I'm All Mixed Up

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GRADE LEVELS:
6^{th} – 8^{th} grades

TIME ALLOTMENT:
3 – 45 minute blocks

SUBJECT MATTER:
Science/ Math

OVERVIEW:
This lesson focuses on investigating the different type of mixtures and their properties. Students will explore the two main types of mixtures (heterogeneous and homogeneous) and will explain the properties of heterogeneous and homogeneous mixtures. The students will examine the three kinds of mixtures (colloids, suspensions, and solutions) and their properties. The students will make mixtures and will gather data from the heterogeneous mixture. After collecting data, the students will use the graphing calculator to compare the data.

LEARNING OBJECTIVES:
Students will be able to:

- define/differentiate between heterogeneous and homogeneous mixtures.
- list and describe the properties of each type of mixture.
- identify/differentiate between the three kinds of homogeneous mixtures (solutions, suspensions, and colloids).
- describe the parts of a solution and identify each in a solution.
- list and explain the properties of a colloid and solution.
- collect data from a sample of a heterogeneous mixture by simple physical means.
- graph and analyze the data collected when using a graphing calculator.

STANDARDS:
State Standards:
The objectives listed may be used in part to address the Virginia Standards of Learning at http://www.pen.k12.va.us

- The student will investigate and understand the basic nature of matter. (VA SOL Science PS.2)
- The student will investigate and understand how to classify material such as mixtures. (VA. SOL Science 6.6)

- The student will investigate and understand how mixtures can be separated by physical processes. (VA. SOL Science 6.6)
- The student will use wide-area networks and modem-delivered services to access and retrieve information from electronic databases. (VA. SOL Computer/Technology C/T8.4)
- The student will compare multiple one-variable data sets, using statistical techniques that include measures of central tendency, range, stem-and-leaf plots, and box-and-whiskers graphs. (VA. SOL A.18)

MEDIA COMPONENTS:
Video:
Physical Science Series #3, "Mixtures and Solutions"

Web Sites:
http://www.usoe.k12.ut.us/curr/science/sciber00/8th/matter/sciber/matter.htm
At this site students will investigate the differences among the types of mixtures. They will see examples of different mixtures and will do an activity to reinforce their gained knowledge.

http://www.bbc.co.uk/schools/revisewise/science/materials/10_act.shtml
Here students will do an activity on solutions. They will discover how solutions are separated by physical means. They will gain an understanding of what is a solute, a solvent, soluble, insoluble, and solubility.

(Note: United Streaming can also be used. The United Streaming Video-*Physical Science: Mixtures and Solutions* can be found at www.unitedstreaming.com . This video in United Streaming is the same or almost the same as the video used in the lesson.)

MATERIALS :

Materials needed for Introductory Activity:
- Play dough – 3 contrasting colors (example: red, blue, and yellow)
  (You will want enough to make a marble-sized ball of each color for each group.)
- 5 to 7 small ziplock bags

Materials needed for Learning Activity:
- Computer(s)
- Mixture Activity Sheets
- Television
- VCR
- Video- *Physical Science Series #3*
- T1 View Screen
- pencil

Materials needed for Culminating Activity:
- Graphing Calculator (for each student if possible)

- Overhead for Graphing Calculator
- 1 large bowl for mixing the Chex Mix
- Chex Mix or material for Chex Mix (Suggested materials: Cheetos, Doritos, Chex Cereal, M&Ms, Peanuts, Pretzels, Chocolate Chips, Froot Loops, Skittles, etc.)
- 1 Gallon or ½ gallon pitcher for the Kool-aid mixture
- 3 Kool-aid packages
- 3 cups of sugar
- 1 large spoon for stirring
- 1 large scoop or spoon for Chex Mix
- 2 styrofoam cups per student

PREPARATION FOR TEACHERS:

- Prior to teaching the unit, bookmark the Web sites.
- Cue the video to the place to start the lesson.
- Prepare the play dough into marble –sized balls of each color and place the three balls in a small ziplock bag.
- Make sure you go through the instructions from the student materials handouts to make certain that you understand and are familiar with the lesson format and what the students need to do or understand for the lesson.
- When using media, always provide the students with a ***Focus for Media Interaction***, which is a specific task to complete during or after viewing video segments, Web sites, or other media material.
- Prior to this lesson, students should have been introduced to the concepts of physical and chemical properties of matter.

INTRODUCTORY ACTIVITY: SETTING THE STAGE

1st Day

Prepare three different colors of play dough (suggested colors would be red, blue and yellow **or** *green, yellow, and red) each in small balls about the size of a marble before class and put in a small zip-lock bag. Make enough for groups of two or three students for the class.*

The Introductory Activity

1. Tell students that you are going to pass out a small sample of play dough and they are to wait until directions are given for what they are going to do.

