

Meaningful Learning Experiences

Strategic Commitment	✓	Part of a regional, ESF-funded 'Careers Local' programme
Curriculum Provision	✓	Enriching a Science topic from a KS3 scheme of work
Employer Partnerships	✓	Involving a local one-man business
Reflective Young People	✓	Self-assessment included the Skills Builder framework
Informed Career Choices	✓	Highlighting vocational skills and self-employment

'Upthrust, Floating & Sinking' is made meaningful with input from a self-employed boatbuilder

As part of Year 9, 'Real World Science', Year 9 students at Joseph Whittaker School near Mansfield learn about floating and sinking. The teacher brief explained that, *'These are difficult conceptually to teach, which is not helped by the fact it is difficult to find context and importance for the science. Employer engagement could bring relevance and therefore deepen understanding.'*

Current resources and the scheme of work for 'Upthrust effects, floating and sinking' include Powerpoint slides to explain Archimedes principle of flotation and a demonstration and explanation about a 'Cartesian Diver' experiment.

Mel Davis Boatbuilder is a one-man steel fabrication business and Mel is a hugely experienced engineer and craftsman. In an informal video message recorded at his workplace, he described how he builds canal boats, ensuring that they are stable and safe. He explained that, in contrast to when boats were used for haulage, modern boats now require ballast. He also talked about his career and the skills that are necessary, including product design and high-quality welding.

A worksheet asked students to calculate the maximum safe load for one of Mel's canal boats, applying their prior learning about mass, density and volume. A selection of the students' work was sent over to Mel for his informal feedback.

Feedback from student self-assessment showed that they found the calculations challenging but 84% of them indicated that they had developed 'Problem-Solving' skills.

Benefits for the Students

What I am proud of:

- *'It has made me think about how Science can have an effect on different job types in my future'*
- *'I eventually understood it'*
- *'Learning what upthrust and displacement is'*
- *'Not giving up and managing to do the work'*
- *'Doing all the calculations correctly and accurately'*
- *'I was able to learn more and be able to problem solve better now'*

Benefits for the School

- '... They were fascinated by the boat building process and the calculations were no longer 'what's the point' number crunching, but numbers that had meaning and value ...'
- '... Many were already interested in manufacturing and engineering careers and seeing how the basic Physics they know can be easily applied to workplace situations was interesting to them. They were more engaged in problem solving than they would have otherwise been ...'

Benefits for the Employer

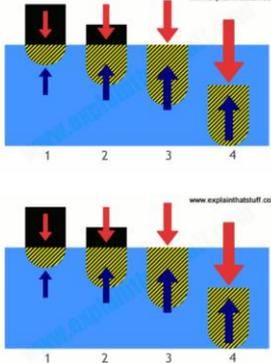
Mel Davis was keen to share his enthusiasm about the value of apprenticeships and the potential for becoming self-employed. Not only is his business completely dependent on his complete attention, but there was no way that the workplace could have been made safe for a school visit. Yet a video message recorded on a mobile phone and informal feedback about the project enabled him to have an impact on a year group of students.

Floating and Sinking



Let me try and explain how I make sure our boats float and are of the highest possible quality

[Click to hear from Mel](#)



www.explainsstuff.com

The theory about floating and sinking was put into a real context by local narrow boat builder Mel Davis, who described what is required to ensure his boats are stable and safe. Students carried out their own calculations based on his information and a selection of their work was sent across to Mel for his informal feedback.

The greater mass of the boat the lower it sits in the water...

If the mass of the boat was 10 tons then the water that has been displaced was 10 tons. The boat would sit lower in eu canal if it weighs 11 tons because it would be displacing 11 tons of water.

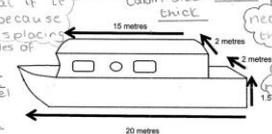
boat
chairs
base steel
10mm
thick

Safe maximum load calculation:
Mass = Density x Volume
Mass = 997 x 105
Mass = 104685 Kg

Boats used for living sit higher than those used for transport...

Boats used for transportation sit lower in eu water because they are usually filled with goods until they reach the safe maximum load. However boats used for living aren't necessarily filled to the maximum load because you only need eu basic necessities - thinner steel on the cabin...

The steel is thicker at the bottom to ensure that the boat in the water is balanced. But if the boat is not sat on water it will...



Narrow boat volume =
20m x 2m x 1.5m = 60m³ bottom volume
+ 10m x 2m x 1.5m = 45m³ top volume
105m³

Overall maximum safe load = 104,685 Kg