

Q405: Saturday Science FS21

Instructor Names:

Grade level: Second Grade

Anchoring Question/Phenomena for the unit: What makes a boat float in water?

Lesson Plan #1

Desired Results

Driving Question for this week's Saturday Session

- What do you notice about how boats/objects float (or sink) in water?

DCI Addressed in lesson:

- **PS1.A: Structure and Properties of Matter**
 - Different properties are suited to different purposes.
 - **Own Explanation:** Gas, solids, and liquids are made up of different properties and these properties are better suited for different situations.

SEPS Addressed in Lesson:

- Analyzing and Interpreting Data: 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 students' ideas about causes.
- **Connections to Engineering, Technology, and Applications of Science.**
 - Influence of Engineering, Technology, and Science, on Society and the Natural World: Every human-made product is designed by applying some knowledge of the natural world and is built using materials derived from the natural world.

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

- In STEM, data recording and observation are present in all the disciplines of STEM. Students will be making observations as well as recording data throughout the majority of the lesson.
- Students will be constructing/testing their boats made out of clay and foil (engineering)

Learning objectives (outcomes):

What do you want students to be able to explain/state in response to the specific lesson question?

Students will be able to explain/state:

- students will be able to put objects into categories of sink or float based on observable characteristics such as shape, weight, emptiness on the inside (hollow) and solids
- Students will see that amount of water does not matter when it comes to an object floating
- Students will make a checkmark on a worksheet that says if it sinks or floats

Timeline of Activities for the Day

- 9:30-9:40 am: Classroom Introduction/Expectations
- 9:40-9:55 am: Engage
- 9:55-10:10 am: EXPLORE #1: Float or Sink Basic Test
- 10:10-10:15 am: EXPLAIN #1: Float or Sink Basic Test
- 10:15-10:30 am: EXPLORE #2: Does the Amount of Water Matter?
- 10:30-10:35 am: EXPLAIN #2 Does the Amount of Water Matter?
- 10:35-11:20 am :EXPLORE #3 Can You Make It Sink? Can You Make It Float?
- 11:20-11:30 am: ELABORATING/EXTENDING Understanding

Learning Plan

Classroom Introduction/Expectation (10 mins):

- Introducing names and short icebreakers.
- Go over class expectations as a class on an anchor chart.

ENGAGE (15 mins)

- First, ask students if they think a rock will float? How do you know this? What about an apple? What experiences do you have that let you know if an apple will sink or float?- these will be tested and demonstrated in front of the whole class
- Then, begin asking the students what they know about sinking and floating. Student responses will be recorded on an anchor chart displayed for the whole class to see. We will come back to this chart and update student statements about what they know about sinking and floating at the end of the lesson.
- We will then do a read aloud of the book "What floats in a Moat" by Lynne Berry
 - <https://video.link/w/x7DBc>
 - **Questions/probing questions to ask during read aloud:**
 - after the read aloud, we will discuss with students why they thought the goat was unsuccessful the first couple of times when building the boat
 - After the students answer and explain why they think that the goat was unsuccessful in the construction of the ship, we will then move into the first exploration phase

EXPLORE #1: Float or Sink Basic Test (15 mins)

- Students will begin by sitting in table groups assigned/give to them by the teachers
- Once in their groups, students will be given a variety of objects to test and see what characteristics are needed in order for an object to be able to float.
 - bouncy balls, tiny metal balls, wiffle balls, ping pong ball, rubber stoppers, toy cars, wooden blocks, marbles, and feathers
- The students will be given an observation sheet in which they will record whether the objects float or sink and they will test each object 3 times in order to ensure their data is not skewed
 - the teachers will briefly ask students what makes a good observation? Why should we test something more than once?

EXPLAIN #1: Float or Sink Basic Test (5 mins)

- After students have tested the variety of objects given we will bring them together as a group and discuss the class's findings.
- We will draw students attention to discuss the different characteristics of objects that floated and objects that sunk
- We will have an anchor chart with a float side and a sink side and we will write students observations/characteristics of each object tested

EXPLORE #2: Does the Amount of Water Matter? (15 mins)

- Start this lesson with an engaging question asked by one of the teachers
 - "Wait guys, I am confused... Do you think the amount of water matters in determining if an object floats or sinks?"
- Students will use the same objects from explore #1 to test if different amounts of water play a factor in whether an item will sink or float.

