Q405: Saturday Science FS21

Lesson Plan Week 1

Instructor Names: Eryn Goldstein, Lauren Barthel, Ruthie Yezerets, Lindsay Leeper

Grade level: Kindergarten/First

Anchoring Question/Phenomena for the unit: How does gooey brownie batter turn into fluffy brownies?

https://www.nextgenscience.org/pe/2-ps1-2-matter-and-its-interactions

https://www.nextgenscience.org/pe/2-ps1-1-matter-and-its-interactions

Lesson Plan #1

<table>
<tr><th colspan="2">Desired Results</th></tr>
<tr><td colspan="2">Driving Question for this week's Saturday Session
● What goes into making brownies and what do we notice happening to the ingredients as we prepare the brownies?</td></tr>
<tr><td>DCI Addressed in lesson:
● Different states of matter can be geared towards different purposes.
● We can use different kinds of materials that we see around us for different reasons, like baking, building, etc.</td><td>SEPS Addressed in Lesson:
● "Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations.
● Analyze data from tests of an object or tool to determine if it works as intended."
CCCs Addressed in Lesson:
● "Cause and Effect
● Simple tests can be designed to gather evidence to support or refute student ideas about causes."</td></tr>
<tr><td colspan="2">Besides science, what other disciplines of STEM will be included in this lesson?
● Mathematics are also infused into this lesson by using measurements in the recipe. Technology is involved in this process by using the oven to bake the brownies, which the students will see in the time lapse, since we will not have an oven at the SOE to use.
Learning objectives (outcomes):
Students will be able to explain/state

● Students will understand that brownies are made by mixing dry and wet ingredients and then putting brownie batter in an oven to bake.
● Students will see that we can turn runny, gooey, brownie batter into solid, fluffy brownies.</td></tr>
<tr><th colspan="2">Timeline of Activities for the Day</th></tr>
<tr><td colspan="2">Introduction: 9:30-9:45 AM
Engage: 9:45:-10:30 AM
Explore: 10:30-11:05 AM (only 10:50-11:00 of this section should be recorded, not 10:30--11:00)
Explain: 11:05-11:30 AM
Clean up: 11:30AM-12:00 PM</td></tr>
</table>

Learning Plan

ENGAGE

Greeting and get-to-know-you game/icebreaker - 9:30-9:45AM

Introduce overall topic of the unit/camp - 9:45-10:05 AM

- Discuss classroom norms - let students help make a brief list of classroom expectations
    - We are all going to be scientists in this classroom together for the next few weeks
    - Scientists need to be looking at things, asking questions, and investigating.
    - When we are being scientists together, what are some other things that we think are important to be doing to make sure we can explore and investigate? (make sure students know this is about classroom norms, take some examples; being kind/respectful of other people and materials, etc.)
- Move into a brief discussion of what kids think a scientist does- Ex: asks questions, make observations, investigate, etc.
    - Has anyone ever cooked with their parents or family members?
    - What are your favorite things to make?
    - How did you make them?
    - What kinds of things did you use?
- Transition into a book read aloud and the teacher gives a quick description on what the story is about. The teacher will tell students to move to a certain designated space on the floor to sit.

Read Bunny Cakes by Rosemary Wells - 10:05-10:20AM

- Teacher will read the whole book
- Why does Ruby not want Max to come near her while she is baking?
- Which ingredients does Max get at the store? Which ingredient does he really want to get for his cake?
- Which cake do you like better, Ruby or Max's?

- Transition: The teacher connects the story to the lesson activity: how we will be like Max and Ruby when we make brownie batter to bake brownies.

EXPLORE

Introduce today's activity

- Explain activity - 10:20-10:25/10:30AM
- Break into groups - 2-3 minutes

Do activity in groups/stations - 10:30-11:00AM
When a timer goes off (every 10 minutes), groups led by a teacher will move from one table to the next.

- Rotation 1
    - Melt ½ cup butter, add 1 cup sugar; whisk together
    - Questions to ask: What color is the mixture? Is the mixture thick or runny? Is it easy to stir or hard to stir? Why do you think the mixture is sticky? Do you think the order of adding the ingredients matters? Why do you think some ingredients need to be hot or cold? Do you think the temperature matters?
- Rotation 2
    - Add 2 eggs, 1 tsp vanilla, ¼ tsp salt
    - Questions to ask: What do we see happening to our mixture? Do we hear or smell

anything different? Does it look like it's a different color? A different consistency? Why do we think these things might be happening?
    - Ways to engage students: measuring vanilla extract, cracking eggs
- Rotation 3
    - Add ⅓ cup cocoa powder, ½ cup flour, ¼ tsp baking powder
    - Questions to ask: What's happened to our mixture now that we added some powders? Does the consistency look different? Is the color different? If we touch the batter, does it feel different than before? Does the batter smell different or sound different when we stir it? Why do we think some of these things are happening?
    - Each teacher has a designated group of students that they guide through mixing up the batter as they move from table to table (stations, each designated for a different step like adding eggs, etc.). The teacher will read the recipe out loud and have volunteers to measure ingredients, pour ingredients in the bowl, and mixers Teachers move with the students from station to station
- Watch time lapse of brownies baking- 11:00-11:03
    - Brownie time-lapse

