Buckinghamshire Schools

Science Transition Units

TEACHER RESOURCES

Additional resources as well as the pupil sheets
can be downloaded from:
www.bucksgfl.org.uk/science

SCIENCE TRANSITION INVESTIGATIONS FOR YEAR 6 AND YEAR 7 TEACHERS

INTRODUCTION

Welcome to the Science Transition Teachers Handbook. This resource has been put together through a collaboration between the Buckinghamshire science consultants, ASTs and teachers. This unit aims to support the transition of children from primary to secondary school by allowing students to undertake an extended Sc1 investigation in Year 6 to consolidate the investigative skills they have learnt and then demonstrate to their new science teachers, on transition to secondary school, what they are capable of.

The Year 6 Science Transition Unit looks at how penguins are adapted to their environment, using the film 'Happy Feet' as a stimulus. This will be followed on in Year 7 (Year 7 Transition Unit) where the film 'March of the Penguins' has been used to investigate why penguins huddle.

The main elements of these units, as well as some ideas for additional activities and cross-curricular work, are included in this Teacher's Handbook which can be downloaded from: www.bucksgfl.org.uk/science. Additional material and resources are also available on the website – make sure you check it out!

SCIENCE UNITS – RATIONALE

These two units have been put together to support the transition of Year 6 children to their new secondary school. Each unit has clear teaching objectives linked to the science national curriculum; however, there is an underlying rationale behind this work, which is:

- Allow students in Year 6 to do a 'final' science project to consolidate all their experience of doing science at primary school in an open-ended investigation, and to celebrate this success.
- To have a record of some of their achievements, which can be shared with their new school, science teacher and peers (a common experience). They should take their investigative report to their new school on the Secondary School Induction Day, where it will be expected by the Science Department.
- To demonstrate to their new science teachers the investigative skills they have already gained from primary science, and that they have developed independent skills enabling them to undertake investigations and research.
- Although the units have a common link, they are designed to be stand-alone in nature to take account of students that either may not have completed the work in primary school or who may have come from out of County.
- The units need to be 'fun' and topical. Hence the link to stimulus material (films) on penguins.

Overview of Lessons, Titles & Content

The following pages contain the main elements of the two transition units, with advice and guidance on carrying out the investigations.

YEAR 6 SCIENCE TRANSITION UNIT

Title of this Unit: ***How do penguins keep warm?***

Pages 4 – 7 ***Year 6: information and lesson plans for teacher***.
Use this information to guide you through the investigation. Remember to visit the website for additional ideas and resources.

Pages 8 – 15 ***Student investigation booklet***.
Provide each child with a copy of this booklet and get them to complete it as they go through the investigation. If you could get the children to complete the evaluations of the investigation in the student booklet, on page 2 and again on the final page, it will allow their new Year 7 teacher to find out a little bit about them.

YEAR 7 SCIENCE TRANSITION UNIT

Title of this Unit: ***Why do Penguins huddle?***

Pages 16 – 19 ***Year 7: information and lesson plans for teachers***.
Use this information to guide you through the investigation. Remember to visit the website for additional ideas and resources.

Page 20 ***Year 7: investigation card sort.***
Use the card sort to confirm that the students know the procedures for the investigation

FINAL NOTES

We have really enjoyed working collaboratively with our colleagues from many schools across Buckinghamshire.

We are keen to support this development further and would ask that if you have used this material please let us know!

Equally, if you have any suggestions for improvements or have additional material that you have developed yourself while delivering these units, please share with us all.

To collaborate further please post your ideas etc. on the forum on the Science Transition website www.bucksgfl.org.uk/science or e-mail the science team: sclark3@bucksgfl.org.uk

Year 6 Science Transition Unit

How do penguins keep warm?

Buckinghamshire Science Advanced Skills Teachers and Consultants

Introduction 	This Year 6 Science Transition Unit will look at how penguins are adapted to their environment, using the film 'Happy Feet' as a stimulus. This will be followed on in Year 7 where the film 'March of the Penguins' will be used to investigate huddling penguins. The Year 6 Unit contains one Sc1 activity which will give the children an opportunity to consolidate investigative skills they have learnt and show their Year 7 Science teachers what they are capable of. Additional optional activities, some cross-curricular, are also included if you would like to extend this activity further.
Timing 	It is envisaged that the Sc1 activity would take three 1½ hour sessions. Additional time would be required for any of the additional, extension work.
Objectives 	• To know how penguins are adapted to their environment. (Sc2 5c) • To know that some materials are better thermal insulators than others. (Sc3 1b) • To make a fair test by changing one factor and measuring the effect while keeping other factors the same. (Sc1 2d) • To use observations, measurements or other data to draw conclusions. (Sc1 2j) Breadth of study: • To identify risks and take action to reduce risks to themselves and others. (2b)
Success Criteria: 	I can: • Change one factor, measure the effect and keep all others the same. • Draw conclusions from my data. • Explain how penguins are adapted to suit the environment they live in. • Explain how some materials are better thermal insulators than others.