2. Pass out the zip-lock bags with the play dough and tell the students to get the red ball of play dough and roll it into a long, slim roll that is about 4 to 5 centimeters long. Another student can get the yellow ball of play dough and roll it into a long, slim roll that is about 4 to 5 centimeters long. Another student can do the same with the blue ball of play dough.

3. Have one student lay the three long, slim rolls of play dough side by side. Tell the student to pick them up together by the ends and easily twist the play dough (like a rope is twisted). Once the play dough has been twisted, have the students lay them down on their desk.

4. **Ask students**: "Are these colors of play dough mixed together?" (Yes) "Are they very well-mixed or not very well mixed?" (not very well mixed). "Can you still see the different colors?" (Yes) "Can you use your hands and separate the different colors?" (Yes).

4. Let the students separate the colors of play dough and then have them twist the colors back to the way they were, i.e. a twisted rope of three colors. Now, have the students cut the twisted "rope" of play dough in half. Have a student in each group take one of the halves of the "rope"of play dough and start really mixing it together. (You can let each student in each group mix the play dough until all colors are mixed well together.) Leave the other half of "rope" with the three distinct colors visible.

5. Now, **ask students**: "Are these colors of play dough mixed together?" (Yes) "Are they very well mixed or not very well mixed?" (very well mixed) "Can you still see the different colors?" (No) "Can you use your hands and separate the different colors?" (No) Say, "We have two different types of mixtures here, well-mixed and least-mixed, and we are going to explore the two types-heterogeneous and homogeneous mixtures. Today, we are going to be looking at a video that will explain the two different types of mixtures."

LEARNING ACTIVITIES

**Note to teacher: Have the video, Physical Science Series #3 ready for viewing before class starts.*

1. Focus for Media Interaction: **Say**, "We are now going to watch a video about mixtures. If you want to take notes, you may. If, at any time you want me to pause for you to write down notes or definitions, just hold up your hand. Now, we're going to look at mixtures. I want you to watch and be able to tell me where granite is formed. Is granite a pure or impure substance? Why? And, of what is granite made?"

2. Start video in the physical properties of matter portion where you **see** a glass filled with bubbles and **hear** "The first class of matter we're going to study is mixtures." **Pause** when you **see** the black stone and white quartz and **hear** "It's made of zinc, mica, feldspar, and quartz." **Ask**: "Where is granite formed?" (deep within the earth) "Is granite a pure or impure substance?" (impure) "Why?" (It is made of many different minerals that keep their individual identities.) "Of what is granite made?" (zinc, feldspar, mica, and granite)

3. Focus for Media Interaction: Say, "Now, I want you to be able to tell me what a mixture is and what three examples of a mixture are given. What do these mixtures have

in them and how are they classified?" **Resume** and **Pause** when you **see** a salad being mixed and **hear** "Mixtures are classified by how well mixed they are." **Ask**: "What is a mixture?" (Matter made of two or more substances mixed together but not chemically combined) "What 3 examples of mixtures were given?" (sand, soil, and salad) "What is in sand?" (sand, rocks, and shells) "What is in soil?" (dirt, stones, and plant roots) "What is in the salad?" (lettuce, tomatoes, mushrooms and carrots) "How are mixtures classified?" (By how well mixed they are)

4. Focus for Media Interaction: Say, "What I want you to look for in this next section is what a heterogeneous mixture is and what are the two examples given? What two properties are given for a heterogeneous mixture?" **Resume** and **Pause** when you **see** a bowl with seeds and nuts mixed together with a wooden spoon and **hear "…**and is not chemically combined." **Ask**: "What is a heterogeneous mixture?" (substance in which components are not evenly mixed) "What two examples of heterogeneous mixtures are given?" (vinegar and oil and cereal with oats, seeds, coconuts, and raisins) "What two properties does a heterogeneous mixture have?" (The particles keep their individual properties and they are not chemically combined.)

5. Focus for Media Interaction: **Say**, "Now, I want you to be able to tell me what a homogeneous mixture is, what examples are given, and why milk is a homogeneous mixture." **Resume** and **Pause** when you **see** a fountain spouting water and **hear** "Having explored heterogeneous and homogeneous mixtures, let's consider the three types of mixtures: colloids, suspensions and solutions." **Ask**: "What is a homogeneous mixture?" (substance in which components are evenly mixed) "What examples were given?"(milk, toothpaste, paint, perfume) "Why is milk considered a homogeneous mixture?" (It is chemically the same throughout.)"

