Q405 Saturday Science Teaching – Fall 2017

Lesson Plan One

MAIN TITLE: Icky Sticky Science

Solids

GRADE LEVELS: K - 1

A) LEARNING OBJECTIVES and CRITERIA FOR DETERMINING IF OBJECTIVES ARE MET (minimum of 2/ lesson)

1. Students should be able to identify the characteristics of a solid.
    a. Students will engage in discussions about how something is a solid or not a solid.
2. Students should be able to create a protective shelter for their egg using everyday materials.
    a. Students will work in groups to build a shelter for their own egg and will drop their egg and shelter from a high point to see if it holds its shape after the fall.

B) STANDARDS (see http://www.doe.in.gov/standards/science)

- **Science and Engineering Process Standards:**
    - SEPS.3 Constructing and performing investigations
    - SEPS.2 Developing and using models and tools

- **Content Standards:**
    - K.PS.1 Plan and conduct an investigation using all senses to describe and classify different kinds of objects by their composition and physical properties. Explain these choices to others and generate questions about the objects.
    - 1.PS.1 Characterize materials as solid, liquid, or gas and investigate their properties, record observations and explain the choices to others based on evidence (i.e., physical properties).

C) MATERIALS (**asterisk (*)** = any materials that may be a **safety concern**)

- Eggs- 12
- Inflatable ball (Beach)- 1
- Egg cartons- 6

- Newspaper- at least 24 sheets
- Meredith's Packing Material Hoard- 1 crate*
- Pipe Cleaners- 1 package*
- Plastic Bags- 6
- Yarn- One roll
- Scissors- 12* (kids)
- Straws- 1 box
- Rubber Bands- 1 box
- Streamers- 3 different colored rolls
- Dixie cups- 1 box
- Ziploc Bags- 1 box (sandwich size)
- Crayons
- Markers

D) TEACHER CONTENT KNOWLEDGE

- Teachers should know the characteristics of a solid.
    - Teachers should be familiar with a wide range of solids to use as examples
    - Teachers should be able to use a wide range of vocabulary to explain solids to students: rigid, doesn't lose its shape, doesn't move or break without force
- Teacher should know about the materials he/she selects for egg drop shelter creation to answer questions of students.
    - Teachers should be familiar with different everyday materials and basic construction points

E) REFERENCES (list **ALL** references that you borrowed ideas from to develop this lesson – including any handouts you may distribute)

We are reading the books *Egg Drop* & *What is the World Made of?* (page 9)

F) TENTATIVE TIMELINE

Check in: (Ashlynn and Molly) Verify master document with parents

Introduction/Ice Breaker: Thumball - Questions 9:00-9:10

Create Expectations List: 9:10-9:15

Read: Egg Drop 9:15-9:25

Intro Activity: Break an egg on the doc cam. Talk about the properties of what makes an egg a solid. 9:25-9:35

Activity One: Create shelters for egg drop and do egg drop 1 9:35-10:15

Discussion: Talk about properties of a solid and how the designs were successful and unsuccessful. 10:15-10:30
Bathroom/Break: 10:30-11:00
Activity Two: Allow the students to work in same groups of 4 to redesign their shelter for the second egg drop 11:00-11:35
Discussion: what worked best and why? 11:35-11:50
Concluding activity: Go through different images with an action attached to each image and have students complete the action if they think the image is a solid. 11:50-12:00
https://docs.google.com/presentation/d/1sGYl6Nd3rsYfID7UlkFLSxcQLKuHrDt7xJRae5Si3mQ/edit?usp=sharing
*schedule is subject to change depending on how fast or slow we get through each activity

G) DESCRIPTION OF YOUR LESSON

ENGAGE: 25 minutes After the ice breaker that we do in the beginning of the lesson, we are going to create an expectations list then do a read aloud. We are then going to read the story "Egg Drop" to the class to make the connection to the egg drop activity later. Crack one of the eggs on the doc camera. Talk about the properties of what makes an egg a solid. Include a discussion as to how it use to be a solid ● "what happened when he fell that changed?" ● "What might have helped him from cracking?" **Focus Question:** How can we keep an egg from breaking when we drop it?
EXPLORE: 40 minutes to create shelter We are going to create a shelter for an egg. We want the students to be able to create something that keeps the egg a "solid" and they have to be responsible for the egg not cracking. They will be able to use a lot of different materials to create a shelter in their groups of four. Each IU teacher will take a group of 4 to help them create their shelters. ● "What is your strategy in creating your shelter?" ● "What one material do you think you have to use?" ● "If we took one material away from your shelter, would it still work?"

If weather permits, we will go outside to the top of the Jordan parking garage and drop the eggs. If the weather does not permit, we will drop the eggs from the atrium and use tarps and extra plastic bags to shield the mess.

EXPLAIN: 15 minutes

After we do the egg drop, we are going to have a discussion that talks about why some shelters worked and why some shelters didn't work as a whole class

- "What parts of your shelter helped keep the egg from breaking?"
- "What parts of your shelter would you change to keep the egg safer?"

EXPLORE: 35 minutes to create new shelter

Students will get back into their groups and redesign for a second egg drop. If the original design was successful, students will be asked to change their design for the second drop. If the design was not successful, students will be asked to focus on changing their materials while trying to keep the same design. We will then do a second egg drop.

EXPLAIN: 15 minutes

After we do the second egg drop, we will hold another large group discussion centered on the concept of if their redesigns were successful or not.