- Students will use the same observation sheet to test the same objects in 3 different amounts of water and record whether the objects were able to float or sink
- Each group will be provided with three tubs containing a different amount of water.
 - Tub 1: filled $\frac{3}{4}$ of the way full.
 - Tub 2: filled $\frac{1}{2}$ of the way full.
 - Tub 3: filled $\frac{1}{4}$ of the way full.
-

EXPLAIN #2 Does the Amount of Water Matter? (5 mins):

- After students have tested the variety of objects given we will bring them together as a group and discuss the class's findings.
- Each group will be asked to explain their findings to the class
- The teachers will then draw students' attention back to the question “**does the amount of water matter in regards to whether an object floats or sinks?**”

EXPLORE #3 Can You Make It Sink? Can You Make It Float? (45 mins): Stem infusion of engineering throughout this whole explore #3 phase

- Students will now be given the opportunity to construct a boat out of aluminum foil
- The students will be told to construct their boat based on what they have learned about characteristics of objects that float
- Students will work at their group (table) to design an aluminum foil boat together and draw out sketches of what they want the boat to look like
 - Be sure to collect the drawings for later use.
- Students will then test their aluminum foil boat in the water
 - first, by seeing if their aluminum boat floats
 - second, how many marbles can their clay boat hold before it sinks
- Students will record their observations as well as how many marbles their boat could hold before it sunk

*****explanation 3 is not needed because this investigation will lead students into next weeks phenomena**

ELABORATING/EXTENDING Understanding (10 mins)

- The lesson will conclude with a group discussion at the very end of the lesson
 - Leading up to group discussion, we will give students the chance to think about what they have learned themselves by finishing the question, “today in Saturday science I learned...”
 - After making their own sentence, we will give them a chance to work with their group to make one sentence to represent all of their ideas.
 - They will then pair up with another group to hear other ideas before sharing as a class.
 - After about 5 minutes of sharing with other group members, they will all be able to bring their sentences up to the board in order for the class to see all 6 group’s sentences.
- This discussion will be facilitated by the teachers and will ask students to share what worked well for them in the construction of their boat? What didn't work well? What have you learned thus far about the properties of objects that float?
- The lesson will then end by showing students a demonstration involving displacement by weighing a small boat in front of the class. Then putting the boat in a clear container of water inside a larger container. The amount of water that is pushed out into the larger container will be measured. We will pose students with the question to think about “what is the significance of the weight of the object (boat) and the amount of water that was pushed out?”

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

- small group discussion
 - students will have about 5 minutes to discuss their ideas with their groups before sharing with other groups or the whole class
- pair
 - each group of 3 will pair with another group of 3 to compare their findings as well as discuss differences they may have had while experimenting
- classroom discussion
 - there are many segments of our lesson that stop and ask students to think critically about the questions we are asking them
- Anchor charts: these will serve the purpose of letting us know what students already know about sinking and floating as well as asses what they are learning throughout the lesson

Individual Student Accomodations

Accommodations/Modifications for Individual Students

- Autism Spectrum Disorder-Working at a higher level
 - working at a higher level; autism
 - to accommodate for this student, this student will be working with an assigned partner who is at a higher level of learning. We will be sure that this student does not sit with the student, Alex.
 - Because the student is at a higher level of learning, the lessons/activities do not need to be modified but frequent check-in by the teachers will take place as well as monitoring that the student feels comfortable and providing the best environment to learn.
 - the student will be reminded frequently to stay seated, but with a change in seating this should not be AS big of a problem as it was when he sat next to Alex
- Anxiety
 - has an IEP but did not define what the IEP is for
 - We will observe and continue to observe this student. From our observations the first day, she gets overwhelmed easily. When she is not ready to move on to a task and it is time to, she gets anxious. We will be sure to have one of the four teachers near her during exploration to be sure she is not overwhelmed and can assist her with the activities.
 - Her best friend is in the class so we can be sure that they are able to work together/be in the same group. She did well on the first day and her friend was a good support to have. We will continue to have her and her friend work together to be sure Romee is not anxious or overwhelmed.
- adhd; anxiety
 - does not have an IEP because homeschooled
 - frequent monitoring that the student is on task and understands what is taking place will occur
 - will be paired with a partner that the student can work well with and stay on task with

Q405: Saturday Science FS21

Instructor Names:

Grade level: Second Grade

Anchoring Question/Phenomena for the unit: What makes a boat float in water?

Lesson Plan #2

Desired Results

Driving Question for this week's Saturday Session

- What is mass and how can we measure it?

DCI Addressed in lesson:

- **PS1.A: Structure and Properties of Matter**
 - Different properties are suited to different purposes.
 - **Own Explanation:** Gas, solids, and liquids are made up of different properties and these properties are better suited for different situations.

SEPS Addressed in Lesson:

- Analyzing and Interpreting Data: 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 students' ideas about causes.
- **Connections to Engineering, Technology, and Applications of Science.**
 - Influence of Engineering, Technology, and Science, on Society and the Natural World: Every human-made product is designed by applying some knowledge of the natural world and is built using materials derived from the natural world.

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

- Math will be included in the lesson throughout the span of the lesson. Math is a key discipline of STEM and students will be using math in the following ways:
 - estimation of numbers
 - measuring using balances
 - using units of measure (grams and Kilograms)

Learning objectives (outcomes):

Students will be able to explain/state

- Students will be able to collect data through observations about the mass of an object using scales
- SWBAT records data and communicates their findings to show understanding.
- STWAT justify their explanations using the data that they collect during the investigations.