Lesson one
1 ½ hours

Starter:
Watch 'Happy Feet' extract http://www.apple.com/trailers/wb/happyfeet/
Brainstorm questions: Where do penguins live? What is their habitat like? How do they think they are suited to living in that environment?
(In addition to this you may want to do some research about penguins – description, species, size, diet, habitat and other)

Main activity: Planning an investigation
Explain to pupils that they are going to investigate how penguins keep warm.
Brainstorm: What factors could affect penguins keeping warm?
(layers of fat, overlapping feathers, huddling, size, thickness of fur, colour, size of feet)
Tell them that for this investigation they are going to investigate whether feathers keep the penguins warm. They will use a plastic bottle to represent a penguin. They can fill this with hot water. Explain that they will make two penguins: one without feathers (a control) and one with feathers. (Children can make their feathers out of any material – this could provide useful comparisons at the end – groups could compare newspaper feather with cotton wool ones.) They may wish to make their bottles look like penguins.
Ask them to work in groups and consider how they could carry out their investigation. They need to consider what factor they will change, what they will measure, how they will make the experiment fair, and a basic method. Pupils could also write a prediction.

Plenary
Discuss the plans the pupils have made and ask them to consider what they think that will happen.

Lesson 2
1 ½ hours

Starter:
Recap planning sheets from last time. Make sure pupils have considered:

- What they are changing/measuring/keeping the same.
- What they will be making their feathers out of.

Show children a selection of plastic bottles. Ask them what bottles they will select and why (discuss fair testing).

Main activity

- Remind the pupils how to read a thermometer.
- Ask the pupils to consider how many results they will collect and help them to create a results table accordingly. They may wish to record start and end temperatures or could take temperatures at intervals.
- Pupils work in groups to carry out the investigation and collect the results.

Plenary:
Discuss children's results. What did they notice about their results?
Explain that they will be used next session.

Lesson 3 **1 ½ hours** 	**Starter:** Children to look at results. Ask the pupils to consider the following questions: • How did the temperature change in their feathered and non feathered penguins? • What was it about their data that suggested this to them? • Why do they think the feathers actually made a difference to the temperature of the water in their penguin? (Discuss thermal insulators) **Main activity:** The pupils should work in pairs and write a conclusion describing the difference in temperature change between the feathered and non-feathered penguin. They could use the Penguin Writing Frame. Alternatively children could choose to present their work in their own way using the headings: • Question • Prediction • What we did • What happened (table/graph/description) • What we found out • What we would do differently next time? **Plenary** Pupils could present their findings to the rest of the class or display the work they have produced. Pupils should consider the science they have covered at primary school and what they are looking forward to learning at secondary school. It would be fantastic if pupils could consider the final two questions on the writing frame. Explain to the pupils that their science teachers in their new secondary schools will read this work.
Extending the activity	• Different size bottles • Different layers of cotton wool • Set up a VLE course on penguins including information on different species of penguin, food chains/webs, habitats etc.
Additional Activities 	• Research information about penguins – find out about different species of penguins – size, diet, habitat, geography. • Adaptations of penguins – children to research more adaptations. Other investigations: see attached sheets • Why do penguins have oily feathers? • Why do penguins have a streamlined shape? • Why do penguins have webbed feet? Push a fork and spoon through water, which was easiest? • Why are penguins fatter at the bottom than at the top? • Food chains and food webs

Key words	Insulate	Thermometer	Temperature
	Degrees	Fair test	Factor

Resources

Plastic bottles or polystyrene cups	Thermometers
Materials to make feathers with	Timers
Planning sheets (if used)	Writing frame (if used)

Health+Safety

Discuss with the children the dangers of boiling water.
Using thermometers safely.