EXPLAIN

Transition: Come back together for discussion- 11:05-11:30AM

- Tie back to driving question for the unit - 10-15 minutes
    - "Now that we've seen each of the steps to making brownies, we're going to tie them back to science."
    - What is the science behind making brownies?
    - Do you think the order of adding the ingredients mattered? Why do you think some ingredients needed to be hot or cold? Do you think that mattered?
    - How did the brownie batter become actual brownies?
    - What did we see happening during the time lapse video in order to make the brownies?
    - How did one state of matter change from the beginning of the brownie making to another state of matter at the end of the brownie making?
- **Do anchor charts with students** - 15 Minutes
    - Transition: "Now that we've seen each step of how we make brownies, what do we think are some ways science goes into how brownies are made? These are just some initial starting thoughts so we can come back to this question at the end of our unit."
- Students answer this question and teachers record on big chart paper (?) - or teachers can write this in dry erase on the board, record it, and rewrite again later

ELABORATING/EXTENDING Understanding

- Students will discuss what they did and how they made brownie mix. To extend the lesson we will be sending dry mix home and encouraging students to make brownies at home. - Pass out baggies with mix on the students' way out

Formative Assessment Evidence (*This is the Evaluation Phase of the 5E approach)

What evidence will you gather to understand if ALL your students met the learning outcome (see green box above)?

- Teachers will check for understanding by asking guiding questions to students and recording answers and observations from each student group on chart paper.

Individual Student Accomodations

Accommodations/Modifications for Individual Students

- Provide a space with minimal distraction
- Administer small group settings
- Allow frequent breaks and or brain breaks (gonoodle)
- Have extra time to process information

Materials + Quantity:

Materials:

- 5 lb bag of All Purpose Flour
- 4lb bag of Granulated sugar
- 1 small container Kosher salt
- 8oz container of Unsweetened cocoa powder
- 1 pound butter (sticks)
- 20 Ziplock Bags (sandwich sized)
- 3 Mixing Bowls (medium sized)
- 3 Whisks or mixing spoons
- 8 eggs
- 1 bottle Vanilla Extract
- 1 container Baking Powder
- 3 sets of Measuring Cups
- 3 sets of Measuring Spoons

Brownie Recipe: https://www.allrecipes.com/recipe/10549/best-brownies/

Brownie in a mug (Student instructions for brownies):
https://drive.google.com/file/d/1iuMtpLsDLHloTSQs9AHG8huRx_kwy-4W/view

Brownie time-lapse

Q405: Saturday Science FS21

Lesson Plan Week 2

Instructor Names: Eryn Goldstein, Lauren Barthel, Ruthie Yezerets, Lindsay Leeper

Grade level: Kindergarten/First

Anchoring Question/Phenomena for the unit: How does gooey brownie batter turn into fluffy brownies?

Lesson Plan #2

<table>
<tr><th colspan="2">Desired Results</th></tr>
<tr><td colspan="2">Driving Question for this week's Saturday Session
● How do we identify states of matter?</td></tr>
<tr><td>DCI Addressed in lesson:

● Students will investigate various examples of the 3 states of matter and determine which materials are a solid, liquid, or gas, and why.</td><td>SEPS Addressed in Lesson:
● "Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question."
-Students will investigate the 3 states of matter and gather data regarding which properties pertain to which materials, in which they can use as the basis for answering questions.
CCCs Addressed in Lesson:
● "Patterns in the natural and human designed world can be observed."</td></tr>
<tr><td colspan="2">Besides science, what other disciplines of STEM will be included in this lesson?
● Technology is incorporated as the students investigate and explore the different items during the stations. Students will be observing properties of different items such as cars, gas filled balloons, etc and discussing their characteristics, such as the parts of the car.
Learning objectives (outcomes):
Students will be able to explain/state:
● Students will be able to explain what liquids, solids, and gases are.
● Students will be able to explain what the five senses are.
● Students will be able to use the properties of an object to determine if it's a solid or liquid.
● Students will be able to identify properties of a gas through a teacher demonstration of gasses.
● Students will reflect their understanding back to making brownies on the first day.</td></tr>
<tr><th colspan="2">Timeline of Activities for the Day</th></tr>
<tr><td colspan="2">● Engage: 9:30-10:00- Record from 9:45-10:00 (5 senses)
● Explore 1: 10:00-10:30 (solids and liquids stations)
● Explain 1: 10:30-10:45 (charting properties observed from stations)
● BREAK: 5-10 mins
● Explore 2: 10:55-11:15 (Demo + gasses stations)
● Explain 2: 11:15-11:30 (gasses explanation -- put on chart)
● Elaborate/Extend: 11:30-11:45 (Chart/record the connection back to brownie)
○ if time, shaving cream can be an extension</td></tr>
</table>

Learning Plan

ENGAGE

- Introduce topic for the day:
    - Initial discussion
        - Ask students to remind everyone of what we did last week (take several answers if different)
            - We made brownie batter; how did we think this was science?
        - Ask if anyone made their brownies in a mug; then follow up to those who said yes about what they observed
        - What happened to my brownie batter? Ask students to refresh our memories of what happened to the brownie batter when we put it in the oven
        - TRANSITION: Now that we've made our brownie batter, seen what happened to them when we put them in the oven, and developed some ideas of what we think happened, we need to investigate this further. One of the ways we can start is by talking about something called states of matter and how they can change.
    - Discussion shift: What are the states of matter? How can we identify them?
        - Introduce matter/states of matter
            - What do we know about states of matter?
            - What is a solid? How do we know?
            - What is a liquid? How do we know?
            - What is a gas? How do we know?
            - What is matter? What are some examples of matter?
    - Transition: How do we identify the states of matter? By using our five senses.
- 5 Senses Presentation
- https://docs.google.com/presentation/d/198uzULxbq237uKuF7FMghFQlGGVeqEOqHllHzUmwjr0/edit?usp=sharing
    - Review the 5 senses
    - Connect the 5 senses science/how to be a good scientist
    - How can you use your senses in science?
    - Ask questions in the slides
    - Transition: Using the five senses to identify the objects in each station (introduce explore activity).