Timeline of Activities for the Day

- 9:30- 9:50 am: As the students arrive, they will begin making their name cards as we wait on everyone to get here and review last week.
- 9:50- 10:05 am: Engage
- 10:05- 10:20 am: 1st Explore Activity- Estimating
- 10:20- 10:25 am: Explain- Estimating
- 10:25- 10:55 am: 2nd Explore Activity- Measure Mass Activity
- 10:55- 11:00 am: Explain- Measure Mass Activity
- 11:00- 11:30am: Task Card Activity/ Wrap up

Learning Plan

Introduction for the day: (20 minutes)

- To start off our lesson this week, we wanted to give the students a chance to make their own name tags.
- This will be a way for them to branch out and communicate better with the different kids in the classroom.
- We will provide them with paper and markers in order to make their own name tags that we will collect at the end of the day to ensure that they are here for the remaining weeks of Saturday Science
- After students have had the chance to make their nametags, a quick review of what was learned last week will take place
- the students will be asked the following questions:
 - What kind of characteristics did we learn about last week that an object that can float have?
 - What about an object that sinks?
 - Does the weight of the object matter in regards to whether it can float or sink?
- Lastly, students will be asked if they want to share anything that they learned about last class/discoveries they made

ENGAGE: (15 minutes)

- To begin the “Engage” section of our lesson, we will start a discussion about mass.
 - Ask the questions:
 - “What do you think mass is?”
 - “How do scientists measure mass?”
 - “Remember from last week that we talked about the mass of an object matters when talking about what floats vs. what sinks”
- Discuss Grams vs. Kilograms
 - Give the students examples of what kind of objects would fall into each category and write these on the board for all of the students to see.
 - Watch Youtube Video- https://www.youtube.com/watch?v=bPwCNT26R_g
- After discussing what was mentioned in the video we just watched, we will move into the “Explore” part of our lesson.

EXPLORE: Estimate Activity(15 mins)

- Using a provided worksheet students will estimate the mass (gram or kilogram) of each picture.
 - Would you use grams or kilograms to measure the object?
 - They will cut and glue each square underneath the flap that makes the most sense.

EXPLAIN: Estimate Activity(5 mins)

- Go over the different estimates that the students made when completing the worksheet. Be sure to discuss with students any misunderstandings that they had when determining if it was 1 gram or 1 kilogram.

EXPLORE: Measure Mass Activity: (30 mins)

- Using a provided worksheet, students will use unifix cubes/blocks to measure specific items that they are supplied to measure at stations with groups that teachers will monitor by constantly walking around and checking in on each group. They will spend 2 minutes at each station until they switch. They will measure one object at each station.
 - The objects at the station will be familiar to them in the classroom: glue stick, math book, crayon, pencil box, ruler, and scissors.
- After completing each station once through and measuring the objects in cubes, the students will then go through the stations again to measure in grams/kilograms. They will again spend 2 minutes at each station until they switch. They will measure one object at each station.
 - The objects will be the same exact objects they just measured to maintain consistency: glue stick, math book, crayon, pencil box, ruler, and scissors.

EXPLAIN: Measuring Mass Activity (5)

- Go over the different masses that the students measured by asking them the questions below and discuss what these findings are as a class. Be sure students explain how they know the answers and why they think this is.
 - Which one has the most mass, least mass?
 - Which one has the most unifix cubes, least unifix cubes?

EXPLORE: Task Card Activity

- In six stations students will complete task cards that challenge them to explore what they have learned in the prior activities.
- Task Cards:
 - Which has more mass?
 - A box of crayons or a bottle of glue?
 - 1 marker or 2 pencils?
 - Find an item that weighs 1 g.
 - Find an item that weighs about 5g.
 - _____ paper clips = _____ crayons (using a pan balance)
 - _____ markers = _____ erasers (using a pan balance)
 - _____ pencils = _____ scissors (using a pan balance)

ELABORATING/EXTENDING Understanding

- The lesson will conclude with a group discussion at the very end of the lesson
 - Leading up to group discussion, we will give students the chance to think about what they have learned themselves by finishing the question, “today in Saturday science I learned...”
 - After making their own sentence, we will give them a chance to work with their group to make one sentence to represent all of their ideas.
 - They will then pair up with another group to hear other ideas before sharing as a class.
 - After about 5 minutes of sharing with other group members, they will all be able to bring their sentences up to the board in order for the class to see all 6 group’s sentences.
- This discussion will be facilitated by the teachers and will ask students to share what worked well for them in the construction of their boat? What didn't work well? What have you learned thus far about the properties of objects that float?

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)?

- We will know the students know how to collect data through observing the mass on the scales when they weigh objects in their stations and teachers monitoring their progress.
- We will also know students can record their data based on what they put on their worksheets and will be able to communicate those findings in group and class discussions.
- We will know students can justify their explanations using the data that they collect during the investigations by being able to participate in group and class discussions. We will also be able to know how the students can explain their data using task cards that challenge them to use their previous activity findings to advance their knowledge.

