Lesson Plan (Gradual Release of Responsibility)

Lesson Title/Topic: Scientific Method & Density

Standards/Rationale: 112.18. (b) 2B & 2E

| Learning Target | Assessment |
| --- | --- |
| Given three cups of different liquids, a clear straw, and a worksheet, students will create an experiment discovering liquid density with 75% accuracy. | Scientific Method Worksheet |

Materials:

* Activity 1: Scientific Method worksheet, 3 clear cups (per group (2-3 students), Clear straws (one per group), 1 gallon of fresh water, 1 gallon of water w/1 cup salt, 1 gallon of water w/2 cups salt
* Activity 2: Water bottles (one per student), Vegetable Oil, Alka-Seltzer tablets (one per student), food coloring (2 packages), glitter (1 medium size bag), large bucket/sink, & computers/tablets (one per person)

Instruction:

|  | The teacher will: | The student will: |
| --- | --- | --- |
| Focus/Mental Set | * Instruct students to turn to a partner and say 3 things they have learned in science this year * Listen and take notes of student’s discussions | * Reflect on science class for the past year * Discuss 3 things that have learned in science class this year |
| Teacher Input  (I Do) | * “Welcome Everyone! Today you guys are going to be chemists! But before we dive into experiments, we are going to learn a little bit about what a chemist does.” * Explain “Chemists investigate substances, create new formulas, make predictions, conduct experiments, and share discoveries. We use so many of the products they create every day.” * Explain minimum education is a bachelor’s degree in chemistry, but some prefer a master’s or PHD in chemistry as well * Explain that the mean salary is $74,470/year | * Listen attentively to teacher’s explanation about chemist * Develops brief questions for the teacher to settle any confusion |
| Guided Practice  (We Do) | * Explain that we will be using the scientific method during our experiment today * Hand student’s a worksheet * Materials: Every team has 3 different liquids in front of them and a straw. * One liquid has a lot of salt, one has a small amount, while the last one has none * Task: “you must stack the liquids into the straw & figure out which one has a lot, a little, & no salt” * Explain that there is one catch to this experiment: If you don’t get the first time, you must keep trying different methods until you do it * Why would I want you to do this? * Say “Good! The more mistakes you make then the more you will learn!” * Observe and monitor students’ experiments * Reminds students that they must try again if their original hypothesis was wrong * Provide guidance to students who are lost * Bring the students together to discuss their findings * What would happen if you do the reverse? \*Start with most dense      * Why do you think the order is important? * What can we then conclude about these 3 liquids? * **Follow-Up Questions to ensure student understanding of density:** * What might make something float to the top versus sink down to the bottom? * What can conclude about these 3 liquids? * What is another scientific concept that involves the weight of a liquid? * Have you heard of density? Can you formulate a definition? * Do you think items of more density sink or float? * Which liquid do you think had the most density? Least density? Medium density? * What did this experiment reveal to us? * Why do you think that matter to us? * Why do you think it matters if something sinks or floats? * Explain that next they are going to create a homemade lava lamp * Tell them the materials they are using are oil & water, glitter, sequence, and food coloring * Explain that the water will go at the bottom and the oil will be added at the top * Ask students: why do you think this is the correct order? What can we conclude about these 2 substances? * After the water, you will add the food coloring…. then the glitter or sequence * Next, fill up the rest of the bottle with oil * Then, break the tablet into 4 pieces * Finally, add the tablets into the bottle and screw the top on quickly * Observe student’s creation process of lava lamps * Provides guidance with students who are lost | * Review worksheet to ensure understanding of the scientific method * responds by explaining that in order to learn we must make mistakes * develops a question and a hypothesis * attempts to stack liquids corresponding to hypothesis * asks for help if totally lost on what to do * records results on worksheet weather or not it was wrong or correct * retry if the results were wrong * Found that the order in the straw must be: yellow, green, red (top to bottom) * Respond by explaining that the liquids would mix * The order is important because it takes time for the liquids to settle according to their density, so if you don’t put them in the correct order they will fight to go to their correct position. * Possible responses: I don’t know? The colors? The order that I picked them up in…? * Respond by explaining that you can conclude that the liquids have 3 different densities * Respond by explaining that the mass/weight of an object/liquid * Respond by explaining that you can conclude that the liquids have 3 different densities * Density is another scientific topic involving weight of a liquid * Items that have more density will sink   + Red is the most dense   + Green has medium density   + Yellow is the least dense * This experiment revealed that liquids have different densities and interactions with each other * The reasoning behind items floating and sinking in water can be seen in many real-world applications such as, why boats float on water, why we float more in a ocean than a lake, why a paper clip will sink in a cup * Create a lava lamp using vegetable oil, food coloring, sequence, glitter, & water * Respond by explaining that the liquids have 2 different densities * Therefore, water is the denser liquid and should be on bottom & oil is less dense and should be on top * Pour out water until the bottle is only 1/3 full * Next add food coloring and other items * Add vegetable oil to fill the bottle * Break the Alka-Seltzer tablets into four pieces * Add the tablets and screw on the cap quickly * Watch as the reaction creates a lava lamp |
| Independent Practice  (You Do) | * Explain that students must create a possible experiment about lava lamps * Tell students it must follow the scientific method steps * Monitor students to ensure they understand the assignment * Provide guidance to those who are lost and confused about the content | * Create an experiment about lava lamps   + Does the temperature of the water influence the reaction?   + Does the size of the bottle determine the quantity of blobs?   + Does the size of the tablets influence how the big reaction is? * Using a computer, create a scientific method worksheet to outline their experiment * Ask questions if confused or lost about how a lava lamp works or the scientific method |
| Closure | * Review the scientific method * Ask students the following questions:  1. What are the steps of the scientific method? 2. Can we only use a hypothesis to test questions about science? 3. What’s an example of a hypothesis we could test in our lives? 4. Why do you think the conclusions of this experiment are important? | * Respond with the following answers:  1. Question, hypothesis, procedures, mistrials. Observations, & conclusion 2. No, we can create hypothesis for various real-world situations 3. Do test scores correspond to individual intelligence? 4. These conclusions are important because it shows us the important idea that mass is not the only reason that causes items to sink or float. In fact, it is the relationship between their mass, volume & size. This is called density and it has several real-world applications |