EXPLORE 1

- Students will go to 2 stations and rotate. The students will still be split into 4 groups, and there will be 4 identical sets of each station material in order to keep from needing to sanitize. Each station will have various objects and students will observe and use their 5 senses to identify if they are a solid or liquid
    - Station 1: Students will examine various objects/samples and will use their senses of touch, sight, hearing, and smell to determine the different properties of each object, as well as make a decision about what is a **solid or liquid**. Students will make an initial decision about what they think is a solid and what is a liquid, and then make a decision after investigation about the same.
        i. Objects at this Station 1: 3 solids (golf ball, flour, rice/beans), 3 liquids (corn syrup, water, vinegar)
    - Station 2: Students will examine various objects/samples and will use their senses of touch, sight, hearing, and smell to determine the different properties of each object, as well as make a decision about what is a **solid or liquid**. Students will make an initial decision about

what they think is a solid and what is a liquid, and then make a decision after investigation about the same.

i. Objects at this Station 2: 3 solids (toy car, ping pong balls, salt), 3 liquids (vegetable oil, hand sanitizer, dish soap)

- Samples
  - Solid: golf ball, toy car, ping-pong ball, rice/beans, flour, salt
  - Liquid (provided in plastic bags): vegetable oil, corn syrup, dish soap, water, vinegar, hand sanitizer
- Questions to ask at each station:
  - For solids: What color is this object? What does the object feel like? Do these items feel different than the others? Do they smell or look different? Do they look or seem similar to the other samples at the table? Do you think this could change in any way? What do you think would happen if we made it very hot? Very cold? Do you think we might use something like this when making brownies?
  - For liquids: What color is this substance? What is the temperature? What do you think this substance is? How can you prove that? How does the sample move when you touch/shake/poke/etc. It? What are some things we can do to explore the properties of this sample more? Does it stay in one place? Do you think something like this might be important when we're making brownies? Do you think this could change in any way? What do you think would happen if we made it very hot? Very cold?

- Come back together as a class for discussion
- Tie back to the driving question:
  - With the knowledge and experience we have now, how can we determine something's state of matter?
  - How do we identify solids and liquids?
  - What did you learn about solids and liquids?
  - What did these types of matter feel like?
  - How does one state of matter change from one to the other?
  - Is it possible to see the states of matter changing through our own eyes?
  - Ask students what they know now about solids and liquids.
  - How can we identify these different states of matter?
  - "With the knowledge and experience we have now, how can we determine something's state of matter?"
  - Students will answer this question and how they identified the states of matter and teachers will record answers on big chart paper. Or teachers can write this on white board with dry erase markers, record it and rewrite again later.

EXPLORE 2

- Gasses demonstration:
  - Teachers transition to a discussion of gasses by saying that we've examined some states of matter, but we haven't talked about the last one
  - Teachers will break students into the same 4 groups as before and demo for each group the combination of baking soda and vinegar in a flask or water bottle, fitting a balloon over the openings immediately after combining the two ingredients
  - Teachers will discuss with students what might be happening in this reaction as we add a solid to a liquid
- Gasses stations:
  - Students blow up and weigh balloons in their same 4 groups from the rotation in Explore 1

- Students weigh their individual balloons on the scales before they're blown up and record/remember how much they weigh
- Students then blow up the balloons with their own breath (spread out and face away from each other as much as possible)
- Students weigh their balloons again and record/remember how much they weigh now
- Teacher asks students to think about and share their thoughts about why the mass might have changed even though we see n

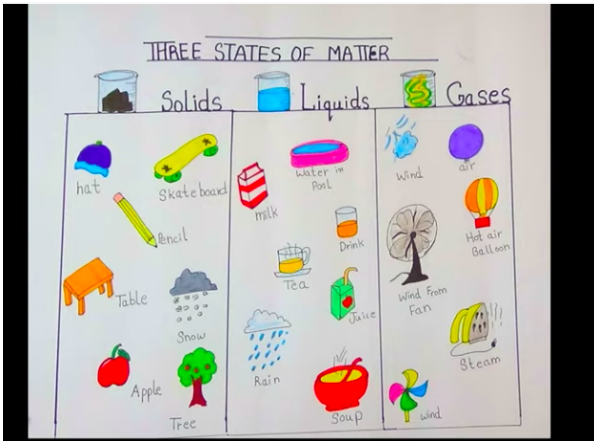
EXPLAIN 2

- Gasses explain
  - Let's also think about how gasses might be involved in the making of brownies; We started with solids and liquids...do we also have gasses?
  - What's inside the balloon (a gas: carbon dioxide)? What causes the balloon to fill? What does the balloon feel like? How do we know there is gas in the balloon? What do you think might cause some balloons to look similar but behave in different ways? Is there anything else you've seen in life that reminds you of this? Do you think we might use something like this when making brownies? Do you think this could change in any way? What do you think would happen if we made it very hot? Very cold?
    - For gasses: we will ask students how they might or might not be gasses involved in the baking process. Teachers will also explain that when the baking soda is used in the batter and is baked, it releases a gas called carbon dioxide which acts as a leavening agent to help the batter rise.