Individual Student Accommodations

Accommodations/Modifications for Individual Students

- Autism Spectrum Disorder-Working at a higher level
 - to accommodate for this student, this student will be working with an assigned partner who is at a higher level of learning. We will be sure that this student does not sit with the student, Alex.
 - Because the student is at a higher level of learning, the lessons/activities do not need to be modified but frequent check-in by the teachers will take place as well as monitoring that the student feels comfortable and providing the best environment to learn.
 - the student will be reminded frequently to stay seated, but with a change in seating this should not be AS big of a problem as it was when he sat next to Alex
- Anxiety

- o We will observe and continue to observe this student. From our observations the first day, she gets overwhelmed easily. When she is not ready to move on to a task and it is time to, she gets anxious. We will be sure to have one of the four teachers near her during exploration to be sure she is not overwhelmed and can assist her with the activities.
- o Her best friend is in the class so we can be sure that they are able to work together/be in the same group. She did well on the first day and her friend was a good support to have. We will continue to have her and her friend work together to be sure Romee is not anxious or overwhelmed.
- adhd; anxiety
 - o frequent monitoring that the student is on task and understands what is taking place will occur
 - o will be paired with a partner that the student can work well with and stay on task with
 - o After the first day of Saturday Science our group was able to understand her learning style. She is very smart, but has trouble not shouting out as well as staying seated. Constant reminders will be given to the class as a whole about what respect is and how to show respect to students and teachers while they are talking. For each activity, we will be sure to engage her with higher order thinking questions that challenge her as well as keep her on task. The table group she is at now, we believe, best suits her and she will continue to be in that table group.

Supplies List:

- Unifix cubes/blocks 100-150
- Bottle of Glue: 1
- Glue sticks 6
- Math books 6
- A Box of Crayons 6
- Markers: 50
- Crayons 6
- Pencil Box (If available): 6
- Ruler 6
- Scissors: 6
- Paper Clips: 100
- Erasers: 50
- Pencils: 2
- Pan Scale: 3
- Electric Balance: 6 (If available)
- Nickel: 1
- White Paper: 25 pieces

Q405: Saturday Science FS21

Grade level: Second Grade

Anchoring Question/Phenomena for the unit: *How does a boat float in water?*

Lesson Plan #3

Desired Results

Driving Question for this week's Saturday Session: What is volume and how can we measure it?

DCI Addressed in lesson:

- **PS1.A: Structure and Properties of Matter**
 - Different properties are suited to different purposes.
 - **Own Explanation:** Gas, solids, and liquids are made up of different properties and these properties are better suited for different situations.

SEPS Addressed in Lesson:

- Analyzing and Interpreting Data: 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 students' ideas about causes.
 - **Connections to Engineering, Technology, and Applications of Science.**
 - Influence of Engineering, Technology, and Science, on Society and the Natural World: Every human-made product is designed by applying some knowledge of the natural world and is built using materials derived from the natural world.

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

- Math will be included in the lesson throughout the span of the lesson. Math is a key discipline of STEM and students will be using math in the following ways:
 - estimation of numbers
 - counting and addition and subtraction as they compare the quantities they've charted in the class data table from the station activity.
 - using units of measure (milliliters and liters)

Learning objectives (outcomes):

Students will be able to explain/state:

- Explain why different sized objects fit differently in the same sized containers
- understand that volume is the amount of space something takes up
- compare the different volumes of different containers

Timeline of Activities for the Day

- Engage: 9:30 - 9:50 am
- Explore + EXPLAIN: Is There Any Water Left? 9:50 - 10:05am
- Explore: Measuring Volume 10:05 - 10:35 am [capture only the last 10 mins here and then into the explain]
- Explain: Measuring Volume 10:35 - 10:50 am
SHORT BREAK -- 5 mins to stretch and get the wiggles out, while the teachers clear out stations for cards
- Explore: Task Cards 10:55 - 11:15 am
- Explain: Task Cards 11:15 - 11:25 am
- Elaborating/Extending Lesson: 11:25 - 11:45 am

Learning Plan

ENGAGE (20 minutes)

- Begin the lesson with a review game over concepts learned such as mass and types of objects that float/sink and the characteristics of these objects. The review game will be done with the use of an inflatable beach ball. Each design color on the beach ball will have one of the following questions:
 - True or False: Mass and weight are the same thing.
 - True or False: The toy car was an object that floated during the Float & Sink experiment.
 - How did we define mass last week?
 - Give an example of something you would weigh in grams?
 - Give an example of something you would weigh in kilograms?
 - Is grams or kilograms a larger form of measurement?
- The teacher will start by throwing the ball to a student:
 - Be sure to instruct students to gently toss, not throw.
 - Whichever color the student's right hand index finger lands on, the student will answer the question that correlates with that color (if students do not know the answer they can ask their classmates for help). The student will then throw the ball to another student and the process will continue until every student has had an opportunity to answer.
- After the review game, the teacher will direct the students attention and explain that today they will be exploring the science concept of volume and will begin using a t-chart.
 - The first column of the t-chart will be filled out as a class with things the students already know/think about the concept of volume and what it is.
 - The students will conclude with the t-chart at the end of the lesson and fill in the other half with things they have learned during their explorations on volume.