- "If your design did not work the first time, what changes did you make?"
- "What parts of your design did you feel might not help keep your egg safe in the redesign?"
- "Was your second test more or less successful than your first? Why or why not?"

ELABORATION: 10 minutes

"Simon Says Solid"

Students will be shown a series of pictures that they will need to identify if they are a solid. A movement will be given for the students to do if they think it is a solid. One teacher will take note of students reactions to the activity.

https://docs.google.com/presentation/d/1sGYl6Nd3rsYfID7UlkFLSxcQLKuHrDt7xJRae5Si3mQ/edit?usp=sharing

- "Is it a solid?"
- "How do you know it's a solid?"

H) **EMBEDDED FORMATIVE ASSESSMENT (the 5th "E") 10 minutes**

- "Simon Says Solid"- Students perform various actions (ex. 10 jumping jacks, 5 toe touches, etc.) when they see a solid on the screen. If they are unsure or know it is not a solid, they will stand still. Leading teacher will discuss why certain objects are/are not solids if misconceptions are formed.
- Discussions during explain phases

I) GEARING UP/GEARING DOWN

1. **Gearing up:** Holding a discussion about eggs and if they are a liquid or solid. We can also change the state of the egg, for example cooking it, to see if students recognize the changing state of matter. Students who do well in creating a shelter for their egg and who show higher levels of comprehension can help students who are struggling as well. This will help reinforce their ideas by having them explain it to other students as well as the students who are struggling because their peers language may benefit them more than the instructors. Students can reconstruct and edit their egg shelters as a challenge if time permits.

2. **Gearing down:** Have a model available for egg drop so students have an idea of what to build. Teachers can also assist students in building their models. Students who do not know how to use scissors or struggle with scissors can receive assistance from an IU teacher. A reminder of the qualities of a solid can be written and spoken often.

(Insert any handouts here)

- http://coloringhome.com/coloring/9ip/bx7/9ipbx7K5T.jpg

- http://www.crayola.com/free-coloring-pages/print/water-water-everywhere-coloring-page/
- https://www.scholastic.com/content/dam/scholastic/kids/pdf/magic-school-bus/msb-friz_liz.pdf
- http://www.classroomdoodles.com/states-of-matter.html

Thumball questions
What school do you go to?
What do you want to be when you grow up?
Favorite color?
What's your favorite animal?
If you could only eat one type of food for the rest of your life, what would it be?
Where are you from?
Favorite summer activity?
Favorite hobby?
Favorite movie or tv show?
If you could have a superpower what would it be and why?
Favorite dessert?
Favorite thing to do at recess?
What does a scientist look like to you?
What do you want to learn at saturday science?
Tell us a science fact.
What do you think of when you hear science?
What is your favorite thing to learn in science?

Q405 Saturday Science Teaching – Fall 2017
Lesson Plan Two
Icky Sticky Science
Sink or Float
Kindergarten-First Grade

A) LEARNING OBJECTIVES and CRITERIA FOR DETERMINING IF OBJECTIVES ARE MET

1. Students should be able to design an object using everyday materials that will sink and float.
2. Considering the properties of their objects, students will be able to make reasonable or evidence based predictions.

B) STANDARDS (see http://www.doe.in.gov/standards/science)

Science and Engineering Process Standards:

- **SEPS.3** Constructing and performing investigations
- **SEPS.4** Analyzing and interpreting data
- **SEPS.6** Constructing explanations (for science) and designing solutions (for engineering)

Content Standards:

- **K-2.E.1** Pose questions, make observations, and obtain information about a situation people want to change. Use this data to define a simple problem that can be solved through the construction of a new or improved object or tool.
- **K-2.E.2** Develop a simple sketch, drawing, or physical model to illustrate and investigate how the shape of an object helps it function as needed to solve an identified problem.
- **K-2.E.3** Analyze data from the investigation of two objects constructed to solve the same problem to compare the strengths and weaknesses of how each performs.

C) MATERIALS (**asterisk (*)** = any materials that may be a **safety concern**)

- Large Clear Tub - 6
- Corks 6
- Styrofoam Balls 6
- Golf Balls 6

- Pennies* 6
- Small rocks 6
- Plastic boats 6
- Styrofoam blocks - 30
- Straws- one package
- Toilet paper/paper towel rolls - 12
- Aluminum foil * - 3 rolls
- Wax paper - 2 rolls
- Cling wrap - 2 rolls
- Construction and white paper - one pack of each
- Tape - 4 rolls
- Playdough or clay - enough for 25 kids
- Sponges 15
- Pipe Cleaners* 50
- Paper Cups 50
- Plates 30
- Popsicle sticks 60
- Wooden Skewers * 30
- Scissors* 25
- Markers lots of markers
- Crayons lots of markers
- Vegetable oil - one large container
- Mason jars- 12
- 1 bottle of syrup
- 1 pint of milk
- 2 cans of soda

D) TEACHER CONTENT KNOWLEDGE

Teachers should know:

- The properties of the objects in order to know if it is going to sink or float.
- Teacher should know about the materials he/she selects for the creation to answer questions of students.
    - Teachers should be familiar with different everyday materials and basic construction points

E) REFERENCES (list **ALL** references that you borrowed ideas from to develop this lesson – including any handouts you may distribute)