ELABORATING/EXTENDING Understanding

- Draw a picture and add a caption - draw two examples of each state of matter (one in the classroom, one from around their house) and try to add a caption
  - This will be useful for the assessment to show the students understanding of the different states of matter.
  - When students go home they can look around their house and pull different objects out that pertain to the different states of matter. This will allow them to know what is a solid, liquid and gas on their own.

Ex:



Formative Assessment Evidence (*This is the Evaluation Phase of the 5E approach)

What evidence will you gather to understand if ALL your students met the learning outcome (see green box above)?

- Teachers will check for understanding by asking guiding questions to students and recording answers and observations from each student group on chart paper. This will allow for students to be able to view what they learned about the different states of matter and share their knowledge

from completing the day's activities.

Individual Student Accomodations

Accommodations/Modifications for Individual Students

- Our class does not have any students with IEPs. They are attentive, eager to participate, and not disruptive. We will continue to use the same accommodations as discussed for the previous lesson.
- Provide a space with minimal distraction
- Administer small group settings
- Allow for breaks, transitions, and/or brain breaks (gonoodle)
- Allow extra time to process information
- For our ELL student: provide additional definitions when possible, make the entire lesson as visual as possible (images, demonstrations, etc.) so that words and specific vocab are not as big of a challenge
- To extend further for our high-achieving students: have students think about what happens when we add two or more types of matter together (do they become liquid? Solid? Gas? Something else altogether? Why? Can you draw or describe the properties something like this would have?)

Materials + Quantity:

- RegularBalloons
- Golf Balls
- Bouncy Balls
- Toy Cars
- Ziploc Bags
- Molasses
- Vegetable Oil
- Honey
- Dish Soap
- Water
- Hand Sanitizer
- Vinegar
- Bowls
- Chart Paper
- Flour
- Corn Starch
- Helium balloons
- Liquid laundry detergent pods

Station 1

Golf ball	**Before** Solid Liquid	**After** Solid Liquid
Flour	**Before** Solid Liquid	**After** Solid Liquid
Rice / Beans	**Before** Solid Liquid	**After** Solid Liquid
Corn Syrup	**Before** Solid Liquid	**After** Solid Liquid
Water	**Before** Solid Liquid	**After** Solid Liquid
Vinegar	**Before** Solid Liquid	**After** Solid Liquid

Station 2

Toy Car	**Before** Solid Liquid	**After** Solid Liquid
Ping-Pong Balls	**Before** Solid Liquid	**After** Solid Liquid
Salt	**Before** Solid Liquid	**After** Solid Liquid
Vegetable Oil	**Before** Solid Liquid	**After** Solid Liquid
Hand Sanitizer	**Before** Solid Liquid	**After** Solid Liquid
Dish Soap	**Before** Solid Liquid	**After** Solid Liquid

Q405: Saturday Science FS21
Lesson Plan Week 3

Instructor Names: Eryn Goldstein, Lauren Barthel, Ruthie Yezerets, Lindsay Leeper

Grade level: Kindergarten/First

Anchoring Question/Phenomena for the unit: How does gooey brownie batter turn into fluffy brownies?

Lesson Plan #3

<table>
<tr><th colspan="2">Desired Results</th></tr>
<tr><td colspan="2">Driving Question for this week's Saturday Session
● How do states of matter change in a way that is reversible?</td></tr>
<tr><td>DCI Addressed in lesson:
● Students will investigate states of matter (gas) and determine its properties.
● Some changes caused by heating and cooling can be reversed, and some changes cannot be reversed.</td><td>SEPS Addressed in Lesson:
● "Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question."
-Students will investigate the 3 states of matter and gather data regarding which properties pertain to which materials, in which they can use as the basis for answering questions."
● "Science searches for cause and effect relationships to explain natural events"
CCCs Addressed in Lesson:
● "Patterns in the natural and human designed world can be observed."
● "Events have causes that generate observable patterns."</td></tr>
<tr><td colspan="2">Besides science, what other disciplines of STEM will be included in this lesson?
● This lesson includes mathematics through the process of measuring weight by taking the mass of different aspects throughout the lesson. Technology is also included by using a scale to measure the amount of mass in something, beakers/flasks to measure out ingredients.
Learning objectives (outcomes):
Students will be able to explain/state
● Students will be able to explain what happens during a physical change
● Students will be able to explain what matter is and what it does in a space
● Students will be able to state examples of a solid and/or liquid
● Students will be able to explain the five senses and how they are used in science
● Students will be able to explain what happens when we measure a gasses mass</td></tr>
<tr><th colspan="2">Timeline of Activities for the Day</th></tr>
<tr><td colspan="2">● Engage: 9:30-10:00AM
● Explain (Matter): 10:00-10:20AM
● Explore (Gasses Review): 10:20-10:40AM
● Explore (Physical Changes): 10:40-11:10AM (filming 11:00-11:10AM)
● Explain (Physical Changes): 11:10-11:25AM</td></tr>
</table>