EXPLORE + Explain [combined -- do it as you go through this with them: Is There Any Water Left? (15 minutes)

- The explore phase will be introduced with a class wide demonstration led by the teacher.
- The teacher will have two different sized containers on display.
 - The teacher will ask students to help decide which container looks the largest out of the two.
 - First, fill the largest container with water up to the rim.
 - Next, the teacher will transfer the water from the largest container to the smaller container.
 - Then the students will observe if there's water remaining after fully filling the second container, or if there is not enough water to fill it up.
- During the activity above --- **The teacher will --in conversation with the students at the tables** -- help them come to this idea that no matter what the shape of the container, if the same amount of some matter is put into two different containers you still have the same amount---the amount has not changed, just redistributed different because of the shape of the container it is. then give the explanation that: the container that could hold the most water has the larger volume. Additionally, explain how everything has a volume and that in the next activity the students will be exploring ways to measure it.

EXPLORE:Measuring Volume (20 minutes)

- The students will work with their table groups during this exploration.
- With their groups students will explore five different stations:
 - Station 1: Rice
 - Station 2: Marbles
 - Station 3: Macaroni Noodles
 - Station 4: Marshmallows [See my note with this station -- a really important 'science' moment that can happen here. I'll review a bit more with you when i see you in the morning, in case you don't understand my note about it.]
- At each station, students will use Dixie Cups to count how many scoops it takes to fill an entire container at each station.
- As the students explore the different stations they will fill out a worksheet in which they will predict how many cups it would take to fill the entire container. After completing each station students will write down the exact amount of scoops it took to fill the container.

EXPLAIN Measuring Volume (15 minutes)

- Students will be brought back together for a discussion of their findings.

- The teacher will ask the students what they observed during this exploration.
 - What kinds of things did they notice about different materials used to fill the container?
 - Did the size of material affect how many scoops it took to fill up the container?
- Goal:
 - Is for students to realize that the smaller the objects the more scoops it will take to fill up the container.

SHORT 5 minute break!!!--transition time!

EXPLORE: Task Cards (20 minutes)

- In five stations students will complete task cards that challenge them to explore what they have learned in the prior activities. The task cards will have students apply their understanding to explore which objects have more volume than the other.
- Task Cards:
 - Which tube has the bigger volume?
 - Four test tubes will be set out with different amounts of water in them.
 - Which container has a bigger volume?
 - Which would hold more liquid [so has more volume]? A coffee mug or water jug?
 - Which has more volume? A glue bottle or gel pen?
 - Which has more volume? A cup of water or the eye dropper?

EXPLAIN: Task Cards (5 minutes)

- After the task card exploration, students will be brought back together to discuss their findings.
- This activity is an informal way to assess what students have learned and if they have developed an understanding of volume.
- Students will conclude with filling out what they have learned from the lesson and finish their volume t-chart from the beginning of the lesson.

ELABORATING/EXTENDING Understanding

- The goal of this lesson was for students to be able to understand that matter takes up space and the different size of the matter means more or less is needed of it to take up the same amount of space. For example, Students experimented with volume and should have concluded that the smaller materials (such as rice, marbles) took more cups to fill the container. Just because an object looks like it cannot hold a large amount of liquid, it can, the material is just dispersed to match the shape of the container but still has the same amount of volume.
- Planting the see for next week:
 - Ask the students the following question:
 - The last three weeks at Saturday Science we have explored the following science phenomenons: floating and sinking characteristics, mass (the amount of something), and volume (the amount of space something takes up).
 - How do you think the ideas about mass and volume specifically might help us to start thinking about our BIG question “How can a boat float?”
 - PROBING: Why do you think we might need to consider these two ideas of mass and volume when thinking about constructing boats -- we’ll be doing this ourselves-- so why might these two ideas be important for us to think about?

If time (while waiting for pick-up):

- The lesson will conclude with the students playing an interactive web game that deepens their understanding as well as challenges their understanding of volume
 - <https://pbskids.org/cyberchase/games/can-you-fill-it>

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

- The t-chart will serve as an informal pre and post assesment: the chart allows teachers to assess what students know about volume before the lesson and then the teacher can informally assess what students have learned about volume concluding the lesson.
- The worksheets that students are making their predictions on as well as the data they collect can serve also as a tool for evidence to see what students are learning and their thought process surround the concept of volume
- Class discussions/group collaboration among students will provide evidence because we can observe and hear students' responses to questions asked as well as questions and ideas they may have.
- Task cards: showcase and conclude what students have learned from this lesson. The task cards allow the teacher to walk around while students complete them to listen in on conversation to understand and gain knowledge about the students scientific thought process.