F) TENTATIVE TIMELINE

Introduction: Icebreaker: Would You Rather 9:30-9:40
Intro Activity: Sink or Float? Each student will have the opportunity to see if object sink or float by placing different things in a clear tub water. 9:40-9:55 (everyone)
Activity One: Design and construct objects 9:55- 10:30 (everyone with groups of 4-5 students)
Discussion: Discuss what happened to their object and then why they think that it went that way. 10:30-10:40
Break: 10:40-11:00
Activity Two: Design and construct a second object that did the opposite of what their first object did. If it sank they need to try and make one that floats and if it floats make one that sinks. 11:00-11:30 (everyone)
Discussion: After the students construct a second object, they are going to have a discussion on why they changed what they changed and an explanation on what they did to change it. 11:30-11:45
Activity Three: After we discuss the changes that we did for our objects, we are going to do a demonstration on what liquid on liquid looks like and facilitate a discussion on what is happening and why they think that is taking place. 11:45-12:00

G) DESCRIPTION OF YOUR LESSON

ENGAGE:
For an introduction to the idea of sinking and floating we are going to have six clear tubs filled with water at six different stations. Each one of us is going to be at one station and have one material (cork, styrofoam ball, golf ball, pennies, rocks, and a plastic boat) and before we set the object in the water we are going to have the students make predictions on whether we think the object is going to sink or float. We want the students to be able to hold the objects to feel the weight before we set it in the water. Each student will have the chance to be able to drop the object in the water. Each group leader will facilitate a mini-discussion after all students have dropped the item at each station about whether their predictions were right or not before moving on to the next station.

- "Do you predict that the object will sink or float?"
- "What about the object do you think will make it sink/float?"
- "What property could we change about the object to make it sink when it float or float when it sank?"

Focus question: "What do we notice about objects that sink compared to those that float?"

EXPLORE:

Students will be split into the same groups as last week to begin drawing their ideas for their objects. They will be encouraged to observe the materials that are laid out on the back table and to recall the introduction activity. Once students have a clear idea, they will use the materials provided to construct their objects. The students will each make their own objects to test in the bucket of water. The materials that we are going to have for the students to create their objects are **styrofoam blocks, toilet paper and paper towel rolls, straws, aluminum foil, wax paper, cling wrap, construction and white paper, tape, playdough and clay, sponges, pipe cleaners, paper cups, paper plates, popsicle sticks, wooden skewers, scissors, markers, and crayons.**

- "What is your strategy for picking materials?"
    - Why did you choose these and not ___ for example?
- "What do you think is an important part of your design that helps it to float (or sink)?

EXPLAIN:

After we test our objects, we will come together as a whole class to discuss what we found during our exploratory phase.

- "What materials do you think caused it to float or sink?"
- "How did you make your choices for the materials you chose? What did you look for?"
- "Did you know that your materials would float or sink before picking them? How did you know/How might you have found out?"

After we discuss what materials caused the object to float or sink, we will ask them if any other factors caused the object to sink/float besides the material the object is made of. From this, students may then bring up the design of the object.

- "If your object sank, what aspects of your design made it sink?"
- "If your object floated, what aspects of your design made it float?"

After we discuss our first design of our object, we will then ask them to reconstruct an object using the materials from the materials table available do the opposite.

- "If your object sank, how can you change the design so it will float"
- "If your object stayed afloat, how reconstruct your design to make it sink."

EXPLORE:

Students will go back to their seats and redesign their original object. If their original object sank, they will redesign it using materials from the same materials table- even if they choose different materials from the same table- to make it float, and if their original object floated, they will redesign it using different materials to make it sink.

- "What is the most important material that you are adding to your redesign?"
- "Is your strategy focused on changing your materials or changing your design to make it sink/float?"
- "Why might your object still sink or still float?"

EXPLAIN:

After we test our objects for the second time, we will come together as a whole class to discuss what we found during our second exploratory phase.

- "What materials did you change from your original object?"
- "What materials do you think caused it to float or sink?"
- "Did you successfully get your object to do the opposite action, sink or float, then it did the first time?"
- "Overall, what did you notice about objects that sink compared to objects that float?"

ELABORATION:

Now that we have discussed how solids float and interact with liquids, we will discuss if liquids float and interact with liquids. Students will join back into a whole group discussion for our final demonstration. There will be 3 mason jars going at one time. Before we start we will combine two groups together so that we have 3 groups instead of 6. The students will demonstrate how oil and water interact together in each group. In addition, each group will receive another liquid (either syrup, milk, or soda). The students will pour the oil into one clear mason jar full of water. The students will pour their other liquid into

another clear mason jar full of water. After investigating, students will talk about their observations while looking at the two different mason jar solutions separately and together in the jar.

- "How do liquids float and interact with other liquids?"
- "How is the interaction of solids and liquids different compared to the interaction of liquids and liquids?"
- "How did water interact with the oil? How did the water interact with the syrup/milk/soda?"

Students will then meet up with the group that shared the same mixture materials and discuss between the two groups. Questions will be the same as above and as follows:

- "Did the other group find similar results? What is the same? What is different?"
- "Did anybody find anything different than the other group?"
- "Did anybody find anything interesting that we have not already talked about?"

If time allows, have students observe another group's liquid mixture.

- "How did these liquids interact? Is it different or similar to the ones we worked on?"
- "From our observations of liquid interactions, do all liquids mix? Why or why not?"
- "If we put food coloring in one cup of water and mixed it with another cup of clear water, what would happen?"

H) EMBEDDED FORMATIVE ASSESSMENT (the 5th "E")

Our embedded formative assessment is going to be where we ask them questions and have a small discussion on what worked and kept their object afloat and what did they do that made their object sink.