6. Focus for Media Interaction: **Say**, "In this next portion, I want you to see what is a colloid? What examples of a colloid are given? What are the two properties of a colloid?" **Resume** and **Pause** when you **see** the word "Suspension" and **hear** silence (There is no sound.) **Ask**: "What is a colloid?" (mixture in which particles are mixed but not dissolved) "What examples are given of a colloid?" (paint, fog, smoke, gelatin, and shaving cream) "What are the two properties of a colloid?" (Particles do not settle out and continually bombard each other and a colloid lets light pass through –scatters light.)

7. Focus for Media Interaction: **Say**, "I want you to listen for the definition of a suspension. I also want you to give me the two examples given and the property of a suspension." **Resume** and **Pause** when you **see** the word "Solution" and **hear** silence (There is no sound here.) **Ask**: "What is a suspension?" (heterogeneous mixture in which some particles settle out) "What two examples are given?"(particles in water in the paperweight and water in the raging river) "What is the property of a suspension?" (Particles settle to the bottom out of water.)

8. Focus for Media Interaction: **Say**, "I want you to be able to tell me what a solution is? What two examples are given and what is in these two examples?" **Resume** and **Pause** when you **see** a cloudy sky and **hear "**It is the air we breathe." **Ask**: "What is a solution?" (a well-mixed mixture in which particles are small and dissolved) "What two

examples are given?" (sea water and the air we breathe) "What is in sea water?" (many different minerals including salt) "What is in the air we breathe?" (nitrogen, oxygen, and other gases)

9. Focus for Media Interaction: Say, " Okay, now that you know what a solution is, I want you to listen and tell me what the two parts of a solution are and what they do in a solution. Also, what is water called?" **Resume** and **Pause** when you **see a** glass of water with a red substance poured in and **hear "…**often called the universal solvent." **Ask**: "What are the two parts of a solution?" (solute and solvent) "What does a solute do in a solution?" (It is the substance that is dissolved.) "What does the solvent do?" (It is the substance that dissolves the solute.) "What is water called?" (the universal solvent) "What was used to make the lemonade?" (water, lemon juice, and sugar) "Which part is the lemon juice?" (a solute) "Which part is the water?" (the solvent) "Which part is the sugar?" (solute)

10. Focus for Media Interaction: **Say**, "I want you to listen for the property of a solution and what kind of solution is a soda." **Resume and Pause** when you **see** the word "solubility" and **hear** silence (There is no sound here.) **Ask**: " What is a property of a solution?" (It has the same color and taste throughout the liquid.) "What kind of solution is a soda?" (A gas is dissolved in a liquid.) "What is the gas dissolved in the liquid?" (carbon dioxide)

11. Focus for Media Interaction: **Say**, "Now, I want you to listen and tell me what *soluble* and *insoluble* means and give an example of each." **Resume** and **Stop** when you **see** the words "Rate of solubility" and **hear** silence (There is no sound here.) **Ask**: "What does *soluble* mean?" (ability of a substance to dissolve into another substance) "What does *insoluble* mean?" (inability of a substance to dissolve into a specific solvent) "What example was given for *soluble?*" (flavored drink crystals in water) "What example was given for *insoluble*?" (oil in water)

***Remind students**: The mixture lab is tomorrow and they are to bring in the items that they said they would bring for the Chex mixture.

2nd Day

Before beginning the second day, refer to what students have learned the previous day, emphasizing the vocabulary: heterogeneous mixtures, homogeneous mixtures, colloids, suspensions, solutions, solute, solvent, soluble, and insoluble.

Bookmark the web sites: http://www.unco.edu/chemquest/q22_ar1.htm
and http://www.bbc.co.uk/schools/revisewise/science/materials/10_act.shtml

1. **Focus for Media Interaction**: Tell the students: "You are now going to go to the computers where you will work on a site dealing with mixtures. You will work in groups of two. There is an Activity Sheet that is to be completed as you investigate the mixture site." (Pass out the Activity Sheet. Each student will have a sheet to complete.) "This must be turned in and completed in order to be evaluated."
2. Go over the questions for which the students will be looking for answers. Tell students to be sure to follow the directions and answer all the questions."

*****_Remind students that they are not to wander away from these two websites!_

CULMINATING ACTIVITY
(3rd Day)

This activity emphasizes the properties of heterogeneous and homogeneous mixtures. It demonstrates the difference in the two mixtures. Using data collected from a heterogeneous mixture, students will enjoy the mixture as they graph the data.

