Brainy Bits – Making a Volcano Erupt

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Slide 1: Title

Midterm

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Science- How to make a Volcano Erupt?

### Slide 2

#### **Experiment- What makes a volcano erupt?**

This science lesson is designed for 20 non-classified Kindergarten students ages 5-6. Generally scheduling kindergarten lessons include that each afternoon there is time designated for incorporating a "theme" lesson. According to this well accepted schedule, each Friday afternoon the lessons are concentrated on science. However, since this specific "Volcano" exercise requires two days, it is recommended to introduce the lesson on Thursday with the conclusion on Friday.

## Slide 3

#### **Goals and Objectives**

At the completion of this lesson, students will have a better understanding of science, specifically volcanos, while adhering to the codes of science safety. From this lesson the students will gain an understanding of the scientific concepts creating the eruption of the volcano. In addition they will demonstrate an understanding of the following key words:

- 1. volcano
- 2. lava
- 3. eruption

The students also should be able to demonstrate understanding of these concepts by:

- 1. Recording through the written word/drawing.
- 2. Verbal discussion.
- 3. Musical skills through learned song/dance.
- 4. Sight word recognition visual.

#### Performance Objectives

By the end of the second day the students will *fully understand that by combining baking soda*, *white vinegar, and food coloring will cause their model Volcano to erupt*. The students will take part in the experiment and then will be able to demonstrate their knowledge through various written and oral assessments.

#### Slide 4

#### **Evaluation and Assessment:**

- Answer questions throughout the experiment (Galgas, 2015).
- Make various connections utilizing "brainpopjr," & "The Volcano song".
- Provide knowledge and understanding through written assessment (paper and journal) and sight word game.

#### <u>Slide 5</u>

#### Sense and Meaning

Neurons play an essential role in the creating of sense and meaning. "When a neuron creates an electric charge and fires back quickly it generates and then goes to the next neuron. The process of synaptic awareness is called long-term potential" (Sousa, p. 84). Eventually after firing multiple neurons, they come together and form a new memory. Sousa explains that "if both sense *and* meaning are present, the likelihood of long term-storage is very high," (Sousa, p. 53).

Throughout the lesson, there are many different instances where the students are able to incorporate and develop sense and meaning, For instance, students visualize and assign a meaning towards what they observe happening in the experiment leading up to the eruption. The children make concrete connections dependent upon whether or not the volcano erupts. The students need to think critically to determine the impact of what specific ingredients were used as well as the ensuing result of combining these ingredients. Once the students are able to make the connection between accurately measuring and mixing the ingredients so to cause the volcano to erupt, the information can then be stored in long term memory (Sousa, 2011).

The students will see the picture of the volcano and be able to connect it to the 3-D version of the volcano. They will observe the lava come out of the 3-D version as well as relating the events to the video "Fast Land Changes." Finally the students will be able to reinforce the lesson by incorporating the words to a familiar tune, "I'm a Little Teapot," (Sanders, 1972). By incorporating visual, written, and verbal recognition students will demonstrate the assignment of sense and meaning to the volcano experiment.

### **Slides 6,7,8**

#### **Primacy / Recency**

The Primacy-Recency effect states that "we remember best that which comes first, second best that which comes last, and least that which comes just past the middle," (Sousa, 2011, p. 129). For this reason, it is crucial to take advantage of the initial time that the student is presented with the principles of the "Volcano Experiment.", what Sousa calls "prime-time-1" (Sousa, 2011).

Prime-time 1: This is when it is important to describe the experiment including step by step directions, ingredients and expected outcomes. Sousa explains that new information should be taught at the beginning of the lesson when the student is focused on the teacher. This is the time when the student is curious and will most likely remember the information (Sousa, p. 95).

Down-time: this is the time when the students practice their new concepts and gives them the chance to also discuss what they learned. Students will use this time to apply their knowledge in written and verbal assessments. (Sousa, p. 130)

Prime-time-2 is the time where new information is most likely to be retained (Sousa, 2011). This is the stage where the student will be evaluated to ensure understanding. There will be ample opportunities for questions after the experiment. In order for the learner to assign meaning to the new information, the learner needs to process and reprocess the material. During the primetime-2

phase, the students will have the opportunity to reinforce new learned information regarding volcanos as well as the comprehension of the newly acquired vocabulary so to commit them to long term memory (Sousa, 2011, p. 87).