Individual Student Accomodations

Accommodations/Modifications for Individual Students

- Autism
 - working at a higher level; autism
 - to accommodate for this student, this student will be working with an assigned partner who is at a higher level of learning. We will be sure that this student does not sit with the student, Alex.
 - Because the student is at a higher level of learning, the lessons/activities do not need to be modified but frequent check-in by the teachers will take place as well as monitoring that the student feels comfortable and providing the best environment to learn.
 - the student will be reminded frequently to stay seated, but with a change in seating this should not be AS big of a problem as it was when he sat next to Alex
- Anxiety
 - has an IEP but did not define what the IEP is for
 - We will observe and continue to observe this student. From our observations the first day, she gets overwhelmed easily. When she is not ready to move on to a task and it is time to, she gets anxious. We will be sure to have one of the four teachers near her during exploration to be sure she is not overwhelmed and can assist her with the activities.
 - Her best friend is in the class so we can be sure that they are able to work together/be in the same group. She did well on the first day and her friend was a good support to have. We will continue to have her and her friend work together to be sure Romee is not anxious or overwhelmed.
- ADHD, Anxiety
 - adhd; anxiety
 - does not have an IEP because homeschooled
 - frequent monitoring that the student is on task and understands what is taking place will occur
 - will be paired with a partner that the student can work well with and stay on task with
 - After the first day of Saturday Science our group was able to understand Josie's and her learning style.
- For students who are struggling we will be sure there is a facilitator close to them to answer any questions/break material down more as needed. There will be a worksheet that is a simplified version of the task cards above incase students need more practice before diving deeper into the phenomenon. Something else that we can do if needed is give the students who may be struggling, tell them to only choose a few of the objects to investigate the volume rather than all of the items in order to give them extra time to analyze the ones they chose to explore.

Materials + Quantity:

- inflatable beach ball
- one small container
- one larger contanier
- worksheet titled draw items you would measure with milliliters and liters
- 5 boxes of white rice
- 5 boxes of kraft macaroni and cheese noodles

- 100 marbles
- pack of dixie brand small cups
- prediction worksheet
- printed worksheets of task cards
- iPads for each student

Q405: Saturday Science FS21

Instructor Names:

Grade level: Second Grade

Anchoring Question/Phenomena for the unit: *How does a boat float in water?*

Lesson Plan #4

Desired Results

Driving Question for this week's Saturday Session

- What materials are best suited to construct a boat in order to make it float?

DCI Addressed in lesson:

- **PS1.A: Structure and Properties of Matter**
 - Different properties are suited to different purposes.
 - **Own Explanation:** Gas, solids, and liquids are made up of different properties and these properties are better suited for different situations.

SEPS Addressed in Lesson:

- Analyzing and Interpreting Data: 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 students' ideas about causes.
 - **Connections to Engineering, Technology, and Applications of Science.**
 - Influence of Engineering, Technology, and Science, on Society and the Natural World: Every human-made product is designed by applying some knowledge of the natural world and is built using materials derived from the natural world.

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

- In STEM, data recording and observation are present in all the disciplines of STEM. Students will be making observations as well as recording data throughout the lesson.
- Students will be constructing/testing their boats made out of various materials presented to them (engineering)

Learning objectives (outcomes):

Students will be able to explain/state:

- students will be able to construct a floating boat using what they know about
 - mass, volume, characteristic of float and sink
- choose appropriate material and objects to construct their boat
- sketch out ideas for what they want their boat to look like

Timeline of Activities for the Day

- 9:30-10:00 Engage
- 10:00-10:15 Explore 1
- 10:15-10:25 Explain 1
- 10:25-11:10 Explore 2
- 11:10- 11:20 Explain 2
- 11:20-11:30 Elaborate/Extend

Learning Plan

ENGAGE: (30 min) First 15min

- The students will begin the construction of their boat this week.
- The lesson will begin with a video students will watch that introduces students to the idea of important qualities involved when considering boat construction
 - video linked here: <https://www.youtube.com/watch?v=VnLccU8mihQ>
- After students have watched the video, we will move into a review session as a whole class
- A T-chart will be displayed for the class to see with the categories:
 - mass, volume, characteristics of objects that float / sink
- The teachers will facilitate this discussion and lead students to the key concepts that they should understand in order to build and construct their boat
- After the chart has been made, students will be asked to consider and think about how all these elements and science ideas apply to the construction of their boat
- The students will then begin the first step in the process of constructing their boat
- The teachers will showcase the instructions and requirements that the students must follow when building their boats
 - Instructions found on google slides
- the teachers will go over the instructions and requirements with students in depth and answer any questions or concerns students have
- There will be time given for any clarification questions or comments students have before moving on to the next step of their design process

EXPLORE 1: (15 min)

- Next, students will begin the first official step in the construction of their boat
- students will be given time to explore and observe the materials they will be given table by table
- The teacher will call students up by tables and students will have a short time to touch, feel, bend, etc the materials they will be given to construct their boat
- After all the table groups have been given this exploration time, a class discussion will take place

EXPLAIN 1: (10 min)

- The teachers will asks students what kind of materials they think would be best for their boat
- Why they think those materials would be best
- Students can learn from their peers ideas and hear their thoughts

EXPLORE 2: (45 min) first 30 min

- The students will now be given time to draw out a model of at least three boats they have in mind
- students will sketch their ideas on a blank piece of paper that will be added to their science journals
- Once students have a good idea of what they want to build their boat out of/look like the student will get the 3 sketches approved and probed through questions by one of the teachers
- Once the students have gotten approval they may begin on the construction of their boat
- As students are working on their boats the teachers will facilitate conversations based on their choices
- Probing and higher order thinking questions will be asked throughout the students construction of the boat
 - Why did you choose these materials?
 - What do you know about float and sink that helped you decide on how you want your boat to look?
 - What do you think will go wrong in your construction? How will you overcome problems?