Note: About two days before you do this activity, have the students bring in certain things for a heterogeneous mixture, such as Cheetos, Doritos, Pretzels, Peanuts, M&Ms, Chex Cereal, Skittles, Chocolate Chips, Fruit Loops, etc. Any of these things can be used to make a Chex Mix.
*****Option: You may want to get a huge bag of Chex Mix already mixed together.
Also, include Kool-Aid and sugar for a homogeneous mixture.
Other items students may bring in are cups and napkins.)

1. Get a very large bowl to mix the materials together. Mix all materials together. Using a scoop or large spoon, put a small portion in styrofoam cups. Tell students that you are giving them a mixture and they are going to do two things to it. First, they are going to count each item in a tally sheet. Second, they will be eating their sample. They can count each item as they eat them or they can count all at one time.
2. Have a helper that can help pass out the samples of heterogeneous mixture and the Kool-Aid. As the students are eating, **ask**: "Which is a heterogeneous mixture?" (the Chex mix) "Which is a homogeneous mixture?" (the Kool-Aid) Using the "Properties of Mixtures" handout (Copy this on a transparency for the overhead projector.), compare the properties of a heterogeneous mixture to the Chex mix. **Ask,** " How many M&Ms did each of you have?" After the students tell you how many they have each, **ask**, "Is each Chex mix the same?" (No) "How are they different?" (Different amounts of items) "Is it still Chex mix?" (Yes) "What property does this show about mixtures?" (The substances can be present in any amount.) "Can you taste the M&Ms?" (Yes) "Can you taste the peanuts?" (Yes) "Can you find the M&Ms and the peanuts?" (Yes) "What property does this show about mixtures?" (The substances keep their own properties.) "If I ask you to put each item in groups to separate the mixture, can you do this?" (Yes) "What property does this show about mixtures?" (The substances in a mixture can be separated by simple physical means. **Say**, "Now, let's examine the homogeneous mixture (Kool-Aid). **Ask,** "How many parts does a solution have?" (2) "What are the two parts?" (solvent and solute)

"What is a solvent?" (the substance that does the dissolving) "What is a solute?" (the substance that is dissolved) "In our solution, which is the solvent?" (water) "Which is the solute?" (sugar and Kool-Aid) "Why is our Kool-Aid a solution?" (the sugar and Kool-Aid are dissolved in water) "Does our Kool-Aid appear the same throughout?" (Yes) "What property of homogeneous mixtures does this show?" (The mixture appears the same throughout and any portion of the solution will look and taste like any other portion of the same solution,)

3. After everyone has finished collecting their data, **tell** the student, "We are getting ready to use the graphing calculators to graph our data." (have your T1 View Screen on an overhead projector and your graphing calculator attached so you may lead your students through the process.)
4. **Say,** " We are now going to record the data in our calculators" (If you have enough calculators for each student, let each student graph the data.) "We will now get our calculators ready for our data. Press the key "**on**". Press "**mode**", making sure all highlighted areas are on the left side. Press "**2nd**" and "**zoom**", making sure all highlighted areas are on the left side. Press "**2nd**" and "**stat plot**" and go to number **4** and press "**enter**". Press "**enter**" again and you will see the word "**Done**". Press "***Y*=**" and make sure all is cleared. If not, press "**clear**".
   "Now press "**stat**" and enter on number 1:Edit. (Make sure that L1 and L2 are cleared. If not, clear the lists by moving cursor up until it is blinking on L1. Press "**Clea**r" and "**enter**." Do the same for L2.) In L1, enter 1, 2, 3, 4, etc. until the number is equal to the number of item that the class has counted. (You will enter after each number is written.)
   In L2, enter the number of each item counted, starting with #1, #2, #3, etc. until all the number of items have been recorded in L2. Now, press "**2nd**" and "**stat plot**." Press "**enter**" two times. Bring the cursor to the first graph shown on the screen and enter. Make sure that the L1 is on the Xlist and the L2 is on the Ylist. Bring the cursor down to "**mark**" and enter on the dot.
5. Next, press "**zoom**" and arrow down to number 9 and press enter. This will give you the window that you need for your graph. Now press "**graph**". Press "**trace** and move the cursor to the right and left in order to view the values. Discuss the scatter plot. "What is the highest number? Of which item did you have the most? Is this your highest number? What do you have the least of? Where is this on your graph?"
6. **Say**, "Now, let's change our graph to another kind of graph. Press **"2nd"** and "**stat plot'**. Press "**enter**". Arrow down to "Type" and arrow over to the 4th graph (box-and-whiskers). Press "**enter**". Make sure the Xlist is L2. Press "**graph**" and "**zoom**". Arrow down to #9 and press "**enter**". Discuss the graph. Press "**trace"** and see the different values. "Where is the lowest value? Where is the highest value? Where is the medium? Do you have the same amount of every item?"
7. **Say**, "Now, as I collect the calculators let's review the two types of mixtures. What kind of mixture was our Chex Mix? (Heterogeneous) What kind of mixture was our Kool-Aid? (Homogeneous)

ASSESSMENT

- The Mixture Activity Sheet from the Internet will be evaluated.
- A quiz on the vocabulary for mixtures will be given.
- Have students make a list of heterogeneous and homogeneous mixtures and put the mixtures in the correct category.