- Explain (Gasses): 11:25-11:30AM
- Elaborate/Extend: 11:30-11:40AM

Learning Plan

ENGAGE

- Introduce topic for the day
    - Initial discussion:
        - Ask students to remind everyone of what we did last week (take several answers if different)
        - We defined whether certain objects were solids or liquids; how did we identify states of matter?
        - Ask if any students found objects around their house that defined a liquid or a solid; then follow up with those students and have them share which objects they found
        - Ask students to refresh our memory of the five senses and how we identify states of matter and their properties
        - TRANSITION: We know the states of matter are solid, liquid, and gas, but what is matter? What does matter do? We've developed some ideas on the different properties of matter and how we can differentiate between solids, liquids and gases, so now we need to investigate this further. One of the ways we can start is by talking about matter and how it relates to physical changes.
    - Discussion Shift: What are physical changes? How can we identify them?
        - Introduce what a physical change is
            - Physical changes include change in color, texture, shape or state
            - They do not change what the matter is
            - Video: Play from 0:00-3:07 https://www.youtube.com/watch?v=x49BtB5dOwg

EXPLAIN

- Emphasize and highlight **matter** **https://www.turtlediary.com/lesson/states-of-matter.html**
- *Teachers will explain and create particle drawings on the board.*
    - We know how to identify solids, liquids, and gasses, but why are they?
    - Matter is everything that takes up space and has mass.
        - **Solids:** Solids are made of little pieces called particles
            - Solid particles are packed closely together.
            - Particles can't move across each other, or float away into space.
            - Solids can be hard like a block or soft like a blanket.
        - **Liquids:**
            - Liquids do not have a shape. They take the shape of the container they're in.
            - The particles of a liquid are held together loosely.
            - They move and slide across each other.
            - When you pour water, it flows into a container. It's not like a solid.
        - **Gas**
            - Gas particles are not held together
            - Particles float away yet they are still filling up the space that their in
            - Gasses can be light or heavy.
            - EX: Why do you think balloons float? Does something like helium

weigh less than air?

EXPLORE - Gasses Review

- Transition in: refresh students' memory of what we tried to do last week to take the masses of the balloons but how it didn't work because we didn't have appropriate tools that would actually measure the miniscule differences
- We will try this again, filling our balloon with CO2 again but through a different experiment - we'll start the reaction right now and come back to it at the end
- Mass the initial balloon; record mass on the board and ask students (based now on what we know about matter and gas as a matter) if they think it will weigh more, less, or the same once it fills with gas. Do they think it will
- Teachers will demo the yeast and sugar experiment, explaining that we're combining a solid and a liquid
- We will wait until the end of class when the balloon has filled with more gas (this reaction is slower) to mass it again

EXPLORE

- Physical changes: melting, dissolving (sugar, salt, flour), freezing, evaporating
    - Stations with physical changes
    - Station 1: Melting ice/butter (solid to liquid) and freezing (liquid to solid)
        - At this station, students will examine the physical change of melting and freezing
        - In their group, students each receive a bag of ice and discuss what they think will happen if the bag is held, if someone were to breathe on the bag, etc.
        - Students discuss other ways of warming things up; why does the state of matter change when the ice is warmed up?
        - Refer back to matter; what do we think is happening with the matter as things are warmed up?
        - What would happen if we put the ice in a freezer? Is there anything else we think we could do to change the state of matter of ice or of water?
        - Now melt butter in the microwave/discuss melting butter in the microwave to bring it back to brownies
        - Is there anything different happening here? What else do you think could be melted? Could something like oil be melted? Or frozen? Why do you think we melted the butter for the brownies? What would happen if we didn't melt the butter? What would happen if we let it sit out on the counter for a while?
        - **MAIN POINTS TO HIT**: What is the change happening here? Can it be reversed, and if so, how? How does this relate to brownies?
    - Station 2: Dissolving sugar (liquid/solid to mixture) and evaporation (liquid to gas)
        - At this station, students will examine the physical change of dissolving a solid to combine with a liquid, and by extension, evaporation
        - In their group, students have a bowl of vegetable oil, water, and corn syrup (or any other more viscous liquid) and a separate bowl/container/bag/etc. of sugar, as well as a mixing spoon
        - Students discuss what they think might happen when they mix the sugar into each; will it dissolve? Will the crystals get smaller? Will they combine completely with the liquids? Will they separate?
        - Students mix crystals into each liquid and make observations about what they see happening
        - Refer back to matter; what do we think is happening with the matter itself as things are combined? What about if we try to reverse this change?

- Is there anything else we think we could do to change the state of matter of the sugar or other liquids? Do you think there's a way we could "un-dissolve" the sugar?
    - Talk about evaporation of the water (liquid into gas) because of heat to make the sugar reappear
- Are there any other things we might be able to dissolve or mix evenly into a liquid?
- How might we have used this in the brownie batter? Are there any other solids we mixed in with liquids? What happened then?
- We will leave the bowls alone until next week; what do we think will happen to each bowl? What are the states of matter in question here that could change? How might they change?
- **MAIN POINTS TO HIT**: What is the change happening here? Can it be reversed, and if so, how? How does this relate to brownies?