Explain 2: (10 min)

- The teacher will bring the class together after some time and talk collectively with the students about what is going well? What is not going well?
- The teacher will ask students questions along the lines of:
 - How will you prepare for next time?
 - What do you need to fix/do to make your boat complete?

- Why did certain things work better than others when constructing your boat?

ELABORATING/EXTENDING Understanding: (10min)

- The goal is for students to construct a boat that floats and can hold materials (pennys) without sinking. We want students to use what they have learned in previous lessons to help them figure out the best way to construct their boat. To elaborate students' understanding about the process of construction we will encourage students to think about a time in which something didn't work out the first time for them.
 - we have noticed a lot of students get frustrated and want to give up when they dont succeed the first time and foresee this happening during the construction of their boat
- We will end the lesson reviewing important concepts discussed and placed on our tchart and get students excited for the final day and completion of their boat

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)?

- The T-chart in the engage section will serve as an informal assessment of what students have learned and remember from the past few weeks of Saturday Science. This chart will allow teachers to assess what students remember from the following categories- mass, volume, and characteristics of objects that float/ sink.
- Class discussions will provide evidence because we can observe and hear students' responses to questions asked as well as questions and ideas they may have.
- The construction of their boat and their thought process will serve as informal assessment for the teachers to assess how students are using all they have learned to influence their design of their boat.

Individual Student Accomodations

Accommodations/Modifications for Individual Students

- Autism Spectrum Disorder- working at a higher level
 - working at a higher level; autism
 - to accommodate for this student, this student will be working with an assigned partner who is at a higher level of learning. We will be sure that this student does not sit with the student, Alex.
 - Because the student is at a higher level of learning, the lessons/activities do not need to be modified but frequent check-in by the teachers will take place as well as monitoring that the student feels comfortable and providing the best environment to learn.
 - the student will be reminded frequently to stay seated, but with a change in seating this should not be AS big of a problem as it was when he sat next to Alex
- Anxiety
 - has an IEP but did not define what the IEP is for
 - We will observe and continue to observe this student. From our observations the first day, she gets overwhelmed easily. When she is not ready to move on to a task and it is time to, she gets anxious. We will be sure to have one of the four teachers near her during exploration to be sure she is not overwhelmed and can assist her with the activities.
 - Her best friend is in the class so we can be sure that they are able to work together/be in the same group. She did well on the first day and her friend was a good support to have. We will continue to have her and her friend work together to be sure Romee is not anxious or overwhelmed.
- ADHD and Anxiety
 - frequent monitoring that the student is on task and understands what is taking place will occur
 - will be paired with a partner that the student can work well with and stay on task with
 - After the first day of Saturday Science our group was able to understand her learning style. She is very smart, but has trouble not shouting out as well as staying seated. Constant reminders will be given to the class as a whole about what respect is and how to show respect to students and teachers while they are talking. For each activity, we will be sure to engage her with higher order thinking questions that challenge her as well as keep her on task. The table group she is at now, we believe, best suits her and she will continue to be in that table group.

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)

- **Aluminum Foil**

- Card Stock Paper
- Clay/Playdoh
- Popsicle Sticks
- Plastic Straws
- Glue Sticks and Glue Bottles
- Rubber Bands
- Tape
- Scissors

Engineering video: <https://www.youtube.com/watch?v=fxJWin195kU>

Grade level: Second Grade

Anchoring Question/Phenomena for the unit: How does a boat float in water?

Lesson Plan #5

Desired Results

Driving Question for this week's Saturday Session: What

DCI Addressed in lesson:

- **PS1.A: Structure and Properties of Matter**
 - Different properties are suited to different purposes.
 - **Own Explanation:** Gas, solids, and liquids are made up of different properties and these properties are better suited for different situations.

SEPS Addressed in Lesson:

- Analyzing and Interpreting Data: 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 students' ideas about causes.
 - **Connections to Engineering, Technology, and Applications of Science.**
 - Influence of Engineering, Technology, and Science, on Society and the Natural World: Every human-made product is designed by applying some knowledge of the natural world and is built using materials derived from the natural world.

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

- In STEM, data recording and observation are present in all the disciplines of STEM. Students will be making observations as well as recording data throughout the lesson.
- Students will be constructing/testing their boats made out of various materials presented to them (engineering)

Learning objectives (outcomes):

Students will be able to explain/state...

- students will be able to construct a floating boat using what they know about:
 - mass, volume, characteristic of float and sink
- choose appropriate material and objects to construct their boat.
- sketch out ideas for what they want their boat to look like.

