



Escape!

LINKED CHALLENGE

To construct a sail boat that both floats and moves quickly across water

ACTIVITY OVERVIEW

Give each child a piece of modelling clay/mounting putty (etc.) and ask them to drop it into a water tank full of water. Does it float? Why/why not? Challenge the children to make it float by changing its shape. Draw out the key facts below, acknowledging that when the shape is wider and flatter, it has a larger surface area and so covers a greater amount of the water surface too. The result is that there is more upthrust on the object and when this force is balanced against the weight of the modelling clay pushing down on the water, it floats.

Set the children a challenge: Block Land is under attack and each Lego™ figure must escape by boat. The children's challenge is to work in pairs to make a boat that can carry this figure, using a variety of recycled (junk) materials. The added challenge here is that it is a *sailing* boat and they need to add a sail which, when a fan is used, will carry their boat from one end of a plastic tray to another. Each pair has access to the same materials and a plastic tray for practice. They can also request 2 trials with the fan* to see if their sail works.

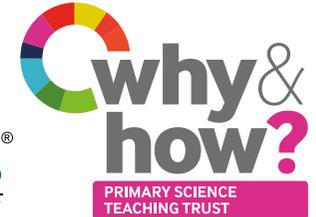
*This is to be led by the activity leader – see Health and Safety guidelines.

After the children have explored and created their designs, run a 'race' where each pair's boat is timed travelling across their tray using a driving force of air from the fan. Which boat was the quickest? Why might this be? Did all the boats float?

KEY FACTS/SCIENCE

There are two key forces acting on any object dropped into water: the upthrust of the water and the weight of the object. *Upthrust* is the force of the water pushing the object upwards. The *weight* of the object is the force that acts in the opposite direction and pulls it downwards (towards the centre of the Earth). For something to float, these two forces acting on it need to be *balanced*. If the weight is greater than the upthrust, it will sink. Objects that float are said to be *buoyant*.

The sail of a boat creates motion when there is movement in the air that pushes against its surface. This air creates a *driving force* on the boat. Acting in the opposite direction there will also be *air resistance*, slowing the boat down. When a boat moves through water, there is also resistance (friction) from the water; this is called *drag*. Whenever the driving force of the moving air pushing on the sail is equal to or greater than the combination of air resistance and drag acting on the boat to oppose this motion, the boat will move forwards.



RESOURCES

Modelling clay/play-dough/mounting putty	Scissors
Water tank	Sticky-tape
Recycled materials: trays, tubs, paper, card etc.	Plastic tray (1 per pair)
Wooden barbecue skewers/cocktail sticks	Water
	Lego™ (or similar) figures
	Fan
	Timer

Health & Safety:

Children must only use the fan with adult supervision.

QUESTIONS/FURTHER LEARNING

- Does the size or shape of the boat change how well it floats?
- How does a sail move the boat forwards?
- Does the shape of the sail make a difference?
- What different forces are acting on a boat when it is moving?

Online supporting video:

<https://www.bbc.co.uk/bitesize/topics/zc89k7h>

