

At the end of today I will be able to...

- Listen to instruction
- Demonstrate understanding of the characteristics of different substances and solutions
- Efficiently work in partners
- Use a pipette and measure accurately
- Use prediction, observation and explanation skills to understand substances and mixtures

What's that Powder?????

An inquiry-based, experiential lesson plan

Outcome: MS7.1 Distinguish between pure substances and mixtures (mechanical mixtures and solutions) using the particle model of matter.

Subject: Main focus is Science

Main Idea: Students will be able to predict, observe and explain different substances and how they react with multiple solutions.

Essential Question: What evidence may we observe that a “chemical reaction” may be occurring?

I Can Statements:

- Listen to instruction
- Demonstrate understanding of the characteristics of different substances and solutions
- Efficiently work in partners
- Use a pipette and measure accurately
- Use prediction, observation and explanation skills to understand substances and mixtures

Outcome:

MS7.1 → Distinguish between pure substances and mixtures (mechanical mixtures and solutions) using the particle model of matter.

Indicators:

- (f) Create mechanical mixtures and solutions using common materials and compare the physical properties of the original materials and the resultant mixture or solution.

Total Time: approx. 1.5 hours. Could be adapted to be shorter or longer.

Prior Knowledge:

- What is an indicator?
- What is a chemical reaction?
- What is predicting, observing and explaining?
-

Materials

Non-consumables:

- Lab coat

- Safety glasses
- Pipettes
- Observation/recording sheet

Consumables:

- Vinegar
- Iodine
- Water
- Phenolphthalein
- Dixie cups
- Plastic spoons
- Aluminum foil
- Drop sheets

Materials for set:

- Bread
- Alka-Seltzer tablet
- Oil
- Food colouring
- Egg soaked in vinegar
- Tea bag
- Lighter
- Iodine

Preparations:

1. Sort the different powders into clear bags. This will be used when scooping powders onto the foil.
2. In labeled Dixie cups, have all the solutions ready to go.
3. Place egg in vinegar 24 hours before lesson.
4. Put a little bit of baking soda on the door handle, windows, a foot print of baking soda. (Clean up after lesson is done) This is the evidence that was left behind by the culprit...aka Mr. Keyes.

Set (30 minutes)

1. For the purpose of this lesson both teachers will put on a little skit to demonstrate to the students what is expected of them. In the future or if there is only one teacher this skit can be done with the class.
 - Have mysterious music playing in the background to set the mood
 - Teachers will demonstrate the concept of indicators.
 - During this lesson, students will be engaged in discussion, they do not need any materials out.
 - Because this is an inquiry-based lesson, students who have questions will be prompted to research this on an available computer during the lesson. As a class we will have the opportunity to take time to research. Based on the student's ability, teacher may need to assist in the researching aspect.

- The experiment the two teachers will participating in will be demonstrating iodine on a piece of bread.
- Role of teacher #1 → Ask teacher #2 questions to spark curiosity. What am I holding right now? What is this used for? If I do _____, what do you think will happen (predict)? Teacher #2 shares their prediction. Teacher #1 tells teacher #2 to observe carefully while the experiment takes place. They are watching intensely and only observing exactly what is happening. Teacher #2 shares what they have just observed. Teacher #1 asks teacher #2 to explain what they think happened. Teacher #1 asks more questions, digs for deeper understanding and explains what happened.
- 2. Teacher #2 repeats these steps but with students this time.
 - **Demonstration:** alka-seltzer tablet in oil and water with food colouring. Write answers on the board for the whole class to reference throughout the POE's process.
- 3. Teacher #1 repeats these steps but with students this time.
 - **Demonstration:** regular egg vs. egg in vinegar. Write answers on the board for the whole class to reference throughout the POE's process.
- 4. Teacher #2 repeats these steps but with students this time.
 - **Demonstration:** tea bag on fire. Write answers on the board for the whole class to reference throughout the POE's process.
- 5. Explain to students the concept of indicators
 - There are many common indicators used by scientists to determine unknown substances. There are dozens of acid-base indicators alone. People who manage a swimming pool use indicators to determine bacteria and chlorine levels. Indicators exist for testing what is needed in soils for specific plants.
 - The colour change in an indicator test is itself a chemical reaction
 - Looking at the different solutions we used, how are the characteristics the same? Same density, all clear. What if we used oil? Would there be the same reaction? No, because oil is not an indicator.
- 6. Explain the difference between a physical change and a chemical change. Recite poem together.
 - **Physical change:** changes how things look. Like tearing the pages in a book, or freezing a liquid, like water to ice, or painting a house to make it look nice.
 - **Chemical change:** has come to pass, if you see a new solid, liquid, or gas. The colour may change or the energy too. A chemical change makes something new.