Options:

| Modification (SPED) | References |
| --- | --- |
| * **Accommodations** * 504: ADD/ADHD: Create a list of the six steps of the scientific method and post the poster in the front of the class * SPED: Visual Impairment: provide oral directions or written instructions with large font * **Modifications** * 504: ADD/ADHD: required to only create an outline of the scientific method for their experiment on a word document * SPED: Visual Impairment: allow student to hand-write scientific method worksheet for their experiment (can’t look at computers for too long) | * CareerPlanner.com Inc. (2018). Chemist Job Description. Retrieved March 24, 2019, fromhttps://jobdescriptions.careerplanner.com/Chemists.cfm * Easy to Make Lava Lamp Science Project! (2016, October 04). Retrieved March 24, 2019, from https://sciencebob.com/blobs-in-a-bottle-2/ * McKay, D. R. (2019, March 20). What Does a Chemist Do? Retrieved March 24, 2019, fromhttps://www.thebalancecareers.com/chemist-career-information-525995 |

| Bloom’s Taxonomy Levels | Technology Integration |
| --- | --- |
| **Knowledge**  **Analysis**  **Synthesis** | Independent Practice: students are to create their own scientific method worksheet using their computers |

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| **Enrichment** | **Reteach** |
| * Create a Mnemonic device for the six steps of the scientific method * Give students an example  1. Quite - Question 2. Happy - Hypothesis 3. People - Plan 4. Occasionally - Observation 5. Are - Analyze Results 6. Clowns – Conclusion | * Create a colorful anchor chart for every step of the scientific method * Chart should include:  1. The definition of step 2. 2 examples (one incorrect, one correct) 3. Image/Drawing |

Team Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

THE SCIENTIFIC METHOD

**MISTRIALS:**

**CONCLUSION:**

**OBSERVATIONS:**

**OBSERVATIONS:**

**OBSERVATIONS:**

**PROCEDURES:**

**HYPOTHESIS:**

**QUESTION:**