# DAY 1

## Prime-time 1

Teacher introduces the safety science tips and sight words at the opening of the lesson. The sight words will be written on the board as well as handed out to the students. The students will repeat the words out loud with the teacher.

- 1. volcano
- 2. lava
- 3. erupt

The teacher then will open discussion to illicit responses about volcanos. This will review information taught in the previous lessons. Some questions will be

- 1. What do volcanos do?- (show picture of volcano)
- 2. How big are volcanos?
- 3. What comes out of a volcanos?
- 4. Where do you find volcanos?
- 5. Why are volcanos dangerous?

## Downtime

After discussion of the sight words and answering the "volcano" questions, the students will perform the safety procedures and experiment as outlined.

## Prime-time 2

- 1. Students discuss sight words they learned and put into the words into sentences.
- 2. The teacher writes sentences on board as students respond.

## Day 2

#### **Prime-time 1**

- 1. Teacher introduces Volcano Song using the smart board.
- 2. Teacher introduces sight words for day 2, "baking soda, white vinegar, food coloring."

### **Down Time**

Students are shown Fast Land Changes ("Fast Land Changes," 2015) video clip on smart board to reinforce what the students observed on Day 1. They once again discuss what occurred with the experiment. They begin to write and draw what they observed and experienced.

### Prime-time 2

- 1. Students sing "Volcano Song."
- 2. Students share writings and drawings.
- 3. Sight word game.

## Slide 9

### **Learning Styles**

Gregorc describes and outlines four different learning styles (Gregorc, 1985). Individuals obtain knowledge and comprehend information in different ways. Gregorc provides a unique perspective on the way we each may learn. The four styles are concrete sequential, abstract sequential, concrete random, and abstract random.

**Concrete Sequential**- The concrete sequential learner needs an orderly presentation as well as a hands on environment. They learn best by utilizing a step-by-step linear progression, and are very organized in nature. They favor hands-on demonstrations (Gregorc, 1985).

Concrete Sequential students begin by thinking about the sight words and applying them to the actual eruption. Once they find they have a firm understanding of the sight words *volcano, lava, and eruption,* they will proceed to *science safety tips*. Demonstration is provided regarding wearing appropriate protection clothing and a step by step instruction outlining the science experiment. Concrete sequential learners appreciate seeing each stage of the experiment and watching the teacher and students measure the ingredients then pouring them it into the 3-D volcano. When the volcano does not erupt, the students understand they need to backtrack so to determine why it did not erupt and what needs to be modified for a successful eruption. Once the volcano erupts the students sit down, watch the video "Fast Land Changes" ("Fast land changes," 2015) then write about what they observed. These students also enjoy going over their sight words while applying them to the assignment. Finally, they appreciate the Volcano song and enjoy being able to teach others what they learned.

Abstract Sequential- The abstract sequential person is intellectual and analytical. They are highly verbal and ordered, and learn well through reading and listening (Gregorc, 1985). They do well with step by step instruction and a lecture format. I will reach this learner by providing detail step-by-step instruction along with the explanation of the experiment. I will give this learner many opportunities to rehearse their skills by reviewing the "Fast Land Changes" ("Fast land changes," 2015) video until they feel comfortable with the process. These students will have the opportunity to look at the volcano, estimate the size of the volcano and then use critical thinking to determine how much of each ingredients was used judging by the weight of the ingredient containers. Once the students get comfortable in their skills of estimating how heavy/light the container is, they begin to form their own opinions and gain confidence and understanding as to what happened during the experiment. Did they need more of one ingredient then another? The teacher can discuss with these students why the volcano OR the dept/

width of the entire in the volcano? The teacher may need to demonstrate this advanced concept on the white board (www.brainopopjr.com).