Development (40 minutes)

- Hand out lab coats and safety glasses to each student.

Description: OH NO!!!!!! Somebody has taken all of the desks out of the Davinci and all that is left are these suspicious white powders everywhere!!! We need to find out who stole the desks so they can return them and all the students can live happily ever after in the Davinci!! These are the suspected culprits! Mr. Keyes, I heard he really loves playing with baking soda in his spare time. Ms. Hunter...well everyone knows she eats corn starch for a midnight snack. Ms. Wagar, WHERE WOULD SHE BE WITHOUT HER SUGAR??? And Ms. Sandiford, word on the street is that she enjoys smuggling baking powder into her pant pockets.

WHATTTTTTT. Students will be divided into partners where they will work together to find the mystery powders which will help them discover who stole the tables out of the Davinci...dun dun duuunnnnnnn.

1. Explain to students the circumstances above. They will be using different indicators to create chemical reactions to find out which powder was left throughout the room.
2. In the Davinci room, pair students up into groups of 2. These are your investigator partners!!
3. Pass out worksheets that students will need to fill in as they solve this crazy mystery! Go over them and ensure all students understand what they need to do.
4. Have prepared materials ready to hand out to each group. (See preparation instructions)
5. Hand out a sheet of aluminum foil to each group. Walk around with each mysterious powder and drop a half scoop onto the foil. Each group will need 4 half piles of the same powder. The foil should have 4 rows of 4 white powdered substances. Ensure all of the foils are the same, as this will help in prompt #8. First row: baking powder. Second Row: baking soda. Third Row: Corn starch. Fourth Row: Powdered sugar. Prompt students to only observe and not touch yet.
6. Show students how to properly use a pipette. Ensure all students understand to not over pipette are else there will be a huge mess!
7. In prepared Dixie cups, pass out all 4 different solutions (water, vinegar, iodine and phenolphthalein. Have the Dixie cups labelled for each group.
8. To ensure this lesson runs smoothly, we will be working as a whole group instruction.
 - Predict the first row. Write answers on the paper. Test the first row (baking powder) with all four solutions, have students record their results. Repeat this for the next 4 powders. The teacher will set the pace, prompting students to test their powders only when told to do so.
9. Students chart should all be filled in at the end. Have students work together to find out who is the culprit of stealing all the furniture in the Davinci. Tell students to keep it a secret until everyone has figured it out. Shout it all out at once!
10. Yes, you guessed it, the culprit is Mr. KEYES!!!!!!
11. Have students clean up their stations. Throw out all of the consumables, wash pipettes, return lap coat and safety glasses.

Closure (15 minutes)

1. Exit slip!!! Pass out pink stickies' and have students write out one thing they learned today, related to science. Example: I learned vinegar reacts with baking soda.
2. On a different sticky, have students write something to Mr. Keyes about stealing the furniture in the Davinci. Ask him why he did that, his potential consequences are, anything! 1-2 sentences.

Assessment

Formative: *Assessment for Learning* → Because this is a whole class paced activity, the teacher can walk around assessing groups on their progress with their worksheet and their aluminum foil.

Formative: *Assessment of Learning* → The worksheet each group will hand in is an assessment the teacher can visually see and understand how much each student understood from the lesson. The exit slip will also demonstrate student learning.

Adaptations

1. Allow students who work better independently to work alone.

Resources

1. This lesson was referenced from
http://www.cfep.uci.edu/cspi/docs/lessons_secondary/Mystery%20Powder.pdf

Names: _____ and _____

Science Detective Mystery Powder Lab

Gather Evidence to Support Your Conclusion!



This investigation has four “mystery powders” to identify. We will use three different “indicators” and record the results of our tests. Like a detectives, look for clues and find the answer.

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See next page...

Use this guide below to find out who stole all the furniture!!

Powder	Reacts with Water?	Reacts with Vinegar?	Reacts with Iodine?
Baking Powder	Yes	Yes	No
Baking Soda	No	Yes	No
Corn Starch	No	No	Yes
Powder Sugar	No	No	No

Record Observations in the chart below!

Mystery Powder	Water	Vinegar	Iodine	Phenolphthalein	Our Prediction? We think this powder is...
1					
2					
3					
4					

WHO IS THE CULPRIT?!?!?!?!? _____