

Early Learning STEM Lessons

Unit 3: Exploring Liquids and Solids

This unit was developed by the Bremerton School District in partnership with the Office of Superintendent of Public Instruction and funded through grants from the Boeing Company and EPA Region 10 to support Early Learning STEM Education. The Early Learning STEM units are designed for educators, teachers, and childcare providers to use with children between the ages of 3-5.



Funded by grants from



Objectives

- Children will learn about different properties and characteristics of liquids and solids.
- Children will learn about conservation of quantity, or that if the same amount of liquid/solid is poured into a different container, it is still the same amount.
- Children will learn about characteristics of things that sink and float.

Common Misconceptions

- *The amount of liquid in a container can change depending on the shape of the container.* If the contents from a short, fat glass is poured into a tall, skinny glass, children will often say that there is more liquid in the tall glass.
- *If something is heavy, or large, it will sink.* Children often believe that it is the weight or size of an object is that will make it sink, rather than the density and weight of the object in relation to the weight of water displaced.
- *If you put something that sinks in a larger amount of water, it will float.* Sometimes children believe that if a small rock or other object that has sunk in a small amount of water, such as a puddle, is then taken to a larger puddle or body of water, it will float.

Target Books

Nonfiction (Informational Text):

- Sink or Float?
 - True to life photographs provide visual cues illustrating the concepts of sink and float. Comparisons can be drawn between the various items that allow for them to either sink in the water or float.
- Where did the Water Go?
 - Explore evaporation and different ways that water moves and can change the environment around it.

Key Vocabulary

- **Liquid** – A liquid has size but no shape. You can push through it and it changes its shape to fit the container it is in.
- **Solid** – something that has a size and shape. You cannot push through it.
- **Gas*** – something that does not have a shape and is usually see through, like air, steam, or smoke. It takes the size and shape of its container.
- **Gravity** – the force that pulls things down to the ground.
- **Material** – what something is made out of.
- **Volume** – the space/area a liquid, solid, or gas takes up.
- **Weight** – how heavy something is.

Pre/Post Assessment Ideas

- Using a spray bottle of water and a cookie sheet or other hard nonporous surface, have children make predictions about what will happen. Encourage them to predict what the water will look like when sprayed (will it be a big puddle or lots of little ones?), if they can make the water move and how, or what might happen to the water if they leave it there.

- Have clear containers of various sizes available. Pour water from a tall container into a short one and ask if there is more, less, or the same amount of water in the new container. Let children explore moving the water from the different containers and telling you if there is more, less, or the same.
- Fill a clear container (about the size of a shoebox or larger) with water about halfway and have various objects. Ask children to explore the objects and predict whether they will sink or float, and why.

Before Reading

- Introduce key vocabulary.
- Take a 'picture walk'-look through the pages and talk about what they see and think the story may be about; when appropriate, have children make predictions about what they think may be happening on a page.
- Record predictions that children make during their picture walk.
- Record what children already know about the topic, a circle map can be an excellent recording tool - examples are at the end of the unit.

During Reading

- Make comments about personal connections, either between you and the story or the children and the story.
- Ask questions that are:
 - "On the page"- basic level questions that have yes/no answers or can be answered by looking at the page
 - "Between the lines" - a higher level of questioning that requires children to recall information they have already heard or information they are hearing right now in order to answer
 - "Beyond the book" - an even higher level of questioning that requires children to take information they have previously heard and make reasonable predictions based on that known information
- A single page of key vocabulary and a variety of types of questions specific to each book is included with the unit. It is recommended that you print this page and keep it with your book copy to serve as a reference guide when engaging with the book with young children.

Book Extension

- Build a boat. Using oil based clay, see what design will be needed to make a boat, and then see if the boat can carry any 'passengers' (weight).
 - Look at different pictures of boats. What do they all have in common (key pieces include sides and a solid bottom).
 - Draw a design for your boat using large paper and markers.
 - Model building a boat using the key components and test it out in a bucket of water-be sure to have some design flaws the first couple times so you can model all steps of the design process.
 - Tell children they are going to be creating their own boats. Keep the pictures and chart of key components of boat design available for children to reference.

- Ask them to draw their boat design, when finished give them a lump of clay to create their boat. Have buckets of water available for them to test their boats.
- When a successful boat has been created, see if their boat will carry 'passengers' (animal figures, dollhouse people, golf balls, marbles, paper clips).