CROSS-CURRICULAR EXTENSIONS

Science:
Students can use the knowledge gained from this lesson to explore the nutrient value of cereals and other items used in mixtures. They could investigate how many fat, protein, and carbohydrate grams in each item.

Art:
Students can use items that were used in the Chex mix to create artwork with repeated patterns. Other mixtures can be used to create artwork.

Math:
Students can find mean, median, mode, upper quartile, and lower quartile. They can use their data to calculate probability.

Social Studies:
Students can locate the areas in the world where the most grain production is and report on how grain is produced and used in difference ways.

COMMUNITY CONNECTIONS

Invite a nutritionist to visit the classroom and speak on how the nutritional value of food is considered when working with food menus. He/She can explain how good nutrition is essential to our health.
A field trip could be made to a farm that produces grain. Here students could understand how grain is found in the natural state before harvesting and turned into cereal.

Name_____

MIXTURES ACTIVITY SHEET

At web site: http://www.usoe.k12.ut.us/curr/science/sciber00/8th/matter/sciber/matter.htm

Answer or fill in blanks.

1. How are mixtures formed? _____

Name the 3 properties of a mixture:

1.
2.
3.

Mixtures can be categorized as _____ or _____.
Heterogeneous do not appear to_____.
The examples given are:_____, _____, and _____
_____.
The particle in a heterogeneous mixture are large enough to be _____ and can be _____ from the mixture.
Homogeneous mixtures are _____ mixed. _____ are homogeneous Mixtures. In a solution one substance is _____ in another.
The particles are too _____ and will not separate upon standing.
Solutions have _____ parts. The _____ is the substance which does the dissolving and the _____ is the substance that gets dissolved.
_____ is called the universal solvent.
Substances like oil do not dissolve in water and are called_____.

At this site: http://www.bbc.co.uk/schools/revisewise/science/materials/10_act.shtml

Follow directions and do the activity. Go to the "fact sheet" at top and click. Answer the following questions:

1. What does dissolving mean? _____
2. What does soluble mean? _____
   What example is given? _____
3. What does the solution look like in the glass? _____
4. What does insoluble mean? _____
   What example is given? _____
5. What doe the solution look like? _____

What does saturated mean? _____
_____ helps things dissolve.
How do you separate a soluble from a liquid? _____
How do you separate an insoluble substance from a liquid? _____
_____
How do you separate 2 insoluble liquids? _____
This is called _____

Go to “Test” and follow directions. Do questions 1 through 9, answering all. Click on “test me” and get your results.

Answer Key for Mixture Activity Sheet

1. Substances mixed together physically, but not chemically combined
2. The properties of mixtures are:
    1. The substances in a mixture can be present in any amount.

The substances retain their own properties.
The particles of a mixture can be separated out by simple physical means.

3. heterogeneous, homogeneous
4. the same throughout
   concrete, conglomerate rock, and oil and vinegar
5. seen, separated

well, solutions, dissolved
too small to be seen

8. 2, solvent, solute
9. water
10. insoluble

1. change when a solid mixes with a liquid to make a transparent solution

when some substance dissolves
Ex: sugar and water
transparent
when substances do not dissolve
Ex: chalk and water
not transparent; cloudy
when no more of a solid will dissolve in the solution
stirring
evaporate the liquid
sieve larger solids – filter the very fine solids
gently pour the liquid from one container to another, decanting

PROPERTIES OF MIXTURES

Heterogeneous Mixtures:

The substances can be present in any amount.
The substances can be separated by simple physical means.
The substances keep their separate properties.
The particles are large enough to be seen with the naked eye.
The particles are mixed but not chemically combined.
The mixture does not appear the same throughout.
The mixture is "least mixed"

Homogeneous Mixtures:

The mixture looks the same throughout.
The particles are too small to be seen.
The mixture is "well mixed".
One portion of the mixture will appear to be the same as any other portion of that mixture.
The substances keep some of their individual properties.

Solution: a homogeneous mixture

The mixture is made up of two parts: solute and solvent.
The mixture is transparent.
One substance is dissolved into another substance.
The mixture is "best mixed"
Each part of the mixture looks and tastes the same as every other part of the solution.