**Floating ice predictions**

**Levels:** 5-6  
**NoS achievement aims:** Investigating in science, Participating and contributing   
**Contextual strands:** Material world   
**Topic:** Antarctica, States of Matter

**Rationale**

Ice is less dense than water.

In this investigation students have opportunity to develop and carry out investigations using models. The context allows them to develop scientific ideas that could support them in forming opinions about important socio-scientific issues.

**What you need**

* Measuring cylinder that has, or can have, measurements marked on it.
* Large ice block (preferably a rectangular shape so that the area above water is easily visible).
* Water.
* Solid block of material (for example, wood, metal) that will fit inside the cylinder without floating when water is added.

**Focus**

* Does ice float or sink when it melts?
* What happens to a full plastic drink bottle containing water if it is frozen? What does this tell you about the density of solid ice compared to liquid ice (water)?
* Do other materials behave in a similar way when they are melted or frozen? (For example, melting candle wax, setting candle wax.)
* How much of an iceberg is above water level?
* Why are scientists concerned about sea levels when they think about global warming?

**Exploration**

Part A:

1. As a class, or in groups, get the students to approximately half-fill the cylinder and measure the water level. (Note that parallax can affect marking position.)
2. Have them add the ice block and measure the water level again.
3. Get them to predict, with reasons, what will happen to the water level as the ice block melts, that is, will the water level:
   * rise?
   * stay the same?
   * fall?
4. Have them test their predictions by measuring the water level when the ice has melted.
5. Share with students that this result is not surprising to scientists because particle theory explains it – in other words, scientists begin with the understanding that ice takes up more room than water.
6. Invite students to use the idea that ice takes up more room than water to explain their own results.

Part B:

1. Explain to students that the model they have been testing is analogous to the Arctic where all the ice is floating. To test a model analogous to the Antarctic, where a considerable amount of ice is on land, have them place the solid block into the cylinder and carry out the activity again, that is:  
   -add water to the cylinder (do not fill past the top of the solid block), measure the water level, then place the same-sized ice block on top of the solid block  
   -predict, with reasons, what will happen to the water level as the ice block melts  
   -test predictions by measuring the water level when the ice block has melted.
2. Invite the students to explain their results.

**Reflection**

* Did your predictions influence the measurements you made? (In other words, if you expected the water level to rise, did you tend to measure higher?)
* Do you think scientists would be influenced in this way?
* In what ways did your results from the first set of measurements (floating ice) differ from those when the ice was placed on a solid block?
* Which of the two situations of ice melt – in water / on land – are of most concern regarding the effects of global warming on sea levels around the world? Why?