Discussion Points

- When looking at the boats, discuss why it is important to have sides, a solid bottom. Are the sails necessary? How is a ferry boat that can carry cars different from a speed boat that only carries people?
- When engaging with children in the construction activity make comments and ask questions that allow them to: describe what they see, hear, and touch; compare and contrast the materials and their observations; along with encouraging further exploration. Examples include:
 - "What materials should we use? How do you think those materials will react to water? Air? etc.?"
 - "Which part is the most important? What will be difficult to build?"
 - "What is your prediction of what will happen?"
 - "Would you change the shape or design of your boat? Why? Do you think it might float longer or carry more "passengers" if you did that? Would you be able to carry a different type of "passenger"? (previous design could only carry pennies, new design can carry a golf ball)"
- When testing out different "passengers", problem solve why different boat designs can carry the different "passengers". One person's boat may only be able to carry the paperclips, while another can carry a toy car.
- As an added challenge, see if children want to make boats from other materials. Can a boat be made from paper? Aluminum foil? Bowls/cups? Can these boats carry "passengers"? How long will they float?

Additional Activities

Small/Large Group Activities:

- **Play with liquids, exchange contents from one container to another:**
 - Talk about whether there is more or less liquid, dependent upon answers remind them that you did not add any or take any away.
- **Play with both liquids and solids in bottles/clear containers:**
 - Sort them and ask children to identify differences.
 - Make patterns (solid/liquid, hot/cold, etc.).
- **Play with ice in cold and hot water:**
 - Which ice cube melts faster? What happened to the ice?
- **Use spray bottles and spritz different surfaces:**
 - How does the water move on the cookie tray in comparison to the play dough?
- **Use different materials to transfer water from one container to another:**
 - Eyedroppers, sponges of different sizes, different types of cloth bits are all great. Compare how the different materials carry the water. Do they

absorb it? How drippy are they? Does one type work better than another type?

Art Activities and Writing Area

Sensory Table:

- With tubs of water or the sensory table, ask children to predict and chart what sinks and what floats (be sure to include some surprises).
- Point out the speed with which some things sink. A rock is going to sink faster than a piece of paper. Why? Try how fast or slow something sinks or what they could do to change it from a sinker to a floater or a floater to a sinker.
- Create a bottle of water and cooking oil (add food coloring to help show the difference) and ask them which liquid is the sinker and which is the floater and add objects to see if you could get floaters in one and sinkers in another (rubber bands, ice, and some pony beads have been rumored to do so).
- Water Drops and Drips:
 - Make drops with eyedroppers and look at them on different surfaces (absorbent vs. nonabsorbent) with magnifying glass.
 - With an eyedropper or pipette, see how many drops of water you can fit on a penny, or if you can make water rise above, or crest, the top of a glass.
 - Show pictures of drips and drops close up in the air or touching a water surface.
 - Relate them to the drops and drips you see outside in the natural world.
- Play with cornstarch and water, if you mix just the right amount of water in you can have something that is in between a solid and a liquid.
- Bubbles and balloons (if introducing gas):
 - Show various sizes of bubbles or balloons and ask what is inside, compare large and small bubbles/balloons to a little or a lot of air.

Meal/Snack Conversations

- Discuss which foods are liquids and which are solids. Why? Can something be changed from a liquid to a solid and how?
- Put small amounts of items in the freezer, and have the same item at room temperature. What is the difference between the two? Do some items change when put in the freezer? Why do they think they changed?
- When something spills, talk about the tool you would use to clean it up. Would a paper towel be better for cleaning up a bowl of cereal or would the broom work better? What about spilled juice?

Outdoor Component/Active Movement

- Play with puddles and see what sinks or floats in them.
- Waterworks:
 - Have a wire or peg board wall for children to connect hoses to, have connectors and splitters for those hoses as well as funnels.
 - Let the children manipulate and explore and write down their discoveries about water.

