Community in the Classroom Presentation Plan

Lesson Name Elements of Life

Presenter(s) David Killilea

Grade Level 5 **Standards Connection(s)** Physical Science: Just a few elements make all living things and most materials. Each element is one kind of atom, organized on the periodic table.

Abstract:

Your opportunity to tell teachers and kids what's going to be fun and interesting about your visit!

Activity and Discussion: After briefly looking at and discussing the periodic table, the class will make a model of elements forming compounds (salt) by using gum drops and toothpicks. They will also look at other models of molecules.

Demonstration: David will break down the compound sugar into its constituent elements using battery acid in a protective chamber. This dramatic reaction will cause the sugar to "carbonize" into a black snake-like chain.

Activity and Discussion: Class will continue to look at the periodic table but now with an eye to which elements make of the human body and how this is linked to nutrition. The class will make a paper chart of a human and fill in the appropriate percentages of different elements in the body. This will help link science and math concepts with their own body.

Activity and Discussion: If time allows, David will lead game with flashcards to have class to identify the component elements of pictured item leading with concepts from periodic table.

Vocabulary/Definitions:

Important (new) words

element: substances that consist of atoms of only one kind
compound: substances that consist of atoms of different kind
atom: smallest whole particle of an element
metal: elements that are typically opaque, fusible, ductile, often lustrous, good conductors of electricity and heat
non-metal: elements that are typically brittle, not lustrous, poor conductors of electricity and heat
salt: compound of metal + non-metal, distinct crystal structures, dissolve to create solutions that conduct electricity.
periodic table: list of all known elements grouped by common properties

Materials:

What you'll bring with you

Periodic table (40cm X 28 cm), vitamin bottle, large butcher paper for human silhouette, colored pens, and chemistry demo set-up. Chemistry Demo consists of Plexiglas isolation chamber, charcoal brickette, beaker, sugar, gloves, eye protection, concentrated battery acid (in safety container), and baking soda (for acid neutralization). Flashcards for element game.

What students should have ready (pencils, paper, scissors)

None

Classroom Set-up:

Student grouping, Power/Water, A/V, Light/Dark, set-up/clean-up time needed

Way to display periodic table for entire class to see, e.g. an easel or bulletin board.
Chalkboard or dry erase board at front of room.
Table or work area at front of room.
Some activities work best in small groups

Classroom Visit

1. Personal Introduction: 5 Minutes

Who are you? What do you want to share with students and why? How will you connect this with students' interests?

Today we're going to be thinking about the different elements that make up everything around us. I am a scientist at Children's Hospital & Research Center at Oakland. I am interested in nutrition, especially vitamins & minerals – all of which are made of elements. I study what happens when people don't get enough of the elements that their bodies need.

I was interested in science early – enjoyed microscope kit as a toy; pretended to be detective.
I enjoyed science classes and loved to ask the question "why" – science is all about this question.
I started in nutrition because I learned that the metal iron can be both good and bad for you. Initially, that didn't make sense. Studying iron also gave me an appreciation for all of the other elements we need for our nutrition. Amazingly, we STILL don't know exactly how much of some of the elements we need and what the elements do inside our body!

Topic Introduction: 5-10 Minutes

Big Idea(s), vocabulary, assessing prior knowledge. What questions will you ask to learn from students?

Does anyone know any names of some elements? [Circle on Periodic Table as named] Where can we find these elements? Does anyone know what elements are found in water? Does anyone know what elements are found in the air we breathe? Can anyone name some other elements found in this room right now?

There are over 100 known elements (112 so far!), although only 83 of those occur naturally. The rest are man-made. All the elements we know are on this Periodic Table. So how do such a small number of elements make up all the different matter in the universe? Let's find out.

2. Learning Experience(s): 30-40 Minutes

Demonstrations, hands-on activities, images, games, discussion, writing, measuring… What will you do, what will kids do? Describe in order, including instructions to kids.

Activity 1: How can small numbers of elements make up very different matter? Pass out gumdrops of 2 different colors and toothpicks to students. Explain that the 2 different colored gumballs represent 2 different elements – sodium and chlorine. Show model of salt molecules and draw chart on board showing properties of sodium and chlorine - sodium by itself will explode when it touches anything wet and chlorine by itself is an extremely toxic gas. Then show 3-dimensional model of how sodium likes to "bond" to chlorine in cubic structure. Ask students to use toothpicks for bonds and to make a model of the salt crystal. Then finish chart on board showing the properties of salt. Concept: Elements can form compounds by bonding together; these compounds can have very different properties from the original elements. This is how the elements can make up everything we know. Just like 26 letters can be combined into all the words in the dictionary, the elements can be combined in different kinds of molecules.