EXPLAIN

- Students will transition to their seats for a discussion
- Teachers transition into talking about the physical changes we were seeing, asking students what they saw during the experiment at every station
    - What kind of changes were made?
    - How did the objects we were observing change?
    - Did the state of matter of the objects change? What did we do to change them (heating, cooling, moving the object around, holding it, etc.)?
    - What do we think would happen if we let some of our samples sit out in the open for a while, or applied the opposite of the first step (e.g., cooling something that was originally heated)?
    - Do you think these changes can be reversed?
    - **Now let's connect this back to our brownie experience**.
    - What were some reactions like this that we saw while we were making our brownie batter?
    - Do you think any of those changes in the brownie batter could be reversed? (Yes, but it might be difficult) - Turn and Talk with a partner
    - Do you think that once the brownies are baked, that we could reverse that change and turn them back into brownie batter? - Turn and Talk with a partner

EXPLAIN - Gasses

- Transition quickly back to the gas experiment we set up at the beginning of class
- Now that we have a better idea of matter, states of matter, and ways it can change physically in a way that doesn't alter it permanently, let's revisit our ideas from last week
- When we worked with gasses last week, we weighed them hoping to see a difference in mass, but that didn't work. Knowing that gas is matter, and matter has mass, what do we think the change in mass should have been? Now that we have this additional tool (more sensitive digital scale), do we think the mass reading will change at all? How? Why might there have been a discrepancy between last week and this week?

ELABORATING/EXTENDING Understanding

- Transition to a shaving cream exploration
- Now that we know more about the most common states of matter, we want to explore the possibility that some might not fall into those categories as clearly
- Students each receive a bowl with shaving cream
- Teachers ask: What state of matter is this? Liquid? Gas? Solid? Why do you think that? Do you think it might be something other than these three states?

- Students are told to talk about their observations in their table groups as they explore
- Students have several minutes to play/explore and teachers will move among groups prompting students to describe what they see, how that might fit or not fit into a category of state of matter
- No group discussion, just some basic ideas and thoughts being shared as students are dismissed

Formative Assessment Evidence (*This is the Evaluation Phase of the 5E approach)

What evidence will you gather to understand if ALL your students met the learning outcome (see green box above)?

- Teachers will check for understanding by asking guiding questions to students and recording answers and observations from each student. This will allow for students to be able to view what they learned about the different states of matter and share their knowledge from completing the day's activities. Also this will allow for students to share their understandings of different liquid properties and how they interact with one another.

Individual Student Accomodations

Accommodations/Modifications for Individual Students

- Our class does not have any students with IEPs. They are attentive, eager to participate, and not disruptive. We will continue to use the same accommodations as discussed for the previous lesson.
- Provide a space with minimal distraction
- Administer small group settings
- Allow for breaks, transitions, and/or brain breaks (gonoodle)
- Allow extra time to process information
- For our ELL student: provide additional definitions when possible, make the entire lesson as visual as possible (images, demonstrations, etc.) so that words and specific vocab are not as big of a challenge
- To extend further for our high-achieving students: have students think about what happens when we add two or more types of matter together (do they become liquid? Solid? Gas? Something else altogether? Why? Can you draw or describe the properties something like this would have?)

Materials + Quantity: (REMEMBER ---These need to be emailed Tulli (tuariya@iu.edu) each Wednesday by 5:00pm) *(you can list here so you have it handy & then copy and paste to submit these separately in Canvas)*

Materials:

- 2 cans of Shaving cream
- 2 packets of Yeast
- 1 box of sugar (enough to make 2 cups)
- 1 pack of balloons
- Salt
- Sugar
- Flour
- -Digital scale
- -Ice

- -normal size ziploc bags for the ice
- -vegetable oil (1 container)
- -corn syrup (1 container)
- -water (1 container)
- -12 small paper bowls

Q405: Saturday Science FS21

Lesson Plan Week 4

Instructor Names: Lindsay Leeper, Ruthie Yezerets, Eryn Goldstein, Lauren Barthel

Grade level: K-1

Anchoring Question/Phenomena for the unit: *How does gooey brownie batter turn into fluffy brownies?*

Lesson Plan #4

<table>
<tr><th colspan="2">Desired Results</th></tr>
<tr><td colspan="2">Driving Question for this week's Saturday Session
● If matter changes state, can it be reversed? If yes, how...if no, why not?</td></tr>
<tr><td>DCI Addressed in lesson:

●Students will investigate states of matter (gas) and determine its properties.
● Some changes caused by heating and cooling can be</td><td>SEPS Addressed in Lesson:
● "Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question."
-Students will investigate the 3 states of matter and gather data regarding which properties pertain to which materials, in which they can use as the basis for answering questions."
● "Science searches for cause and effect relationships</td></tr>
</table>

reversed, and some changes cannot be reversed.	to explain natural events” **CCCs Addressed in Lesson:** ● “Patterns in the natural and human designed world can be observed.” ● “Events have causes that generate observable patterns.”

Besides science, what other disciplines of STEM will be included in this lesson?

● This lesson incorporates engineering by having the students create and build lava lamps.. This lesson also includes mathematics through the process of measuring when making lava lamps. Technology is also included by using measuring cups to measure out certain ingredients.

[Highlight in blue in the learning plan section below, where your team is planning to explicitly infuse STEM in the day’s activities.]

Learning objectives (outcomes):

Students will be able to explain/state

- ...that solids and liquids can change in some ways, like melting, dissolving, ripping, etc. but some of these changes can’t be undone.
- ...that if a solid or liquid is changed in a way that makes it look different, that doesn’t have to mean that it actually is different; it’s still the same thing (matter).
- ...that matter is just little pieces (particles) that move around in different ways.
- ...that when looking at matter, when it changes its state, it can’t be reversed.