- "What is your strategy for picking materials?"
- "Are there any materials that may cause your object to sink immediately?"
- "How does your design impact your object's ability to sink or float?"
- "If your object sank, please reconstruct a new object to make it float."
- "If your object stayed afloat, please reconstruct a new object to make it sink."

I) GEARING UP/GEARING DOWN

1. **Gearing up:** Holding a discussion about our designs and what aspects helped them sink or float. Students who do well in creating their objects and who show

higher levels of comprehension can help students who are struggling as well. This will help reinforce their ideas by having them explain it to other students as well as the students who are struggling because their peers language may benefit them more than the instructors. Students can reconstruct and edit their object design as a challenge if time permits.

2. **Gearing down:** Have different models so students have an idea of what to build. Teachers can also assist students in building their models. Students who do not know how to use scissors or struggle with scissors can receive assistance from an IU teacher. A reminder of the qualities of a liquid can be written and spoken often.

Handouts: N/A

Would You Rather Questions

- Travel to space or climb a mountain?
- Travel to the future or travel to the past?
- Travel by boat or train?
- Wear your shoes on the wrong feet or your pants backwards?
- Live somewhere that was always cold or always hot?
- Be able to fly or be invisible?
- Have hands for feet or feet for hands?
- Have cookies or cake?
- Study plants or animals?
- Study the stars or study the ocean?

Q405 Saturday Science Teaching – Fall 2017
Lesson Plan Three
Icky Sticky Science
K-1

A) LEARNING OBJECTIVES and CRITERIA FOR DETERMINING IF OBJECTIVES ARE MET (minimum of 2/ lesson)

- Students should understand not all solids and liquids, when put together, respond the same way
    - Students will draw pictures of what they think will happen and what actually happened (can include descriptions if they want)

B) STANDARDS (see http://www.doe.in.gov/standards/science)

- **Science and Engineering Process Standards:**
    - **SEPS.1 Posing questions (for science) and defining problems (for engineering)**
    - **SEPS.3 Constructing and performing investigations**

- **Content Standards:**
    - **K-2.E.1 Pose questions, make observations, and obtain information about a situation people want to change. Use this data to define a simple problem that can be solved through the construction of a new or improved object or tool.**

C) MATERIALS (**asterisk (*)** = any materials that may be a **safety concern**)

- https://docs.google.com/a/umail.iu.edu/document/d/1Y1aSakofBygXJ6GupMOSnoK-OATNhkKsZRMhZQMOa0w/edit?usp=sharing (skit)
    - https://docs.google.com/a/umail.iu.edu/presentation/d/18X_bvcnTCyv__vh0SXFLJGoQMid1vj-F3BjU-lust7o/edit?usp=sharing
- 7 Pumpkins
- Baking soda- 4 boxes
- Vinegar- 1 gallon jugs
- Dawn Dish soap- 2 bottles
- Water
- Food coloring - 6 different colors
- Salt - one large box
- 50 Ziploc bags
- Measuring cups- the measuring cup drawer

- Contact solution - 2 large bottles - walmart
- Glue - 1 large
- 6 trays
- 6 8 oz bottles
- 6 funnels
- 50 8 oz clear plastic cups
- Bag of sand
- Knives for carving the pumpkins

D) TEACHER CONTENT KNOWLEDGE

- We need to know what a physical change is in order to teach students about mixing solids with liquids. Physical changes are changes that affect the form of a chemical substance, but not its chemical composition.
- We also need to know what a chemical change is. Chemical changes occur when a substance combines with another substance to form a chemical reaction.
- In order for our exploding pumpkins to be successful, all IU teachers must know the correct measurements of both substances to combine to make a reaction.
- We need to know the definition of a reaction and mixture and how they are different. This will come into play when students are mixing the different substances to make an explosion with the pumpkins and to make slime. A reaction is a chemical change or transformation in which a substance decomposes, combines with other substances, or interchanges constituents with other substances. A mixture is a substance made by combining two or more different materials in such a way that no chemical reaction occurs. The important differing part is that a mixture can usually be separated back into its original components and a reaction cannot.

E) REFERENCES (list **ALL** references that you borrowed ideas from to develop this lesson – including any handouts you may distribute)

https://docs.google.com/a/umail.iu.edu/document/d/1vRz6x3CrHoGyftwlhpLJVVutfFp4HEXLopE_MynMdTw/edit?usp=sharing

http://littlebinsforlittlehands.com/pumpkin-cano-sensory-science-activity/

F) TENTATIVE TIMELINE

Intro: Teacher Skit 9:30-9:40

Discussion: talk with the kids about the problem in the skit, the ending of the skit, and what we are going to do about it in the middle. 9:40-9:45

Activity 1: Do a demonstration for the chemical reaction (have students understand the mixing of the solid and liquid and how the product cannot be separated back into a solid and a liquid) 9:45-9:50

Activity: Students will be able to mix their products together so that they can try and create an explosion on their own. 9:50-10:50
Discussion: What worked, what didn't work, why? 10:50-11:00
Break 11:00-11:25
Activity #2: Make slime 11:25-11:45
Discussion #2: Compare mixing the original two items to the components mixed in slime. What happens when you mix solids and liquids? 11:45-11:55
Closing Activity: Read a book about Halloween! 11:55- 12:00

G) DESCRIPTION OF YOUR LESSON

ENGAGE: The first thing that we are going to do with this lesson is a skit. The skit is about someone who doesn't read the instructions on their fertilizer and now they have pumpkins growing everywhere. To get rid of the pumpkins, the kids are going to have to explode the pumpkins to get rid of them. This skit is creating a "problem" for the students because this man didn't leave us a recipe on how to explode the pumpkins, but our students have to figure out how to mix the correct materials together to make an explosion.
https://docs.google.com/a/umail.iu.edu/presentation/d/18X_bvcnTCyv__vh0SXFLJGoQMid1vj-F3BjU-lust7o/edit?usp=sharing

Focus Question:What are the two things the Old Farmer and Pumpkin Peyton mixed together and why did it explode?

