ECHOS®

Early Childhood
Hands-On Science

Water Play

Acknowledgements

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Overview

Overall Goal: Children will use science processes to investigate volume, water displacement and buoyancy.

Lesson	Objectives	Vocabulary	Key Concepts	Tools
#1: What a Mess!	Children will understand that the volume of water can be measured.	drop dropper funnel large/larger measuring cup prediction small/smaller volume	• A drop of water has less volume than a cup of water. • The volume of water in a bottle can be measured in cups.	dropper funnel measuring cup
#2: Moving on Up!	Children will understand that when an object is placed in a container filled with water, the water level rises because the object takes up space.	full more/less overflow rise space	• When something is placed in water it takes up space; the water level rises (is displaced). • If a container is too full, placing an object in the water may cause the water to spill, or overflow. • The larger the object, the more space it takes up in the container, and the more water is displaced.	measuring cup
#3: Which One?	Children will discover that when objects are of similar size and shape, the heavier object will usually sink.	float/sink heavy/heavier level light/lighter top/bottom up/down weight	• When objects have the same size and shape, we can use their weight to predict which will float and which will sink. • A lighter object is more likely to float. A heavier object is more likely to sink.	balance scale
#4: Unsinkable Shapes	Children will explore how sinking and floating is influenced by an object's shape.	boat model shape	• The shape of an object can determine whether it sinks or floats.	

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Science Process Skills

Science Process Skills	Lesson #1	Lesson #2	Lesson #3	Lesson #4
Observing				
Identifies object properties	●	●	●	●
Uses senses to observe concrete, familiar objects	●	●	●	●
Differentiates between models and the real thing				●
Uses measurement tools to record observations	●			
Uses tools to observe objects or events	●		●	
Describing				
Describes key attributes of objects	●		●	●
Creates drawings or models depicting objects				●
Describes changes in objects		●		●
Discusses changes in variables that affect an investigation		●		●
Categorizing				
Notices similarities and differences	●	●	●	
Sorts objects into groups using one attribute at a time			●	
Establishes own sorting criteria				
Sorts objects using multiple attributes				
Provides reasoning for grouping objects			●	
Predicting				
Verbalizes thinking	●	●	●	●
Recognizes and extends patterns		●	●	
Makes simple predictions	●	●	●	●
Makes predictions based on observations	●	●	●	●
Uses estimation to make quantitative predictions	●			
Experimenting				
Investigates models of objects/phenomena				●
Manipulates materials	●	●	●	●
Identifies factors that might affect the outcome of an experiment		●	●	●
Participates in collecting data	●		●	
Interprets data using symbols or graphs	●			
Performs trial-and-error investigations		●	●	●
Drawing Conclusions				
Makes verbal interpretations of observations	●	●	●	●
Finds patterns from data collected			●	●
Connects findings from an investigation	●	●	●	●

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Lessons at a Glance

In ***What a Mess!*** children make predictions about how much water it will take to refill a bottle. They test their predictions using a measuring cup. Then, they check the results to see if their predictions were correct.

In ***Moving on Up!*** children conduct a trial-and-error investigation by observing what happens when clay balls of various sizes are submerged in a container. Which displaces more water: the small ball or the large ball?

In ***Which One?*** children discover that although two objects might look the same, one object may sink and the other may float. Children use a balance scale to measure the weight of a range of objects. Then, based on the weight of each object, children make predictions about which will sink and which will float, and learn the importance of testing their predictions.

In ***Unsinkable Shapes*** children explore how changing an object's shape determines whether it sinks or floats. Children use pieces of aluminum foil and clay to create various shapes, and explore which shapes float and which sink.

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Key Concepts

It's not difficult to observe that some objects sink and others float. However, the underlying science concepts, including volume, displacement and buoyancy, are complex, and children will not develop a full understanding until later in their schooling. For example, many children believe that heavy objects sink and lighter objects float, but an object's shape and the amount of air inside can also determine whether it sinks or floats. ***Water Play*** introduces these physical science concepts, using water and objects familiar to children, in a playful manner.

- **Volume** is the amount of space an object occupies. Since larger objects take up more space than smaller objects, they have a larger volume. For example, a cup of water takes up more space than a drop of water, so the cup of water has a larger volume than the drop. The volume of liquids (water, milk, etc.) is commonly measured in gallons, quarts, cups and tablespoons. In the metric system, volume is commonly measured in liters, and milliliters.

- When an object is placed in a container of water, it pushes some of the water aside and causes the water level in the container to rise. This is called **displacement**. The larger the volume of the object, the higher the water level will rise. For example, when two different-sized clay balls are placed in cups of water, each will displace the water and make the water level rise. The larger clay ball will displace more water than the smaller one.

- An object that floats usually lies on top of water. **Buoyancy** is the upward force that keeps things afloat. The buoyancy of an object (whether it sinks or floats) depends partly on its **weight** and partly on its **volume** (the amount of space it takes up).

  – **Weight** can be used to predict whether objects of the same size and shape are likely to sink or float. Given two objects of the same size and shape, the heavier object is more likely to sink than the lighter object. For example, a golf ball will sink, but a ping-pong ball of the same size will float. However, the weight of objects of similar size or shape does NOT always tell us if it will sink or float, but it **can help predict** what will happen.

  – The **shape** of an object can also determine whether it will sink or float because it is related to the objects' buoyancy. For example, when one cup of clay is flattened and molded into a clay boat, it will float. This is because weight of the clay boat is spread over a greater surface of water. When the same amount of clay is molded into a solid ball, it will sink.

- A **balance scale** is used to measure an object's weight. When a scale is used to compare the weight of two objects, the side with the heavier object goes down and the side with the lighter object goes up. When the weight of both objects is the same, the scale is **level**.

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Lesson Guide

TEACHER TALK

Teacher talk is indicated by **bold letters that appear in large print**. When you first start teaching ECHOS, you may need to rely heavily on this text to ensure that you are presenting the science concepts accurately. As you become familiar with the text, use it as a guide or refer to it only as needed. You should always read the entire script prior to delivering the lesson.

TEXT IN ALL CAPS

Text IN ALL CAPS appears throughout the script to emphasize a step or instructions given to children.

VOCABULARY WORDS

Vocabulary words are introduced during the lesson and reinforced in the Outcomes section.
They appear in ***red italic letters*** the first time they are introduced.

MATERIALS IN BLUE LETTERS

Materials listed in blue letters in the *Material Preparation* page, indicate materials that are non-consumable. Once acquired, these materials do not need to be replaced.

SCIENCE AREA

The last page of each lesson contains suggested materials that could be added to your science area. Before adding any materials for children's independent use, evaluate whether the item is safe to be explored with limited supervision. The science area should be a place that children use freely to explore and conduct their own trial and error experiments, rather than a display area.