Background information

Penguins are flightless birds that have adapted to living in the cooler waters of the Southern Hemisphere. The 17 species of penguins found today are thought to have evolved from petrel-like flying birds some 50 million years ago. Some species spend as much as 75% of their lives in the ocean, yet they all breed on land or sea-ice attached to the land. All penguins have a very similar torpedo-shaped body form, though they vary greatly in size. Penguin wings are highly modified to form stiff paddle-like flippers used for swimming, and their feet and stubby tails combine to form a rudder. The penguin's bones are solid and heavy, which help them to remain submerged and reduce the energy needed for diving.

Penguins are able to withstand the extreme cold because insulation provided by their short, densely-packed feathers forms a waterproof coat. A thick layer of fat or blubber also serves as an energy store. These adaptations, among others, enable them to minimize heat loss in icy cold waters enabling them to cope with the harsh conditions of the Antarctic.

Web links

Film: http://wwws.warnerbros.co.uk/happyfeet/

This document and other resources can be downloaded from the www.Bucksgfl.org.uk/science website.
Click on: Science Transition Project (KS2-3)

Produced by: Buckinghamshire Science Team
Advanced Skills Teachers (Gwen Calder, Christine Ryan, Sam Bennion)
Secondary Science Consultants (Karen Crinyion and Shane Clark)
www.bucksgfl.org.uk/science

Buckinghamshire Schools

Moving on in Science

My Name	
My Primary School	
My Secondary School	

Science self assessment

How do penguins keep warm?

What new things have you found out by doing this investigation?

What was the most difficult part of this investigation?

What other things could you investigate if you did this investigation again?

Your own comments on this investigation

How do penguins keep warm?

Researching penguins – what I have found out about penguins

Planning

We are investigating

What are the factors or things that could change?

What we are going to change

We are going to measure

We will keep our experiment fair by

We predict

To carry out our experiment we will (our plan)

How will we make sure the experiments are safe?

Collecting results

This is my table of our results

Here is another way of representing our results (graph?)

Concluding

What we found out

Evaluating

How could we improve the experiment

Comments for your Year 7 Science Teacher

In science I am good at

My favourite topic in science is

I need to improve at

My funniest moment in science was

In my KS2 Science test I am expecting a level: ☐

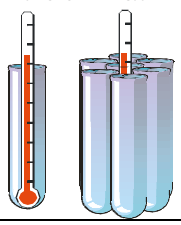
Write a poem or draw a picture about penguins

Year 7 Science Transition Project

Why do Penguins huddle?

March of the Penguins

Buckinghamshire Science
Advanced Skills Teachers and Consultants

Introduction 	This is a stand-alone resource targeted at Year 7 teachers enabling them to appreciate and understand the investigative skills that their pupils have already gained from primary science. In Year 6 some of your pupils may have completed the link activities on penguins focussing on insulation based upon the children's film 'Happy Feet'. This activity, using the film 'March of The Penguins', considers how penguins' behaviour helps them survive at extreme temperatures for many months. Additional optional activities are also included if you would like to extend this activity further.
Timing 	It is envisaged that this investigation could be carried out over three one hour lessons to be taught within the first two weeks of the Autumn term. Additional time would be required for any of the additional extension work.
Objectives 	• Work as part of a group to plan and carry out an investigation into why penguins huddle. • Analyse and evaluate the investigation. • Imaginatively present the results and conclusions of the investigation to the rest of the class.
Outcomes	• Explain the significance of huddling. • Imaginatively present your findings to the rest of the class.
Procedure 	Use boiling tubes to model a penguin. Group boiling tubes together with elastic bands to model the huddling penguins. Boiling tubes are filled with hot water (caution!). Stand huddles in beakers. Pupils compare the temperature change of a lone penguin with that of a huddling penguin. Pupils may choose to record temperature at regular intervals.

Lesson 1

Setting the scene

Starter:
Use clip of Huddling Penguins from 'March of the Penguins' as stimulus for pupil discussion about the penguins behaviour and to set the scene for the investigation.

Main activity: Rainbow group planning (a suggested approach)
In groups of 5 allocating each group a different colour, pupils to brainstorm ideas of how to carry out the investigation outlining an appropriate plan to include

- independent, dependent and control variables
- apparatus required
- risk assessment

Rearrange the pupils into rainbow groups. (Each rainbow group should have at least one representative from each of the five colours)
Each group should be allocated one of the following five tasks to discuss in detail and record onto large pieces of paper (you may have more than one group focussing on each aspect of the plan, depending on class size.)

1. prediction with science included
2. fair test
3. apparatus
4. method (bullet points)
5. table of results

Plenary:
Pupils should return to original colour group and report back to the rest of the group and agree a final plan. If time permits, one or two groups to feedback to the whole class.

