

# 3<sup>rd</sup> Grade

## Buoyancy

- NYS Standard 4 (Science): Physical Setting (PS) and Engineering Design**

  - ✓ **Key Idea 3: Matter is made up of particles whose properties determine the observable characteristics of matter and its reactivity.**
- NYS Standard 1 (Analysis, Inquiry, and Design): Engineering Design (ED)**

  - ✓ **Key Idea 1: Engineering Design is an iterative process involving modeling and optimization finding the best solution within given constraints which is used to develop technological solutions to problems within given constraints.**
- NYS Standard 1 (Analysis, Inquiry, and Design): Mathematical Analysis (MA)**

  - ✓ **Key Idea 3: Critical thinking skills are used in the solution of mathematical problems.**

Major Understandings	Learning Experience/Objectives	Supporting Terms
<p><i>PS 3.1.e The material(s) an object is made up of determine some specific properties of the object (sink and float, conductivity, magnetism). Properties can be observed or measured with tools such as: hand lenses, metric rulers, thermometers, balances, magnets, circuit testers, and graduated cylinders.</i></p> <p><i>ED 1.1a Identify a simple /common object which might be improved and state its purpose</i></p> <p><i>ED 1.1b Identify features of an object that help or hinder the performance of the object</i></p> <p><i>ED 1.1c Suggest ways the object can be made differently, fixed, or improved</i></p>	<p><b>Sink or Float:</b> Students will use background knowledge to make predictions about why some things sink or float.</p> <p><b>Clay Boats:</b> Students will design three different clay boats and test the how the design relates to the amount of cargo it will hold.</p> <p><b>Plastic Cup Boats vs. Clay Boats:</b> Students will compare the number of ceramic cylinders that their boat can support to that of a plastic cup and redesign their boats to hold the same or greater amounts of ceramic cylinders.</p> <p><b>Displacement:</b> Students will observe the changes in water level when various objects are put in the tank demonstrating the relationship between volume (size) and displacement.</p> <p><b>Salt Water vs Fresh Water:</b> Students will demonstrate an understanding of why certain objects sink in fresh water and float in salt water.</p> <p><b>Submarine-Sink Then Float:</b> Students will determine the number of ceramic cylinders it takes to make a plastic jar partially submerge and fully submerge in water and compare how this concept is similar to a submarine.</p>	<p>shape, ceramic, cylinder, optimize, fair test, vertical, compare, contrast, displacement, density, submarine</p>
<p><i>MA 3.1a Use appropriate scientific tools (ex. metric rulers, spring scale, pan balance, graph paper, thermometers [Fahrenheit and Celsius], graduated cylinder) to solve problems about the natural world</i></p>	<p><b>Measuring Mass:</b> Students will observe a teacher demonstration of finding the mass of the cylinders using the balance and compute how many grams their boat designs can hold.</p> <p><b>Measuring Buoyant Force:</b> Students will use a K'nex rubber band scale to measure the buoyant force on objects of different sizes and describe the relationship between size and the level of buoyant force.</p> <p><b>Weight of an Object In Water:</b> Students will predict, observe, and explain the apparent change in weight of objects when they are out of water, partially submerged, and submerged as it relates back to buoyant force.</p>	<p>mass, balance, horizontal, buoyancy, force, gravity, bobber, trials, level, submerged, detach, attach, weight</p>
<p><i>ED 1.2a Identify appropriate questions to ask about the design of an object</i></p> <p><i>ED 1.2b Identify the appropriate resources to use to find out about the design of an object</i></p> <p><i>ED 1.2c Describe prior designs of the object</i></p>	<p><b>What Makes A Good Boat?:</b> Students will research different types of boats and compare and contrast their appearance, function, and design of those boats with the ones they created.</p>	<p>research, propulsion, hull, structure, materials</p>

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