Timeline of Activities for the Day

- ENGAGE: 9:30-9:45
- EXPLAIN 1: 9:45-9:55
- EXPLORE: 9:55-10:25
- Break: 10:25-10:35
- EXPLAIN 2: 10:35-11:00
- ELABORATE/EXTEND: 11:00-11:45
- ELABORATE 2 (washing soda & epsom salt): If time allows/In the instance that we finish early

Learning Plan

ENGAGE

- Introduce topic for today
    - Initial discussion:
        - Ask students to remind everyone of what we did last week (take several answers if different)
        - We discussed how particles of states of matter move at a certain speed and how much space they take up.
        - Ask if any students need a recap of how our activities from last week still confuse them on how solids turn to liquid by applying certain pressure
        - Ask students to also refresh our memory on our gases review and how when combining yeast and sugar to warm water allows to inflate a balloon.
        - TRANSITION: We know the states of matter are solid, liquid, and gas, but what is matter? What does matter do? We've developed some ideas on the different properties of matter and how we can differentiate between solids, liquids and gases, so now we need to investigate this further. One of the ways we can start is by talking about matter and how it relates to chemical changes.

EXPLAIN - EVAPORATION REVIEW

- Now that we've been looking at physical changes, let's observe what happened during our reaction from earlier
    - Teachers bring the yeast/sugar demo experiment back out to refer back to
    - Have students look at the experiment and share what they see
    - Ask students what kind of changes do you think happened here? What did we combine? What do we have now as a result? What do you see? Is this like the changes we saw today? Why or why not? Do you think these changes are reversible? Are they physical or something else?

EXPLORE

Chemical Changes Stations (All teachers lead)

- Water and Alka Seltzer Experiment
    - What did we notice that happened with this experiment that we didn't see in the water and salt experiment?
    - What happened with the vinegar and baking soda that is similar to this experiment?
- Vegetable Oil and Alka Seltzer Experiment
    - Have students make predictions about what they think will happen when we mix these two substances together?
    - Has anything new been created?
    - How is this reaction different from the water and alka seltzer reaction?
- Alka Seltzer and Vinegar Experiment
    - Do you think the alka seltzer will dissolve? Why or why not?
    - Do you think the alka seltzer will cause bubbling like it did with the water experiment? Why or why not?
    - How is this reaction similar/different from the other experiments?
    - Note: Make sure students realize chemical changes do not only occur when a gas is formed, in case we do not get to the washing soda & epsom salt extension due to time.

EXPLAIN

- Students will transition to their seats for a discussion
- Teachers transition into talking about the chemical changes we were seeing, asking students what they saw during the stations

- ***Teachers will record on the board with anchor charts***
    - What kind of changes were made?
    - How did the objects we were observing change?
    - Did the state of matter of the objects change? What did we do to change them (heating, cooling, moixing, etc.)?
    - Do you think these changes can be reversed?
    - **Now let's connect this back to our brownie experience**.
    - What were some reactions like this that we saw while we were making our brownie batter?
    - Do you think any of those changes in the brownie batter could be reversed? (Yes, but it might be difficult) - Turn and Talk with a partner
- We discussed that once the brownies are baked, that we could not reverse that change and turn them back into brownie batter, that something new is actually created; how did our stations relate to this idea?
- What does it mean when we say something new is created?
- Why did the alka seltzer not react in the oil?

<u>ELABORATING/EXTENDING Understanding</u>

Lava Lamps

- Teachers lead students in creating lava lamps.
- Teachers follow the instructions and have students help measure out, pour, and mix substances together.
- Questions to ask students:
    - What happens when we mix water and vegetable oil?
    - Is the water evaporating? Why not?
    - Why do you think these liquids separate?
    - How is mixing these liquids similar to when we made our brownie mix?
    - What happens when we add alka seltzer tablets? Why do you think that happens?
    - What do you predict is going to happen when we add food coloring?
    - Once we add all of the substances together, do you think we can change it back to the original substances? Why can't we?
    - Could we change our brownie batter back to the original ingredients? Why can't we?
    - Connect those two situations to the idea of chemical changes, where we cannot reverse changes back to their original state.

- Washing Soda & Epsom Salt
    - Tsp Soda and Water Mix
        - What do you think will happen when we mix these two substances together?
        - Is this reaction similar or different to the experiments we did earlier?
    - Tsp Salt and Water
        - What do you think will happen when we mix these substances together?
        - How is this reaction similar/different from the washing soda and water mix?
        - How is this reaction similar/different to the alka seltzer and water mix?

Formative Assessment Evidence (*This is the Evaluation Phase of the 5E approach)

What evidence will you gather to understand if ALL your students met the learning outcome (see green box above)?

- Teachers will check for understanding by asking guiding questions to students and recording answers and observations from each student. This will allow for students to be able to view what they learned about the different states of matter and share their knowledge from completing the day's activities. Also this will allow for students to share their understandings on how if a state of matter changes, how it can not be reversed.

Individual Student Accomodations

Accommodations/Modifications for Individual Students

- Our class does not have any students with IEPs. They are attentive, eager to participate, and not disruptive. We will continue to use the same accommodations as discussed for the previous lesson.
- Provide a space with minimal distraction
- Administer small group settings
- Allow for breaks, transitions, and/or brain breaks (gonoodle)
- Allow extra time to process information
- For our ELL student: provide additional definitions when possible, make the entire lesson as visual as possible (images, demonstrations, etc.) so that words and specific vocab are not as big of a challenge
- To extend further for our high-achieving students: have students think about what happens when we add two or more types of matter together (do they become liquid? Solid? Gas? Something else altogether? Why? Can you draw or describe the properties something like this would have?)