Lesson 2

Investigating penguins

Starter:
Provide pupils with card sort activity to sequence the method.
Highlight safety and risk assessment.

Main activity:
Pupils carry out practical safely, in small groups and record results.
Pupils to calculate change in temperature.
Extension: pupils could produce a graph of their results.

Plenary:
Each group is asked to summarise what they had learned about how huddling has affected the temperature.

Lesson 3

Presenting outcomes of the investigation

Starter:
State the objectives of the lesson:

- Pupils to creatively summarise their investigation as a group
- Present summaries to the class

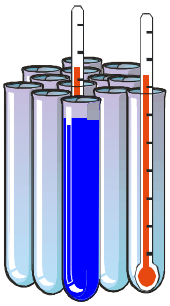
Snowball discussion (suggested approach)
Groups need to agree an appropriate medium for presenting their summaries. (For example: verbal presentation, poster, song, rap, poem PowerPoint presentation, webpage, etc.)

- Ask pupils to work individually for one minute to list ideas of how to present findings.
- In pairs share and extend their list
- In fours share ideas and agree which method their group will use

Main activity:
Pupils to work in groups to summarise their investigation.

Plenary:
Groups to present their summaries to the whole class.
Focus on celebrating the individual and group successes.

Extending the activity



- Pupils make comparisons of the change in temperature of the central penguin compared with one at the edge of a huddle.
- Pupils could investigate how long the outer penguins would survive before needing to change places with inner penguins.
- Place boiling tubes in ice to investigate rate of cooling.
- Teachers could provide a spreadsheet for pupils to enter their individual results and calculate a class average.
- Pupils could compare different size penguins (for example, use a boiling tube to represent an Emperor penguin and a test tube for the Adelie penguin)
- This whole investigation and the extension work could be carried out using data logging equipment if available.

Resources

'March of the penguins' DVD

Boiling tubes	thermometers	timers
kettles	elastic bands	beakers

Health & Safety

Take care when handling hot water and glassware.

Key words	thermal conduction thermometer fair test	temperature convection insulate variable	huddle radiation predict evidence

Background information

The **Emperor Penguin** (*Aptenodytes forsteri*) is the tallest and heaviest of all living penguin species. It is endemic to Antarctica and the only penguin species that breeds during the Antarctic winter. Emperor Penguins first begin to breed at approximately 5 years of age. Emperor penguins travel about 90 km (56 miles) inland to reach the breeding site. The penguins start courtship in March or April, when the temperature can be as low as –40°C. In May or June, the female penguin lays one 450 gram (1 lb) egg, but at this point her nutritional reserves are exhausted and she must immediately return to the sea to feed. Very carefully, she transfers the egg to the male, who incubates the egg in his brood pouch for about 65 days consecutively without food by surviving on his fat reserves and spending the majority of the time sleeping to conserve energy. The transfer of the egg can be awkward and difficult, and many couples drop the egg in the process. When this happens, the chick inside is immediately lost as the egg cannot withstand the low temperatures on the icy ground. To survive the cold and winds of up to 200 km/h (120 mph), the males huddle together, taking turns in the middle of the huddle. They have also been observed with their backs to the wind to conserve body heat. After about two months, the female returns. She finds her mate among the hundreds of fathers via his call and takes over caring for the chick, feeding it by regurgitating the food that she has stored in her stomach. The male then leaves to take his turn at sea. After another few weeks, the male returns and both parents tend to the chick by keeping it off the ice and feeding it regurgitated food. About two months after the egg hatches, as the weather becomes milder, the chicks huddle in a crèche for warmth and protection, still fed by their parents. Eventually, both the chick and parents return to the sea and spend the rest of the summer feeding there. At the end of the summer the whole inland trip is repeated for all those penguins of breeding age, while the younger ones stay at the sea edge.

Additional resources

This document and other resources can be downloaded from the www.Bucksgfl.org.uk/science website.
Click on Science Transition Project (KS2-3)

Produced by: Buckinghamshire Science Team
Advanced Skills Teachers (Mandip Bahra and Amanda Bennett)
Secondary Science Consultants (Karen Crinyion and Shane Clark)
www.bucksgfl.org.uk/science

Card sort: experimental method

Repeat the experiment
Pour water into test tube and put thermometer or temperature probe in it
Write down start temperature and start the stopwatch
Collect apparatus
Set up apparatus as shown in your diagram and plan
Write down the final temperature
Heat the water
Record the temperature at regular intervals