Shipwrecks: a lateral thinking problem

Learning objectives

1 Develop higher order thinking skills including lateral thinking and creative thinking.

2 Design a valid investigation which models one of the factors that might affect the rate of rusting at different depths below sea level.

Introduction

There are two shipwrecks. One in deep water and the other in shallow water. The one in deeper water is less rusty. Why?

Concept cartoon

Design a concept cartoon with four possible reasons for which shipwreck rusts faster. Concept cartoons are cartoon-style drawings that put forward a range of viewpoints about a particular situation. Concept cartoons are normally used to promote a group discussion.

Your concept cartoon should have a drawing in the middle showing the shipwrecks at different depths and four speech bubbles around it expressing opinions about why one will be rustier than another. The best cartoons will be those with the greatest number of plausible explanations.

Below are some ideas that you might include in your concept cartoon:

- The shallow seawater is warmer/cooler.
- The shallow seawater has more/less oxygen dissolved in it.
- The shallow seawater is moving with a faster/slower current or is stirred about more/less.
- The concentration of salt in solution varies with depth.

The best explanations take the reasoning further and explain why…

...the shallow water might be warmer/cooler.

...the shallow water might have more/less oxygen in it.

...the shallow water might get stirred up more/less.

...the shallow water might have a higher/lower salt concentration.

Design an experiment

Plan an investigation to determine how temperature, the salt concentration, the dissolved oxygen concentration or the amount of stirring affect the rate of rusting of iron shipwrecks.

Experiment template

Hypothesis

Ask a question or state a hypothesis to be tested:

_____

_____

Identify the variables

What is the independent variable? _____
(The thing you will change.)

What is the dependent variable? _____
(The thing you will measure.)

What are the control variables (the things you will need to keep the same to ensure the test is valid)?

_____ _____

_____ _____

_____ _____

_____ _____

Make a prediction

What results do you expect to measure?

_____

_____

_____

Equipment

Write a list of the equipment you will need:

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

Write a method

Give step-by-step instructions. Remember to state which piece of equipment you will use, what you will measure and the units.

Step 1: _____