Dressing a 'passenger' to test for heat loss

SHIPWRECKED IN SCIENCE WEEK 2008!

Saba Tyson of Data Harvest describes a fun science investigation using dataloggers

Earlier this year I was invited by the ICT coordinator of South Bursted Primary School in West Sussex to run an activity for the combined year 3 and 4 classes (8–9 year-olds) during Science Week. After a chat with their class teacher Emily King, I discovered that they had recently been on a school trip, as part of their Tudor history project, to see the Mary Rose, the 16th century warship which was sunk in 1845 and subsequently discovered and raised in 1982. I had the idea that this could form the basis for a fun science investigation based on the survivors of the sunken vessel, which would also fulfil various National Curriculum requirements for science (unit 4c), IT (units 3C and 4D) and maths.

I asked the children to think about who might have been on the Mary Rose and what might have affected whether they survived the sinking or not. Key words and phrases were introduced during a class discussion: insulation, heat transfer, temperature, degrees Celsius, thermal insulator, hypothermia, thermometers, temperature sensors, dataloggers and fair testing.

After a lively discussion, the class decided that the types of person on the ship could be represented by:

- cabin boy – poorly dressed in rags.
- fat rich merchant – well dressed in layers of clothing
- sailor – thin layer of clothing
- rich lady/gentleman – lots of layers of very rich fabric
- captain – layers with outer clothing made of waterproof fabric.

They hypothesised that having many layers of clothing would keep the person warm for longer, and that factors such as the wind, and falling into the cold sea would have the effect of making the person cold quickly.

Everyone was keen to plan an investigation to test their hypotheses and the children split into small groups to decide which character and which external conditions they would study. They worked cooperatively, dividing the tasks between them.

As this investigation was to be carried out by 8–9 year-old children who had never used a datalogger or sensors before, each group was given the opportunity to become familiar with the equipment, exploring and recording temperature with an external plug-in temperature sensor. They quickly learnt how to use the dataloggers and to interpret the display. With a little guidance they decided that a 10-minute recording time and sampling every second would give the best line graph.

The resources available were 500 ml plastic drinks bottles with small holes in the lids, a variety of fabric samples, scissors, rubber bands, access to warm water (40 °C), measuring jug, trays capable of holding cold water, fans, Data Harvest *EasySenseQ3* dataloggers and external plug-in temperature sensors, and a laptop connected to a whiteboard to display results.

The children decided that the bottles filled with warm water would represent the passengers and that they would be dressed using the fabric offcuts secured with elastic bands. A fan would be used to mimic the wind, and a plastic tray of cold water would be used as the sea. Some victims were to remain dry, others wet, some wet and blown by the wind, and some dry and wind-blown.

Everyone had great fun dressing their character. The children carefully measured 500 ml of warm water and filled the bottles; a temperature sensor was then inserted through the lid into the 'body'. Each group subjected their character to whichever conditions they had chosen and, having programmed their dataloggers beforehand, began

logging and collecting the data over a 10-minute period.

Boys and girls of all abilities appeared extremely motivated throughout their tasks, talking within their own group and with others about their findings, comparing results and discussing reasons for them.

At the end of the experiment the data were retrieved from each logger and merged onto one graph, which was displayed on the whiteboard. Before I revealed which line graph belonged to which group, I asked the class to predict which passenger would have remained the warmest and which the coldest. This sparked a lively discussion and in general they were able to identify and label each line graph correctly.

The class concluded that dry clothing slowed down the transfer of heat, keeping the victim warm for longer. Layers were more effective at this and were a better insulator. If the character was submerged in the cold water they lost heat more quickly than if they remained dry and the same was true if the victim was wind-blown. They thought that this was because blowing allowed the heat to transfer to the outside quicker.

Using the sensors and a computer made the results of the investigations visual and instantly accessible; it was easy to compare the groups' results. The children enjoyed a valuable learning experience and were keen to think of other investigations they could explore with the dataloggers.

Collecting evidence with a sensor and datalogger

Acknowledgements

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The *Easysense Q3 Primary datalogger* is available from Data Harvest Ltd, 1 Eden Court, Leighton Buzzard, Beds LU7 4FY. Tel: 01525 373666

Saba Tyson is Area Sales manager (UK South) for Data Harvest.