

Unit 5F Monitoring environmental conditions and changes

ABOUT THE UNIT

In this unit children learn that devices can be connected to a computer to monitor and measure changes in environmental conditions. Children gain an understanding of computer monitoring of external conditions.

This unit links with the ICT key stage 2 programme of study 2b (monitoring events such as changes in temperature) and with the science key stage 2 programme of study Sc1, Scientific Enquiry 2f (making systematic observations and measurements including the use of ICT for datalogging).

Children should be able to apply what they have learnt in this unit when working on Unit 6C 'Control and monitoring – What happens when...?'

WHERE THE UNIT FITS IN

This unit assumes that children:

- are familiar with using traditional methods of monitoring and measuring environmental conditions and changes, *eg temperature, light, time*
- are familiar with using sensing equipment, *eg thermometers*.

TECHNICAL VOCABULARY

- sensing equipment
- sensors, *eg light and temperature*
- analogue readings
- digital readings
- datalogging
- recording
- monitoring
- measuring

RESOURCES

- datalogging equipment
- traditional thermometer, beakers

EXPECTATIONS

at the end of this unit

most children will:

choose the appropriate sensor/s to monitor environmental conditions and changes and carry out experiments safely and independently

some children will not have made so much progress and will:

carry out experiments with support and/or guidance

some children will have progressed further and will:

understand when it might be appropriate to use a computer device for datalogging; select appropriate sensors and carry out the experiments safely and independently; draw simple conclusions from data

LEARNING OBJECTIVES

POSSIBLE TEACHING ACTIVITIES

SETTING THE SCENE

CHILDREN SHOULD LEARN

- **key idea:** that sensing devices can be used to monitor changes in environmental conditions
- ◆ Discuss ways in which measurements of environmental data are taken in a range of everyday situations, *eg weather forecasting, central heating, thermostats.*
- ◆ Discuss the difficulties experienced when manually recording data. Identify the need for a system to record data.
- ◆ Identify difficulties encountered when collecting data over very short or long periods of time and discuss different ways in which data can be recorded, *eg tables and graphs.*
- ◆ Compare methods of presenting data where a variable changes over time in different formats (numbers, graphs). How can we use the computer to do this?

SHORT FOCUSED TASKS

- **key idea:** that a device attached to a computer can take readings of conditions such as light intensity, temperature and sound levels
- **technique:** to attach a sensor to a device connected to a computer and take readings
- ◆ Show the children how to link a sound sensor to the computer. Record the various levels of sound with the whole class participating, *eg silence, quiet talking, shouting* and show the changes displayed on the computer screen. Discuss what happens to the graph as noise levels change.
- ◆ Demonstrate how to attach a sensor to a device connected to the computer and, if necessary, how to configure the software to show the data being collected. Give children the opportunity to 'have a go', without the activity being related to any precise scientific investigation, *eg recording temperatures of cold water, from hands, under armpit* to show how changes are logged and are then printed out as a graph. Ask the children to mark at each point on the graph what they thought was happening.

- **key idea:** that a computer can take samples of data for a set period of time
- **technique:** to use the program set-up features to set variables such as selected sensor and time span of recording
- ◆ Set a light sensor to monitor the classroom over 24 hours. Discuss the difficulties that such an investigation would face without the use of ICT. Ask the children to interpret the resulting graph.
- ◆ As part of an investigation into insulation, pour equal quantities of hot(ish) water into two beakers of different sizes and types of insulation to compare rates of cooling. Use temperature sensors to compare rates of cooling over a given period of time, *eg 20 minutes.* Print data and graphs. In both cases, children will need to change variables for the timings of the readings and discuss how often readings need to be taken in each case.

INTEGRATED TASK

- to identify opportunities and design simple investigations for which the collection of data through a computer device is both feasible and advantageous
- ◆ Encourage the children to come up with their own questions and hypotheses. Suggestions could include, *What happens to the temperature of a glass of water after ice cube(s) are dropped in over a period of x minutes? Which will cool quickest, a large or small bowl of hot water? Which coat/jumper is the warmest? What is the darkest/brightest time over a 24-hour period?*

LEARNING OUTCOMES

POINTS TO NOTE

CHILDREN

- develop awareness of some of the problems faced by scientists in collecting data
- learn that a line graph may be more illustrative of gradual change over time than either tables or bar charts

Data collection examples could be linked to current science investigations.

- learn that computers can monitor external conditions
- learn how to attach sensors and make their readings display on the computer

This activity should be conducted with the whole class. Links to noise pollution, classroom sound levels and a quiet environment.

In some circumstances, temperatures change gradually, *eg under armpit measurements*, and children will need to be shown how long to record a particular temperature location to get readings. If there is access to a computer room/suite, the sensing/datalogging could be done in the classroom and the data gathered could then be graphed/interpreted in the computer room.

Consider how responsive the computer sensor is compared with a traditional thermometer. What implications might this have for the timing of the first records? Are we able to conclude which method is the more accurate?

Some sensing kits can be used 'remotely' away from the computer and then download their data. Can the children think why this might be an advantage?

Children should be encouraged to draw conclusions from their data. Graphs can usually be saved as a graphic and imported or pasted into a word processing package.

- understand that computers can be used to take a series of accurate readings, over a period of time, without being 'distracted' by other events

It may be necessary to create a peak artificially for the 24-hour light monitoring experiment. This may require someone to switch on classroom lights for a short period after the class has gone home, and to turn lights on when it is dark during the monitoring period so as to see the effect of a sudden change. The change in the trend of data is then discussed. Why did it occur? What happened to cause the sudden change?

- use a monitoring device and are aware of the reasons for doing so
- explain why a computer device is used to monitor and record data rather than 'traditional' methods

Some sensing kits have a snapshot facility which does not take advantage of the continuous recording capability of the computer, but is a useful tool nonetheless.



Ref: QCA/00/488

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