**Concrete Random**- The concrete random student enjoys experimental, trial and error approaches to learning in an unstructured environment. They are impulsive and independent, but at the same time benefit from practical demonstration and processes (Gregorc, 1985). These learners use personal proof and intuition as a guide for validating information. They enjoy independent study and problem-solving activities and like to question authority. These students will enjoy looking at different options before completing the science experiment. They make an educated guess or hypothesis about what they think will happen if you *don't* measure the ingredients. These concrete random learners will appreciate picking up their materials and following the measurements as directed (Gregorc, 1985). Once they see that the experiment did not fully happen, then they can estimate the amount they *think* they need of each ingredient in order to make the volcano erupt. The students will come up at random, and decide what ingredient to use. These students enjoy feeling the texture of the materials and often become curious about mixing the ingredients.

**Abstract random**- The abstract random learner is extremely sensitive to other's feelings and works well in an unstructured environment. This learner enjoys sharing ideas and often is involved in many projects at once (Gregorc, 1985). This learner will be reached most effectively during the group discussions and demonstrations. This learner enjoys listening to other students as well as participating in discussions. They observe what they see and discuss it with the class. At the start of the experiment, the teacher will have the students count off by 3's. They will gather in their numbered groups, 1) baking soda 2) white vinegar and 3) food coloring. Once their number is called, one student from that group will come up, put on the proper safety gear, get their material and pour it into the volcano then return to their group. After a few seconds, nothing will happen, and the students will continue to rotate their roles. They take turns pouring in the different ingredients. The students continue to pick different positions around the volcano to help it erupt. Once the experiment is done, they have the opportunity to talk about what happened. They each will record by drawing/writing their interpretation of the experiment. The students will be reminded that they need to use their new sight words in their writing or picture. Following this, they watch the video and again participate in a class discussion.

#### <u>Slide 10</u>

#### **Multiple Intelligence**

During this lesson students will have the opportunity to exhibit multiple intelligence. Howard Gardner (Gardner, 1983).

**Visual/Spatial**- Students will be able to discuss the picture of a volcano. I will ask the students what they see and also what they know about volcanos. As the students respond, I will ask them

to come to the board and write their answers. During this exercise I will stand next to the each student to provide support. (For example if a student says "lava." He will re required to walk to the board, sounds it out and write the word from a comfortable standpoint the letters he/she hears). Student states the students will be able to look at the volcano from the "green line" (line that forms a square in the middle of the room) and then once called up, they will have enough distance from the volcano in order to perform the experiment. Students also need to look at the smart board to watch the educational video and help complete the assessment. As well as learn the Volcano song from the green line and complete their journal entry by writing their sight words on either the table or the floor. Utilizing both visual and writing skills helps to reinforce learning (Gardner, 1983).

**Logical/Mathematical**: Using a measuring cup, students will accurately measure the following ingredients and place them into the volcano:

- Two spoonful's of baking soda
- Five drops of food coloring (students color choice)
- One cup of vinegar (dish soap may also be used)
- \*(Ingredient amounts may be varied to accommodate size of volcano)

At the completion of the experiment students will be able to discuss their observations with one another. Did the volcano erupt? Why or why not? (Gardner, 1983)

**Intrapersonal**- How does a student perceive the lesson, (Gardner, 1983)? Does he have a firmer understanding of using science safety tips (example: not to spill on clothes- wear protective gear)? In what way did the students perceive the experiment and were they able to understand what caused the eruption? Did they apply the sight words to the lesson? What were their thoughts? What did they learn from "Fast Land Changes," ("Fast Land Changes" 2015)? They then apply what they learned to their paper afterwards (Gardner, 1983)?

**Body-Kinesthetic** - Students are able to get close enough to see the volcano and the eruption as well as interact with the smart board (brainpopjr.com). They use their arms to show each other how big they think a volcano. The students have to help complete final assessment on the smart board. Standing nicely around the green line, they also use their bodies for the Volcano Song-fine motor skills to write about what they learned with the experiment. Participating in the sight word game (Gardner, 1983).

**Interpersonal-** They share with each other what they see happening with the volcano's eruption and what they wrote and draw on the paper- students assisting each other with the assessment after the "Fast Land Changes" ("Fast land changes," 2015) visual. They learn the Volcano song from each other as they participate in the sight word game (Gardner, 1983).