Activity 2: So once elements join to form new compounds, are they changed forever or are original elements still there? Let's see if we can break a compound back down to its original elements. Inside a protective clear Plexiglas chamber, place beaker of sugar. Explain sugar [show sugar] contains carbon, hydrogen, and oxygen mixed together – but it doesn't look like charcoal [show charcoal], so is the carbon really still there? Let's do an experiment to find out. We know that with enough chemical energy, we can "pull" hydrogens and oxygens away from compounds as water. So, car battery acid [note that this is very dangerous], might be able to. Add strong battery acid to the sugar in protective chamber and mix. While waiting 1-2 minutes, for reaction, draw elements and compound on board. During that time, a "black snake" will appear to grow from inside the beaker and a funny smell will be in the air. What is going on and what is the black material? Make predictions based on elemental description. Concept: Compounds may have very different properties, but the constitutive elements are still there. Just like you can take all of the words in the dictionary and divide them into the 26 known letters.

Nutrition: Our bodies are made of lots of different elements in different compounds, but some elements are more common than others. If I tell you that the body is about 70% water, can anyone figure out what the two most

common elements in our bodies are? [Prompt answer with H2O if necessary.] How many other elements would you guess can be found inside of us? [Write down guesses on board and then circle correct answer.]

Do you know many elements that are good for your body? Does anyone know what important element is found in milk and cheese that is good for our bones? [Prompt for calcium.] Does anyone know what important element is found in meat and some veggies like spinach that is good for our blood? [Prompt for iron.] How many of you take vitamins? Let's look at the elements that are in a typical vitamin. [Show vitamin bottle and read back – write elements on board and mention what they do in body- help muscles work, etc.]

Good nutrition is really about getting the right amounts of the right kinds of elements in our food. Some people take vitamins to get elements they might not be getting in their meals. But you can also get too much of something as well as too little. So paying attention to what you eat is important. Since we're made of lots of different elements, let's look at the most common elements in our body by drawing a picture.

Activity 3: What elements are people made of? Divide students into groups and trace the outline of volunteer students onto butcher paper. On the board, list chart of what elements are inside people at what percent. Ask students to color in this percentage onto their paper model of a person in the correct proportions. (Tests some basic math principles) With that chart, answer questions: What is the most common element? What is the most common metal? What are some of the least common elements? Concept: Many elements make up a person, but the four most abundant are hydrogen, carbon, oxygen, and nitrogen.

3. Wrap-up: Sharing Experiences and Building Connections 5-10 Minutes

Putting the pieces together – how will students share learning, interpret experience, build vocabulary?

What are some of things you learned today? [Write discussion points and answers to prompts on board. Possible prompts as needed to get discussion going]

- How can some elements be bad for us (like sodium & chlorine) but their compounds (like salt) be good? [When they combine, their properties change.]
- Why is nutrition important? [It helps us get the elements we need to live and grow.]
- If elements make a compound (like sugar), are the elements still there? How do we know? [Yes because they can be broken down into their elements.]
- What are some of the most common elements inside us? [H, O, C, N]
- What do some of the elements do inside our bodies? [varied tasks, list on board as described]
- What element(s) were you surprised to find in an everyday item?

4. Close: 5 Minutes

How can kids learn more? Thanks and good-bye! Clean-up.

Three take-home messages:
1: "The periodic table is the playbook for the whole universe." Everything that we can see and feel is made from the elements on the periodic table, this includes the sun, the air, the oceans, the school, the desks, and everyone in this room.
2: "You can't judge an elemental book by its cover." Some elements can look and act very different based on natural form. For example, charcoal, pencil "lead", and diamonds are all made out of exactly the same thing (carbon), but the forms are different. Also, when elements combine, their compounds can have radically different properties. Table salt is needed for our proper nutrition, but component elements are very toxic.
3: "The dose makes the poison." Too much or too little of any of the needed elements can cause diseases. For example, you have to have water and salt everyday or you will get sick; however, you can also get very sick of more than a gallon of water or 2 tablespoons of table salt. It is critical to have the right "elemental balance". Nutrition is really just making sure that our body gets the right balance of elements from the periodic table.

Restate why I like studying the science of nutrition and point out that there are many mysteries not yet figured out that future scientists will need to help us with.

TOTAL 50 – 60 Minutes

Follow-up – After Presentation

Suggest students write a letter explaining "How we learned about _____?"
List or attach examples of activities, websites, connections for additional learning.
Attach worksheets, hand-outs, visuals used in classroom presentation.

1. Write a letter about what the students learned - include drawings of an object with component elements labeled or an experiment that we did together.

2. Write a report on your favorite element. Identify the properties of the element, like metal vs. non-metal, solid vs. liquid vs. gas, stable vs. radioactive, abundant vs. rare, light vs. heavy, etc. What is the normal color? Where is the element found in nature? What everyday items is this element used in?

3. Write a report on an element needed for human nutrition. How much is in a healthy person? What happens if you don't get enough of it? What happens if you get too much? What foods is it found in?

Recommended web site: http://www.webelements.com. See attached supplemental material.