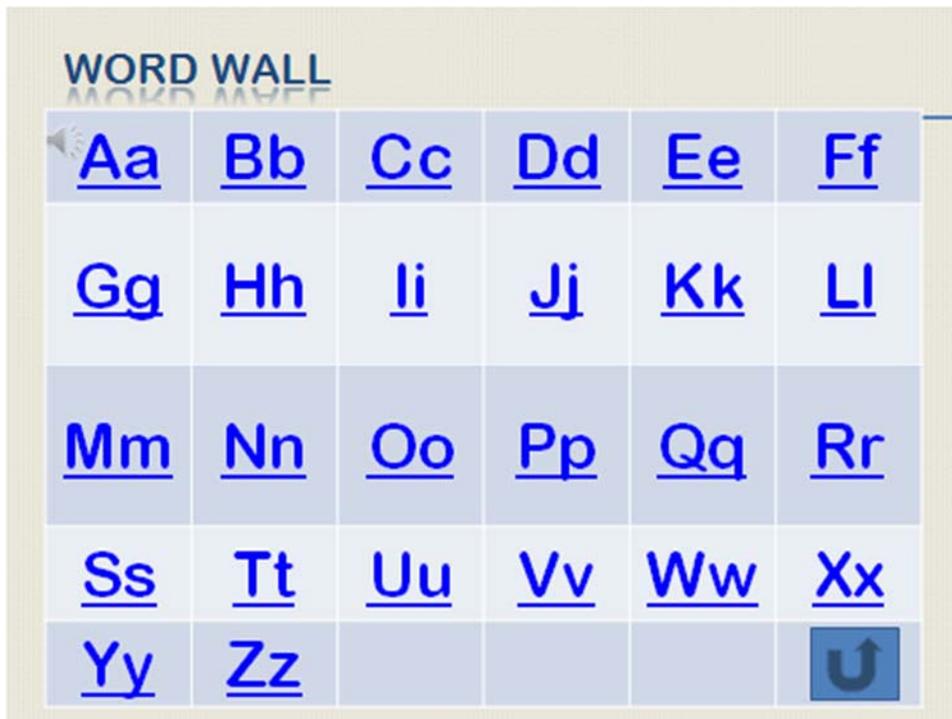
- Ask them that when they learn something new to present it to the class so the other children can try it too and see if they get the same result.
- Have a container marked at consistent intervals:
 - Graph how much it rained by the amount of water that is in the container (use a consistent time of day) for a set period of time.
- On a rainy day, put powdered tempera paint on paper. Place on a cookie sheet and set outdoors. Talk about the patterns of colors that the rain makes. How big are the drips?
 - Do the same activity on a sunny day using spray bottles. Compare the difference between the rain painting and the spray bottle painting.

Assistive Technology

Assistive Technology is the use of strategies, adaptations, and/or materials which are created or commercially available products to enable participation in activities that otherwise would not be accessible. While these strategies are designed to assist those with disabilities and/or other barriers to learning, they can be implemented with all children, including those who are not native English speakers, and provide additional visual and technological support.

For this Unit:

- Add visual/picture supports for each of the block types you are using:
 - Clip art available as sticky notes for some children to choose rather than drawing or writing their observations.
 - Clip art or objects for each shape you are searching for, the shapes can be matched to photos of the actual objects that are observed.
 - Clip art or other symbols or objects for each building type to answers to questions about which sense was being used.
- A communication device programmed with key words, vocabulary as well as words that could answer questions about the senses or observations. This could be used to participate in discussions, answer questions, and request items.
- Make sure the water table or buckets are accessible for all children.
- Provide pictures of boats for children who are not able to draw their own picture or the boat, or include “boat parts” with pictures on the communication device or with clip art and attach to a surface with Velcro for a child to choose.
- Create a spinner attached to a switch so a child can participate in selecting living and non-living items for others to categorize. The same spinner can be adapted for use with the provided math game.
- Create an electronic interactive word wall: This is created using PowerPoint. Each letter in the first slide is a hyperlink to the corresponding alphabet page. At the bottom of each alphabet page are links to return to the main screen or go forward to backward a page. Children can assist with the creation by choosing pictures and suggesting words to be added.



e			I see with my eye.
	eye		
e			I can hear with my ear.
	ear		
e			

Other Resources

- **Teacher Resources**

- Discovery Education – www.discoveryed.com is an online resource that offers a wide variety of digital media content into classrooms. This allows for increased engagement of children and gives them the opportunity to explore and experience fascinating people, places, and events. All content is aligned to state standards, can be aligned to custom curriculum, and supports classroom instruction.
 - Video segments: A First Look: solids, Liquids, and Gases contain 13 segments; A First Look: Water; and other segments about water

- BookFlix – <http://bkflix.grolier.com> is an online literacy resource that can be purchased through Scholastic and is geared for children up to approximately third grade. Over 100 pairs of fiction and nonfiction books are included, with the fiction book being animated and the nonfiction in a read-a-long format. BookFlix includes games or puzzles, a meet the author section, web resources, and teacher lesson plans.

Sample Circle Map