- "What is the problem in the story?"
- "How can we figure out the recipe that will make the pumpkins explode?"

Before we let the students make their own explosions with their teacher. We are going to have a demonstration so that they know what it is suppose to look like when they are making their reactions.

EXPLORE: Students will be split into groups based on the numbers that we will write on their nametags before the lesson begins. In their groups we are going to have them create mixtures with the materials and record what they find on our handout. Then we are going to allow them create their own explosions. Each teacher is going to have a pumpkin in their group and together they are going to have to come up with a combination of materials to make an explosion in their pumpkin. Students will use the clues from the skit to figure out which materials to

use. Students will also be encouraged to use their senses (not taste) to figure out what to mix together. If we find that the students are still struggling with the combination of the materials, as a group we can have them refer back to the demonstration that worked. They will first test the materials in plastic bags until they find a solution that creates the desired reaction. Once they have found this, they will use the same measurements and create a reaction inside of their pumpkins.
We will already have the pumpkins cut open, cleaned out, and have a bottle with dish soap in the bottom. We are also going to already have materials for each table group already put together so that the students aren't going up to the back table all at one time. The available solids and liquids will be labeled as liquid 1, liquid 2, etc. so we know what the students mix together.
Materials that they are going to be able to use are water, vinegar, salt, sand, baking soda, and soap.

- Do you think the reaction required more of one material than the other?
- If your reaction isn't working, what can you do to change the mixture?

EXPLAIN: Then we are going to discuss with the students about what worked in their explosions and why they think it worked. The will have the opportunity to share about the steps they took to get the right kind of explosion. After we discuss what did work, we are going to discuss what didn't work when they were testing reactions. This is where we will "tie in what they found on their worksheets that they did with the liquids and solids.

- "What materials created a reaction?"
- "Did all of the materials create a reaction?"
- What material can you separate back into two parts?

ELABORATION: The Old Farmer decided he wanted to glue some pumpkins back together. To prove the idea that once you mix liquids and solids together you can't get back the original materials we are going to create slime. Based In order to create slime we will need contact solution, baking soda, glue and food coloring. Each student is going to have slime that they are going to get to take home. Before creating the slime, the students will draw their predictions on the back of their pumpkin worksheet.

- "Will the materials in slime react the same way together as the materials in our pumpkin mix did?"
- "What happens if we take away one material from the mixture?"
- "Can we use other materials to make slime?"
- "Is slime a liquid or a solid?"

H) EMBEDDED FORMATIVE ASSESSMENT (the 5th "E")

For the formative assessment we will use the predictions that the students drew on the back of their pumpkin worksheet.

Multiple Choice Exit Sheet: Today we learned when solids and liquids mix...

a) They all mix the same way
b) They all mix differently

I) GEARING UP/GEARING DOWN

1. **Gearing up:** Holding a discussion about our reactions and what exact measurements helped them explode. For example, 20 mL of vinegar and 2 tablespoons of baking soda creates a reaction that explodes a foot high in the air. Students can then discuss what would happen if they changed the measurements, for example if they now did 2 tablespoons of vinegar and 20 mL of baking soda. Students who show higher levels of comprehension and recognition of appropriate measurements can help students who are struggling as well. This will help reinforce their ideas by having them explain it to other students as well as the students who are struggling because their peers language may benefit them more than the instructors. Students can continue to edit their "recipes" that can be tested at home with parent permission.
2. **Gearing down:** If students are struggling, the teachers will guide them by encouraging students to use their senses. For example, if a group cannot figure out the correct measurements of the vinegar and baking soda to make a reaction, we will say that in the skit, we heard the liquid smelled which hints at vinegar.

Q405 Saturday Science Teaching – Fall 2017
Lesson Plan Week 4
Icky Sticky Science
Solid or Liquid?
K-1

A) LEARNING OBJECTIVES and CRITERIA FOR DETERMINING IF OBJECTIVES ARE MET (minimum of 2/ lesson)

- Students will be able to explain if an object is a solid or a liquid
    - Students will explain on the worksheet whether they think oobleck is a solid or liquid. They will also compare and contrast the oobleck and playdoh that we make on a t-chart.