**Linguistic**- Students stating the terms and identifying the different parts of the experiment. Teacher stating directions. Watching the movie where they characters are speaking- singing the Volcano song and stating the answers for the sight word game. Sharing what they learned from the "Fast Land Changes" ("Fast land changes," 2015) video reinforces prior learning (Gardner, 1983).

**Musical**- The mirror neuron is known to have the student *mirror* what they see the teacher doing. In this sense the teacher first demonstrates the song and then students follow the teachers move after. "Mirror neurons probably explain the mimicry we see in young children when they imitate our smile and many other of our movements," (Sousa, p. 23) By use of the smartboard, the students will be able to see the words and actions as well as watch the teacher doing the moves step by step (Gardner, 1983).

To the tune of "I'm a little teapot (Sanders, 1972):" "I'm a volcano wide and tall (arms wide, then tall);

I am so strong, I will not fall (show big arm muscles);

When I am ready you will see (crouch down and tremble);

Lava bursting out of me (jump up and use arms as exploding lava)."

The students continue to listen to calming music as they write their answers about what they saw happen in the experiment. The students get excited when they hear the beginning introduction to the "Fast Land Changes" ("Fast Land Changes," 2015) video.

**Naturalistic-** students compare the picture of the volcano and on brainpopjr. To the environment around them. What are the similarities and differences? (Gardner, 1983)

**Existential-** Students think of how volcanos formed and where they came from. The students' questioning "what is the purpose of volcanos?" develops students' critical thinking (Gardner, 1983).

## <u>Slide 11</u>

### **Technology**

This lesson requires the use of the following:

- Computer- mouse keyboard
- Smartboard
- Whiteboard
- pointer

The use of technology in this classroom is pertinent since some students are ESL and ELL. The smartboard allows you to pick different options for language as well as magnifier. Since every student comes from a different background and culture, the smartboard makes it easier for a student to properly understand the lesson. Along with making the proper adjustments on the smartboard, the teacher can also use a pointer to point to different areas on the smartboard, as well as using the "markers" to drive and direct the students' attention to where it needs to be.

The smartboard would be great for Prime Time Recency since it captures the student's attention as well as making the student be involved in their own learning experience.

During the lesson I would log into <u>www.brainopopjr.com</u> and as a class we would watch the video on Volcanos called "Fast Land Changes" ("Fast Land Changes," 2015)

- Once the video is complete, it provide you the opportunity to complete an assessment. Students will have a chance to come up and interact with the smartboard by choosing the answers to the questions (assessment).
- We will also use a whiteboard to write down the sight words and learn the Volcano song.

\*Uses a variety of multiple intelligence

# <u>Slide 12</u>

# Neurons and Sensory input

Neuron development starts in the embryo very early on and continues to form during the child's life (Sousa, p. 24). A child's brain develops at a different pace especially the learning periods. All students learn through their senses. When they go to a specific location, they use their vision to know and understand where they are. If you do, the amygdala tells the brain it is okay and a safe environment. The only sense that goes directly to the amygdala is smell. David Sousa (Sousa, 2011) states that" all sensory stimuli enter the brain as a stream of electrical impulses that result from neurons firing in sequence along specific sensory pathways." Each sense is perceived through the brain differently.

# <u>Slide 13</u>

# **Cerebral Lobes**

David Sousa outlines the components of the brain, specifically that the brain has four lobes (Sousa, 2011). Each lobe is responsible providing a different function to contribute to the way we learn, remember and incorporate information. Those four lobes are defined as the frontal, parietal, temporal and occipital lobes.

<u>Frontal Lobe-</u>Students use this part of brain with decision making and problem solving. They try to understand *why* the Volcano is or is not erupting. They think about different solutions that will potentially help the volcano erupt. They also use the frontal lobe to answer questions on "Fast Land Changes", and ponder on which part of the experiment to draw and write about. All information is processed and stored in the Frontal Lobe. (Sousa, 2011)

<u>Parietal Lobe</u>- The neurons provide information to each other about the experiment as well as the rest of the lesson. Students space themselves appropriately on the green line according to where the Volcano is. The students also use their parietal lobe when the senses are involved. This includes recognizing and putting on safety gear well as touching the materials (baking soda, vinegar, food coloring) or find a spot to sit on the floor watching brainpopir. The parietal lobe is also used when singing the Volcano song and participating in the sight word game up on the white board (Sousa, 2011).