Q405: Saturday Science FS21
Lesson Plan #5

Instructor Names: Ruthie Yezerets, Lauren Barthel, Eryn Goldstein, Lindsay Leeper

Grade level: K-1

Anchoring Question/Phenomena for the unit: How does gooey brownie batter turn into fluffy brownies?

Lesson Plan #5

<table>
<tr><th colspan="2">Desired Results</th></tr>
<tr><td colspan="2">Driving Question for this week's Saturday Session
● How can we use what we've learned about states of matter and different kinds of changes to identify different brownie ingredients?</td></tr>
<tr><td>DCI Addressed in lesson:

● Students will investigate states of matter (gas) and determine its properties.
● Some changes caused by heating and cooling can be reversed, and some changes cannot be reversed.</td><td>SEPS Addressed in Lesson:
● "Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question."
-Students will investigate the 3 states of matter and gather data regarding which properties pertain to which materials, in which they can use as the basis for answering questions."
● "Science searches for cause and effect relationships to explain natural events"

CCCs Addressed in Lesson:
● "Patterns in the natural and human designed world can be observed."
● "Events have causes that generate observable patterns."</td></tr>
<tr><td colspan="2">Besides science, what other disciplines of STEM will be included in this lesson?
● This lesson incorporates technology by having students use tools and materials to mix ingredients together during stations.
Learning objectives (outcomes):
Students will be able to explain/state

● Students will be able to identify mystery mixtures by making predictions
● Students will be able to review chemical and physical changes
● Students will be able to identify properties of matter within the brownie ingredients</td></tr>
<tr><th colspan="2">Timeline of Activities for the Day</th></tr>
<tr><td colspan="2">● Engage: 9:30-9:50
● Explore:9:55-10:35
● Explain: 10:35-11:00
● Break: 11:00-11:10
● Elaborate/Extend: 11:10-11:30</td></tr>
</table>

Learning Plan

ENGAGE

Introduction:

- Ask students if they can remember what we did last week and our big takeaways from our lesson.
- Review with students what chemical and physical changes are, and ask for some examples of each.
  - Physical changes are those when the ingredients can be separated (sitting next to each other; we can just take them apart) or the change can be reversed (change of state of matter, shape of something, amount of it)
  - Chemical changes are those when the change cannot be reversed, like when something new is made (a precipitate: could be a gas, a solid BUT it cannot
- Review the ingredients from our brownies, and fill out an anchor chart with students discussing properties each ingredient has.

EXPLORE

- Students are split into 4 groups, one for each teacher
- Students move with their teachers from station to station, identifying the ingredients in each
  - Students will be given tools like **spoons, whisks, gloves, syringes, etc.** to manipulate the contents of the bowls and try to identify and determine their properties.
  - Students agree as a group what is in each mixture and must explain why based on the physical properties (color, texture, smell, etc)
  - Teachers record on chart paper what the students think the ingredients are
  - Teachers record on their own paper why
- Mystery Mixture Stations:
  - Station 1: melted butter + cocoa powder
  - Station 2: flour + egg
  - Station 3: baking powder + egg? Water? Some kind of liquid that will react with it...
  - Station 4: salt + flour
  - Station 5: cocoa powder + flour
  - Station 6: water + baking powder
  - Station 7: salt + vanilla extract
  - Station 8: cocoa powder + vanilla extract
    - Questions for Stations: What do you notice about this mixture? What ingredients do you think were combined to make this mixture? What makes you think that? Did you use your senses to help you identify the ingredients? What senses did you use, and what did you gather from using them?

EXPLAIN

- Each team talks about what they thought the ingredients at each station were (recorded on a big chart paper provided by teachers beforehand).
  - Students from each team present their ideas about each station in rounds (e.g. during round 1 we talk about station 1)
  - After all students present their thoughts about a round, the teachers say which ingredients were inside each mix
  - Teachers ask students now to revise their thinking, knowing the ingredients, and to try to explain why those might be the ingredients involved
  - Teachers and students talk about any outliers in the statements of what they think the ingredients are, why those outliers might exist, and some students share why they thought they were correct

BREAK

- 10 Minute brain/bathroom/stretch break

ELABORATING/EXTENDING Understanding

- Teachers remind students of what they said at the beginning of Saturday Science, 5 weeks ago, about the main question (How does gooey brownie batter turn into fluffy brownies?)
- Teachers ask the question again and take new answers; record them on the board or chart paper
- Teachers make sure students understand that brownie batter (a mixture of liquids and solids) becomes brownies (a solid) through chemical changes (the baking powder interacts with other ingredients to form a gas which makes the brownies rise and harden.
- Draw the process of baking brownies- starting from ingredients through to fully baked brownies
    - ❖ Have students explain their drawings
    - ❖ How is this science? How does this relate to states of matter?

Formative Assessment Evidence (*This is the Evaluation Phase of the 5E approach)

What evidence will you gather to understand if ALL your students met the learning outcome (see green box above)?

- Teachers will check for understanding by asking guiding questions to students and recording answers and observations from each student. This will allow for students to be able to view what they learned about the different states of matter and share their knowledge from completing the day's activities. Also this will allow for students to share their understanding and be able to connect back to our first week when creating brownie batter and the making of brownies.

Individual Student Accomodations

Accommodations/Modifications for Individual Students

- Our class does not have any students with IEPs. They are attentive, eager to participate, and not disruptive. We will continue to use the same accommodations as discussed for the previous lesson.
- Provide a space with minimal distraction
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