B) STANDARDS (see http://www.doe.in.gov/standards/science)

- **Science and Engineering Process Standards:**
    - **SEPS.2 Developing and using models and tools**

- **Content Standards:**
    - **K.PS.1 Plan and conduct an investigation using all senses to describe and classify different kinds of objects by their composition and physical properties. Explain these choices to others and generate questions about the objects.**
    - **1.PS.1 Characterize materials as solid, liquid, or gas and investigate their properties, record observations and explain the choices to others based on evidence (i.e., physical properties).**

C) MATERIALS (**asterisk (*)** = any materials that may be a **safety concern**)

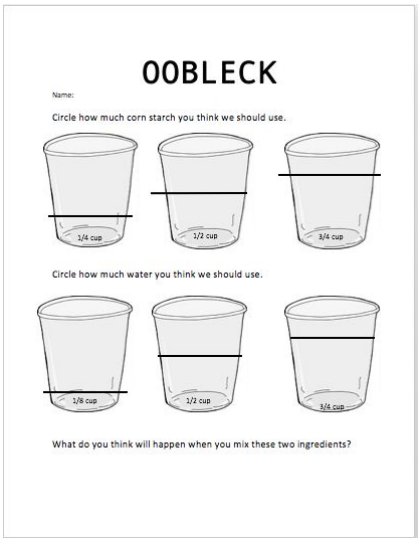
- Water
- Food Coloring (4 colors you have)
- 3 boxes Cornstarch
- 6 rectangular plastic tablecloths (disposable)
- 1 bag Flour (15 cups)
- 3 containers Salt
- 1 medium sized bottle of Oil
- Popsicle sticks-35
- ⅛ c. measuring spoons (6)
- ½ c. measuring spoons (6)

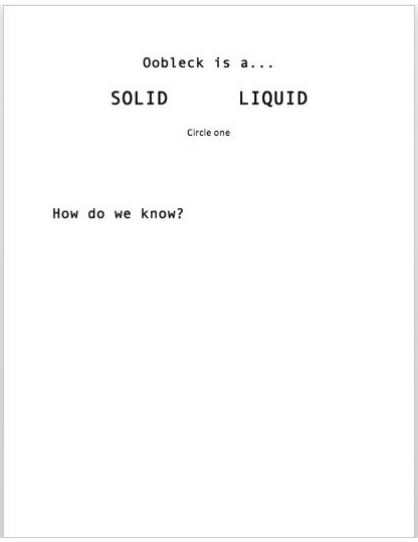
- ¼ c. measuring spoons (6)
- ¾ c. measuring spoons (6)
- Plastic sandwich bags (30) any size

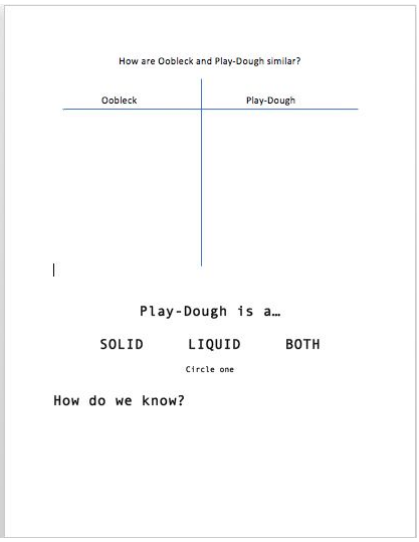
D) TEACHER CONTENT KNOWLEDGE

- We need to know the correct measurement ratio to make oobleck and play-dough.
- We need to know that the definition of Non-Newtonian fluid is a fluid that does not follow Newton's Law of Viscosity
- We need to know the characteristics of a solid and liquid.
    - Solid has fixed volume and shape.
    - Liquid assumes that shape of the container it occupies.

E) REFERENCES (list **ALL** references that you borrowed ideas from to develop this lesson – including any handouts you may distribute)







F) TENTATIVE TIMELINE

Intro: *Read Bartholomew and the Oobleck*, Demonstration of what oobleck is. 9:30-9:50
Activity 1: Students will make their own oobleck using their chosen measurements as groups. (Everyone) 9:50-10:10
Discussion: Whole group discussion about what each group's oobleck looks like 10:10-10:30
Activity 1 Revision: Students will revise their oobleck based on the measurements the best group was that they voted on. (Everyone) 10:30-10:40
Break 10:40-11:00
Activity #2: Students will make playdough. 11:00-11:20
Discussion #2: Comparing oobleck to playdough (11:20-11:40
Closing Activity: 11:40-12:00 (or dismissal)

G) DESCRIPTION OF YOUR LESSON

ENGAGE

Read *Bartholomew and the Oobleck.* The lead teacher will begin the discussion after the read aloud by asking students what oobleck is made of. After the correct materials are identified, the teacher will say how we need to create oobleck too, but we do not know the recipe. The lead teacher will then ask the students to continue the story by taking on the role of the magicians who create the oobleck. In this role, the students will try to recreate the oobleck similar to what they did last week with recreating the recipe for the fertilizer to make the pumpkins explode.

- What materials could we use to make oobleck?
- Does the amount of each ingredient you use matter when you are making a recipe?
- How can you recreate something only from looking at it? What kinds of things can help you?

Focus question: What is oobleck made of?

EXPLORE

Students will get into groups and decide on how much cornstarch and how much water they will use to make their oobleck as a group. Once the group have decided on a measurement, they will make their own oobleck separately, all using the same measurements of cornstarch and water. The goal with this is that every student in each group creates their own oobleck, but each groups' oobleck is the same, which is necessary for the discussion.

- Does the amount of cornstarch you use affect how much water you use?
- What do you think would happen if you added more cornstarch than water?
- What do you think would happen if you added more water than cornstarch?

EXPLAIN

After each group has made their oobleck, the class will come together as a whole and compare their measurements and the consistency of their oobleck. Because each group potentially has different oobleck, the goal of the discussion is to see what the correct measurements of cornstarch

and water are. Each group will be able to share with the class what they did and how successful their oobleck was.

- How much of each material did you use?
- What does your oobleck feel like? Is it hard or watery?
- Which material could you add more of to get the right mixture?
- Is oobleck a solid or a liquid?

