Lesson 2
FLOATING FRUITS!

ESSENTIAL QUESTION:

What characteristics does a mango have, compared to an apple or a banana, that affects its ability to float?

CCSS Skills:

CCSS.ELA-LITERACY.SL.2.1
CCSS.MATH.PRACTICE.MP3
CCSS.ELA-LITERACY.SL.3.1
CCSS.MATH.CONTENT.3.MD.A.2

NextGen Science Standards:

3-5-ETS1-3
2-PS1-2

GOAL: Use the scientific method to test a hypothesis about whether certain fruits will float in water and use appropriate measurement tools to explore how density relates to floating.

TIME: One class period (45 minutes)

MATERIALS: One mango of any variety; an apple and a banana, a kitchen scale with measurements in grams; a large jar; a large pan or plastic tub; a measuring cup with milliliter markings; a towel; a calculator; student worksheets and pencils

PREPARATION: Create a large data table on the board to organize your experiment data. Label the columns: Fruit, Hypothesis, Weight (grams), Volume (ml), Density, Float/Sink. Create 6 columns, one for each fruit to be tested.

FRUIT	HYPOTHESIS	WEIGHT (GRAMS)	VOLUME (ML)	DENSITY	FLOAT/SINK
Mango					
Apple					
Banana					

1. Open the lesson by inviting students to share what they've observed about each piece of fruit before submerging it into water. Ask: *What are some things each piece of fruit shares? (Possible answer: skin/peel.) What are some of the things the fruits don't share? (Answers could include: two have pits or seeds, all are a different color, etc.) How is the mango different from the apple or the banana when you bite into it? (Possible answer: higher concentration of water within the flesh of the mango, which is what makes it so juicy and sweet!)*

2. Share with students that today they're going to experiment with different fruits to learn more about what makes some float and some sink. Explain that when scientists have a question they want to investigate, they use the scientific method to guide their research. Walk students through the steps of the scientific inquiry process:
   - Question (What do we want to learn about?)
   - Research (What might we need to know before doing our experiment?)
   - Hypothesis (What do we think will happen?)
   - Procedure or method (What are we going to do in order to test our hypothesis?)
   - Data (the information we collect during our experiment)
   - Observations (What did we notice during the experiment?)
   - Conclusion (What did the data and our observations tell us about our hypothesis? Was it correct or incorrect?)

3. Hand out the Floating Fruits! student worksheet. Ask students to fill in the columns of the data table on their worksheet so that it matches the ones on the board. Next, have students record their guess (hypothesis) for each fruit by circling "sink" or "float" in the second column.

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Lesson 2 (Continued)

FLOATING FRUITS!


Atavlfo


Francis


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Tommy Atkins

4. Set up the testing area by placing the large jar into the pan and filling it to the top with water. Be sure that no water is in the pan when you begin testing each fruit.

5. Conduct the experiment. Invite students to the testing area, individually or in small groups, to help accomplish the following procedure with each of the fruits to be tested:

   A. Weigh the fruit and record it in grams. Explain to students that **weight** is the amount of force exerted on an object by gravity.

   B. Slowly lower the fruit into the jar of water. Note whether it sinks or floats.

   C. If the fruit sinks, carefully remove the jar from the pan and pour the water from the pan into a measuring cup. Record the amount of water in milliliters in the VOLUME column. Explain to students that **volume** is the amount of space that the fruit took up in the jar.

   D. If the fruit floats, gently push it down using the tip of a pencil. Stop when the fruit is just under the surface of the water. Measure the water that spilled over into the pan and record your findings.

6. Once the weight and volume for each fruit has been determined, it's time to calculate the density. Explain to students that **density** is determined by how tightly molecules are packed in a material or substance. Guide students in identifying which fruit is the most dense and which is the least dense. Students can use calculators to complete the data table on the worksheet, or these calculations can be done as a class.

7. Review the completed data table on the board and ask students: *Which fruit is most dense? Which is the least dense? Do you see any connection between a fruit's density and whether or not it floats? Do you see any connection about a mango's characteristics that would affect whether or not it floats? Were there any results that surprised you?* Explain to students that density is an important concept for scientists and engineers to know when they are brainstorming new innovations and is key to understanding the world around you. Use the following examples to highlight students' understanding:
   - Density is the reason we bob for apples rather than mangos, but both are a delicious after-school snack!
   - Ships and submarines can float because they have things called ballast tanks that hold air, which have a density that is less than water and can therefore float.
   - Hot air balloons are filled with helium, which is less dense than the air around it, causing them to rise.

8. **Optional:** Allow students time to complete the challenge question on the Floating Fruits! worksheet.

EXTENDED LEARNING: Send home Mangos 101: Select, Slice, and Enjoy and Mmm, Mmm, Mangos family activities with your students.

NAME: _____

FLOATING FRUITS!

ESSENTIAL QUESTION:

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What is density? Density = Weight in grams/Volume in milliliters

FRUIT	HYPOTHESIS	WEIGHT (GRAMS)	VOLUME (ML)	DENSITY	FLOAT/SINK
Mango					
Apple					
Banana					

QUESTIONS:

1. Which fruits floated? _____
2. Which fruit sank? _____
3. Which fruit was the most dense? _____
4. Which fruit was the least dense? _____

Do you think there is a connection between the density of fruit and whether it floats or sinks? How do you know?

GRAPH IT:

Plot the density of each fruit you tested on a number line and circle the fruits that floated in red and the fruit that sank in blue. What does this tell you about the density of water?

DID YOU KNOW?

- Mangos contain more than 20 different vitamins and minerals, which makes them a superfood.
- One cup of mango is 100 calories.
- Each serving of mango is fat free, sodium free, and cholesterol free.