<u>Temporal Lobe-</u> Students are able to listen to instructions (science safety prior to experiment) as well as verbalize their answers through the use of this lobe. Students will listen to brainpopir, the song, and the sight word game. They discuss with each other what they saw during the experiment and what they found interesting. They will listen to the noises made when mixing the ingredients together in the volcano as well as watching how their classmates react. (Sousa, 2011).

<u>Occipital Lobe</u>- Students will be looking and understanding every aspect of the lesson. The Volcano, the eruption, brainpopir- Fast Land Changes, watching the teacher demonstrate the song (mirror neuron), and watching for the sight words. They will also be looking at their assignments as well as their classmates when they present them (Sousa, 2011).

# <u>Slide 14</u>

While describing the limbic system, David Sousa (Sousa, 2011) details various areas of the brain and what each involves. The students' use each area of the limbic system while observing their environment and watching the lesson. For instance:

## The Limbic System

The Thalamus- All sensory information (except smell) is first processed through the Thalamus (Sousa, p.18). Students first take in sensory input from the atmosphere when the first walk into the positive classroom atmosphere and then become curious at the idea of the Volcano. They will listen to their teacher and classmates and watch the educational video. They will touch the pencil and paper in order to complete the assignment.

The Hypothalamus- The hypothalamus is in control and maintains the homeostasis of the student. (Sousa, p.18). Student's come to class in many different conditions. Luckily they are provided with a snack in the morning. This snack usually is either crackers or cereal. This allows for the students to be prepared for class and helps to restore energy in order to be alert during the day.

The Hippocampus- the hippocampus is integral for the duration of the lesson in that it aids in working memory and long term storage (Sousa, p. 19). "Memories are formed when a group of neurons fire together when activated," (Sousa, p. 85). The students are always shown the sight words to which they will put into long term storage and associate them with the experiment.

There are multiple means throughout the lesson to help the students recall and understand the terms.

The Amygdala- The amygdala "regulates individuals interactions with the environment that can affect survival" (Sousa, p. 19). It is known for its emotional connections. When the students first walk into the room, the environment is positive and friendly. Once the students feel comfortable with their environment, the amygdala will give the student the "okay" and the student will feel safe. This lesson triggers many emotions. "The emotional component is recalled whenever the memory is recalled," (Sousa, p. 19). Students will make the connection between getting excited about the experiment to the baking soda, white vinegar, and food coloring, causing the volcano to erupt. The students will feel excited, nervous, and anticipate the volcano erupting. They feel happy when it finally does erupt and are inquisitive as to how the volcano did erupt. Over the course of the lesson, the amygdala will also be used to help the students recall what has happened. The sense of smell goes directly to the amygdala. So after the completion o the experiment any time the students smell an odor reminiscent of the eruption that memory will automatically be directed to the amygdala.

## **References**

All images used from Prezi

*Fast land changes*. Retrieved January 30, 2015 from https://jr.brainpop.com/search/?keyword=Fast Land Changes.

Galgas, S. (2015). Retrieved February 2, 2015 from http://www.sciencebob.com/experiments/volcano.php

Gardner, H. (1983). *Frame of mind: The theory of multiple intelligences*. New York, NY: Basic Books.

*Gregorc overview*. (2013, 09). Retrieved January 31<sup>st</sup>, 2015 from http://msetramapo.org/edtc631/wp-content/uploads/2013/09/Gregorc-Overview.pdf.

*Iis for I'm a volcano*. (2010). Retrieved February 1, 2015 from http://preschooldaze.com/2010/04/13/i-is-for-im-a-volcano/

Mills, D. (2002). *Learning styles key word facts*. Retrieved January 20, 2015 from http://msetramapo.org/edtc631/wp-content/uploads/2013/09/Learning-Styles-Key-Word-FACTS.pdf.

Sanders, Ronald (January 1972). *Reflections on a Teapot, the Personal History of a Time*. Harper & Row, New York

Sousa, D. (2011). *How the brain learns*. Thousand Oaks, CA: Corwin Press.