EXPLORE

Students will get back into their groups and decide which material they should add more of. The students will need to keep track of how much of the material (water or cornstarch) they added so that they get the right consistency. The goal is that the students will get closer to the correct ratio. We want them to be able to see that if their oobleck is too watery then they need to add more cornstarch and vice versa.

- If your oobleck is too liquidy, what can you do?
- If your oobleck is too hard, what can you do?
- What would happen if we used a different liquid like vinegar instead of water?

EXPLAIN

Have students discuss how the properties of their oobleck have changed after revising the mixtures. Students will discuss how they ensured their accuracy. Lastly, have students share successes and failures of their trial and error.

- How did the correct measurements of each part compare to what you originally used?
- What changed in your oobleck mixture?
- How will this affect how you measure in the future?

Is oobleck a solid or liquid or both? Why? Use evidence.

ELABORATION

Focus question two: How are oobleck and playdough similar?

In this phase, students will make playdough as a group. Because there are 4 ingredients in playdough, each student in a group will be responsible for contributing one material to the group's playdough. The lead IU teacher will give the students the correct measurement of each material, but it will be their responsibility to find the correct utensil, measure it out, and add it to the rest of the ingredients. After every

group creates playdough, we will have a final discussion comparing and contrasting oobleck and playdough.

- How does oobleck look different from playdough? How do they look the same?
- Are the materials used in oobleck and playdough the same or different? Would they still be the same if we swapped materials and used oil, salt, water, and flour for oobleck and cornstarch and water for playdough?
- What happened when you picked the oobleck up?
- How does oobleck feel compared to how playdough feels?

Is playdough a solid or liquid or both? Why? Use evidence and what you learned from the oobleck.

H) EMBEDDED FORMATIVE ASSESSMENT (the 5th "E")

- Worksheet that asks whether oobleck is a solid or liquid and why they think this.
- Worksheet that compares oobleck and play dough

I) GEARING UP/GEARING DOWN

1. **Gearing up:** Have the students who grasp the concept of measurement help the other students to get the desired results. The student who understands can model the correct measurements to use, but can have the student who does understand physically moving and dumping the materials while repeating the process of identifying the correct utensils and materials.
2. **Gearing down:** If students are having trouble getting their oobleck to be the correct ratio, tell them that the oobleck requires more cornstarch than water.

Q405 Saturday Science Teaching – Fall 2017
Lesson Plan Five
Icky Sticky Science
Explosions
K-1

A) LEARNING OBJECTIVES and CRITERIA FOR DETERMINING IF OBJECTIVES ARE MET (minimum of 2/ lesson)

Students will be able to observe gas in reactions.

Students should understand that gasses exist everywhere.

B) STANDARDS (see http://www.doe.in.gov/standards/science)

- **Science and Engineering Process Standards:**
  - **SEPS.2 Developing and using models and tools**
- **Content Standards:**
  - **1.PS.1 Characterize materials as solid, liquid, or gas and investigate their properties, record observations and explain the choices to others based on evidence (i.e., physical properties).**

C) MATERIALS (**asterisk (*)** = any materials that may be a **safety concern**)

- Vegetable Oil (4 large bottles)
- Food Coloring (12)
- Alka Seltzer tablets (2 boxes)
- **16 oz.** water bottles (Empty) (33)
- Paint (acrylic or water-based finger paint)
- Film canisters (30)
- Paper (preferably watercolor paper, but if budget doesn't allow, regular is fine)
- Baking Soda (2 boxes)
- Vinegar (2 bottles)
- Tablecloths (6)
- Balloons (26)
- Plastic bags - ziploc bags- 26 - sandwich bags
- Clothespins- 26

D) TEACHER CONTENT KNOWLEDGE

- Characteristics of solids, gases, and liquids. A solid is firm and stable in shape. It is not hollow and does not contain gaps or spaces. A liquid is a fluid that conforms its shape to fit the container. It has a definite volume but no fixed shape. A gas fills its

container evenly. It does not have a definite shape nor definite volume. Gases also have a lower density than all other states of matter.

- Reactions that release gas and what happens when the gas can't escape. Mixing baking soda and vinegar will cause a reaction that releases a bubbly, gas explosion. If we trap the explosion inside of a balloon, we will be able to fill the balloon up because gas rises.
- Gas is a type of matter.
- Chemical reaction, a process in which one or more substances, the reactants, are converted to one or more different substances, the products.

E) REFERENCES (list **ALL** references that you borrowed ideas from to develop this lesson – including any handouts you may distribute)

- https://www.themaven.net/kidsactivities/kidsactivities/exploding-baggies-science-experiment-for-kids-CvrcWEzruEqWKxHRjwMbDQ?full=1&utm_content=buffer98aef&utm_medium=social&utm_source=pinterest.com&utm_campaign=buffer
- https://sciencebob.com/build-a-fizz-inflator/

F) TENTATIVE TIMELINE

9:35-9:50: Water bottle gas balloons with discussion
9:50-10:20: Exploding Paint Activity
10:20-10:40: Discussion about exploding paint
10:40-11:00: Break and Snack
11:00-11:20: Exploding Baggies
11:20-11:30: Discussion about exploding bags
11:30-12:00: Lava Lamps (Everybody)

G) DESCRIPTION OF YOUR LESSON

ENGAGE

We will begin the lesson by doing a demonstration of magic inflating balloons. To start, one IU student will dump baking soda into a balloon and hold it upside down. Then the teacher will pour vinegar into the water bottle. After pouring, the teacher will put the balloon on the top of the water bottle and flip it up, showing the reaction when the balloon fills up. Then we will have a short discussion about what happened. After the discussion, students will have a competition in their groups to see who can blow their balloon up the biggest from their reaction.

