PhET Tips for Teachers: *Buoyancy*

Tips for controls:

- Both scales and blocks can be moved.
- You can put the blocks in the water. If an object floats, you can hold it under water to measure its volume.
- Use the scale and the volume of water displaced to calculate the density of the mystery objects.
- Select same mass, volume, or density to compare and contrast the buoyancy of two blocks.
- Turn on the forces and drag the object below the surface to see how the buoyancy force changes.
- You can switch from water to oil using the buttons at the bottom of the Intro tab. In Buoyancy Playground tab, there is a continuous slider for fluid density.
- The scale in the fluid can be moved
- There are more controls in the "Buoyancy Playground" tab.
- If you are doing a lecture demonstration, set your screen resolution to 1024x768 so the simulation will fill the screen and be seen easily.

Important modeling notes / simplifications:

- For named objects in the drop-down menu, mass changes volume to keep density constant; for "My Block", mass changes density.
- There is a drag force when the block is moving through the water, but we do not show it. It is confusing to students and is not necessary for understanding buoyancy.
- We purposely left out the density of water on the slider, since we saw that it caused students to engage more with the sim.

Insights into student use / thinking:

- Students do not need to be told to put the block in the water; it is often their first move.
- Students notice that the buoyant force equals the block's weight when the object is floating.
- Comparing two blocks at a time helps students notice the important ideas about buoyancy.
- Some students notice that when objects float, they displace their mass, but when objects sink, they displace their volume.
- Students learn that density is what determines whether an object sinks or floats.

Suggestions for sim use:

- For tips on using PhET sims with your students, see: **Guidelines for Inquiry Contributions** and **Using PhET Sims**.
- The simulations have been used successfully with homework, lectures, in-class activities, or lab activities. Use them for introduction to concepts, learning new concepts, reinforcement of concepts, as visual aids for interactive demonstrations, or with in-class clicker questions. To read more, see: **Teaching Physics using PhET Simulations**.
- For activities and lesson plans written by the PhET team and other teachers, see: **Teacher Ideas & Activities**.