Timeline of Activities for the Day

- 9:30 - 10:00 am Engage)
- 10:00 - 10:45 am Explore
- 10:45 - 11:00 am Explain
- 11:00 - 11:20 am Explore
- 11:20 - 11:30 am Explain
- 11:30 - 11:45 am ELABORATING/EXTENDING Understanding

Learning Plan

ENGAGE 30 minutes :

- As a whole class we will have a discussion over both the positive and negative outcomes from the prior Saturday when building our boats, we will use a t-chart for things that worked and did not work.
 - Key points to hit:
 - Higher Walls
 - No Holes
 - Balanced Boat
- In order to better support the student's understanding the teachers will model their own boats that they created in the prior week. Explain to the students why the boats are constructed in their particular manner.
- Introduce students to the STEM challenge they will be facing this week by showing them the following YouTube video:
 - STEM Challenge: Float Your Boat
 - <https://www.youtube.com/watch?v=vnlie8YQP8U>
- After the students have been introduced to the challenge the teachers will showcase the instructions and requirements that the students must follow when building their boats
 - Instructions found on google slides.
- The teachers will review the instructions and requirements with students in depth and answer any questions or concerns the students have.
- There will be time given for any clarification questions or comments students have before moving on to the revision part of the activity.

EXPLORE 45 minutes:

- Students will continue to work on their designs from the prior Saturday and modify as needed. Additionally, they will take what was discussed during the engagement part of the lesson and see how they can improve their model.
- As students are working on their boats the teachers will facilitate conversations based on their choices
- Probing and higher order thinking questions will be asked throughout the students construction of the boat
 - Why did you choose these materials?
 - What do you know about float and sink that helped you decide on how you want your boat to look?
 - What do you think will go wrong in your construction? How will you overcome problems?
 - Students will need to have one finalized model going into the STEM Challenge. Be sure to set a countdown timer for students so they know how much time is left.

EXPLAIN 15 minutes:

- The teacher will bring the class together after some time and talk collectively with the students about what is going well? What is not going well?
- The teacher will ask students questions along the lines of:
 - What did you do to fix your boat?
 - Why did certain things work better than others when constructing your boat?
- Before moving on to the penny part of the lesson the teacher will review the challenge again with the whole class.
- The teacher will provide a demonstration of the challenge using their own boats they showed during the engagement part of the lesson.

EXPLORE 20 minutes:

- During this exploration students will be testing their model boat to see how many pennies it will hold before sinking.
- There will be two tubs on each end of the room with a teacher at each station. Students will test one model at a time allowing everyone the opportunity to test.
 - The teacher will ask questions as the students test their final model:
 - How do you plan on placing the pennies?
 - What do you think will happen as you add the pennies to your boat?
 - Why did your boat sink so fast?
 - Was there anything you could have done differently so that the boat would not sink?
- The other two teachers will be floating around the classroom interacting with students.
- On the dry erase board the teacher will write down how many pennies each student's boat holds.

EXPLAIN 10 minutes:

- After all of the students have tested their model boats and the data is written up on the boat the class will participate in a group discussion.
- For the boats that held the most pennies the teacher will ask the student to share their boat with the entire class. The teacher will have the student explain the different characteristics that made their boat successful.
 - Be sure to point out balance, height, materials, etc.
- The teacher will then ask the class what things they could have done differently to create a sturdier boat.

ELABORATING/EXTENDING Understanding 15 minutes:

- The goal is for students to construct a boat that floats and can hold materials (pennies) without sinking. We want students to use what they have learned in previous lessons to help them figure out the best way to construct their boat. To elaborate students' understanding about the process of construction we will encourage students to think about a time in which something didn't work out the first time for them.
 - We have noticed a lot of students get frustrated and want to give up when they don't succeed the first time and foresee this happening during the construction of their boat.
- Using an anchor chart we will have a whole class discussion over the different boats that were successful during the STEM Challenge. We will discuss the different characteristics that allowed the boat to not only float but hold pennies.
- To wrap up Saturday Science we will watch the fun YouTube video to really drive the point of why boats float:
 - <https://www.youtube.com/watch?v=4zB46ztt7KM>
- Saturday Science Exit Ticket
 - At the very end of the class students will finish the following statement and answer the question either by drawing or writing their response.
 - One thing I did not know about before Saturday Science was.....
 - How does a boat float in water?

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)?

- Class discussions will provide evidence because we can observe and hear students' responses to questions asked as well as questions and ideas they may have.
- The construction of their boat and their thought process will serve as informal assessment for the teachers to assess how students are using all they have learned to influence their design of their boat.
- Saturday Science Exit Ticket
 - At the very end of the class students will finish the following statement and answer the question either by drawing or writing their response.
 - One thing I did not know about before Saturday Science was.....
 - How does a boat float in water?

Individual Student Accommodations

Accommodations/Modifications for Individual Students

- For students who are struggling we will be sure there is a facilitator close to them to answer any questions/break material down more as needed. There will be a worksheet that is a simplified version of the task cards above in case students need more practice before diving deeper into the phenomenon. Something else that we can do if needed is give the students who may be struggling, tell them to only choose a few of the objects to investigate the volume rather than all of the items in order to give them extra time to analyze the ones they chose to explore.

Materials + Quantity:

- Aluminum Foil
- Card Stock Paper
- Clay/Playdoh
- Popsicle Sticks
- Plastic Straws
- Glue Sticks and Glue Bottles
- Rubber Bands
- Tape
- Scissors
- Two Plastic Tubs for water