- What properties of solids and liquids mix well together?

- How do we know there is something inside the balloon?
- What is inside the balloon filling it up?
- If something is there, can we touch it or see it?

Focus Question: How do we know gas is there?

EXPLORE

Students will go back to their tables and be given the materials (paint, water, alka seltzer) for the exploding paint activity. They will experiment with the water and alka seltzer to figure out which ratio creates the best reaction. Once students figure out how much of each material they want to use, they will be given a film canister and paint to create their final product by placing all the water, paint, and alka seltzer in the film canister and then putting the lid on the canister. The closed canister will be placed cap down on paper and the students will observe what happens. The students will record the materials they are using on the worksheet as well as their prediction. After the experiment, the students will record what actually happened.

- How can we make a bigger explosion?
- Does the amount of water that we use affect how big or small our explosion is?
- What happens when we add less/more alka seltzer?

EXPLAIN

We will then have a discussion with students about their exploding paint.

- What would happen when you add more or less of the alka seltzer?
- What would happen when we have more water?
- What would happen if we have more paint?
- What would happen if the container was bigger?

EXPLORE

For this phase of the lesson, students will create exploding baggies. Again, students will be given the materials (baking soda and vinegar) and be given time to experiment with them to find out how much of each they want to use. We will then give them a Ziploc baggie and help them add their materials and observe the reaction.

- What do you predict will happen based off of the other experiments?
- What do you think will happen to the bag?
- Will this explosion make a mess?

EXPLAIN

We will then have a discussion with the students about their exploding baggies

- What inside the bag caused it to explode?
- What did you see inside the bag right before the explosion happened?
- What happened to the materials that were in the bag after the explosion? Can you still identify all of them separately?

ELABORATION

Students will create "lava lamps" using similar materials as before. The lava lamps are created by putting water and oil in a bottle and then dropping an alka -seltzer in the bottle. This will elaborate what reactions are created, and how we can observe gasses in the bottles. The students will predict what will happen with the lava lamp and record the prediction on their worksheet. They will also draw a picture of what actually happened.

- How can we observe gas in real life?
- What can gas look like?
- Can gas be contained?
- What reaction did this most resemble? Why do you think this?

H) EMBEDDED FORMATIVE ASSESSMENT (the 5th "E")

Students will fill out the worksheet at the end of the lesson plan as we go through the day.

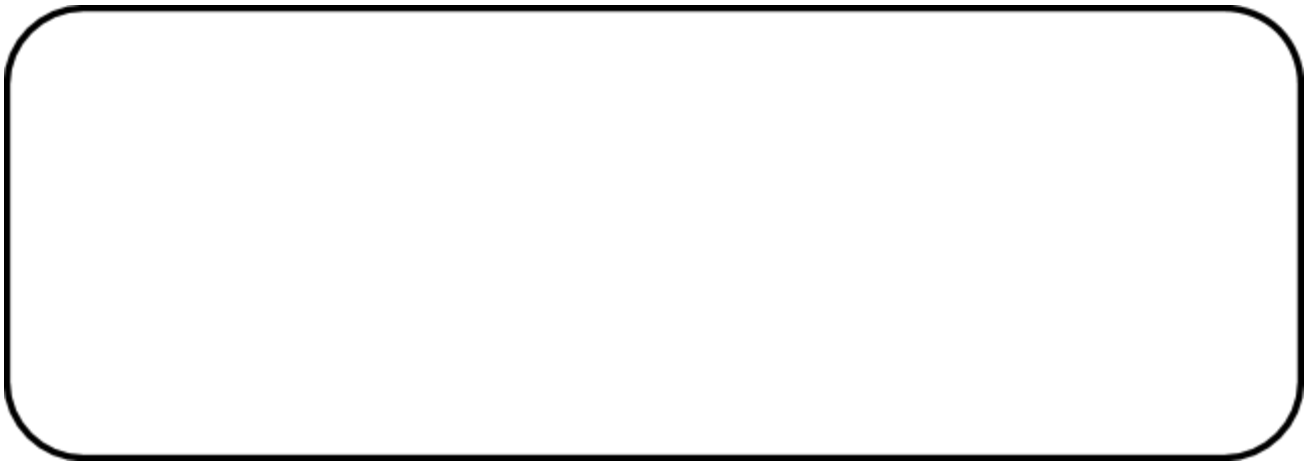
I) GEARING UP/GEARING DOWN

1. **Gearing up:** Talk about what gases are and how they are everywhere. Discuss how they surround everything and can be captured. Maybe introduce the idea that gas is surrounding us.
2. **Gearing down:** Give students the ratios to use with their experiments, rather than allowing them to figure it out on their own. Also, we can tell students what reacts specifically in the experiment and how that works.

(Insert any handouts here)

Predictions Worksheets

1. Draw what your ingredients are below:



2.

What do you think will happen?	What actually happened?

3. What happened that made the "explosion"?

A. The bubbles get trapped
B. The water spilled out
C. The cap fell off

4. Based off of the exploding paint, what do you predict will happen with the lava lamp? Draw below:

5. Was your prediction correct?

Yes No

6. What was the same in your experiments?

Alka Seltzer Water Oil Paint

7. Where did the bubbles go? Draw a picture below: