smart science

Bodywatch

Self Management: to keep track of what I am doing

Investigative skills: to decide on what kind of evidence to collect and what equipment and materials to use

Activating Personal Capabilities in Science

Generic task

When I went to...

20 minutes

Learning Objective

Self Management: to keep track of what I am doing

Introducing the task 5 minutes

Ask the children whether they've ever let their mind wander in a lesson or a meeting. Have they ever lost track of what the discussion was about or not really paid attention to what needed to be done. Give a personal example of a time it happened to you.

Keeping track of what is going on around us is about keeping our eyes and ears open. Explain that 'When I went to…' challenges us to keep track of what other people are saying. The class will need to work together to see how many things they can remember from different shopping lists. Remember, that helping others out is often the way we all succeed.

Running the task 15 minutes

1 Organise the children into a circle, facing inwards. Decide on where the game is to be set – e.g. at the shop, on the farm, in space, at the garden centre etc.

2 Start the game with one child saying, 'When I went to the shop I bought…' adding one item they bought from the shop.

3 The next child repeats the sentence and adds another item. Go round the group by repeating the sentence and adding more and more items to the list.

4 If someone gets stuck they can ask the group to help and the game continues.

How did you keep track of what other people said? Try not to repeat the same item on the list – if you do you can have another go, but if you do it again, you'll have to start again!

Helpful Hints

Encourage the children to think of unusual things as they may help people remember them better. Tell them to imagine the item as the person says it, so that they have a picture in their mind as they look at each person.

Ideas to give this task a science focus:

- Ask for items to do with a healthy (or unhealthy) diet for the shopping trip.
- Ask for items to do with living things for the trip to the farm or garden centre.
- Ask for items to do with the Earth, Sun and Moon for your trip into space.

Science embedded task
Bodywatch

1 hour

Learning Objectives

National Curriculum Sc1: 2c, 2i

Investigative Skills to decide on what kind of evidence to collect and what equipment and materials to use to make comparisons and identify simple patterns in their own observations and measurements

Equipment
A range of measuring equipment, e.g. stopwatches, measuring tapes, metre rules, string, bathroom scales etc.

Success Criteria
To be successful the children will:

- organise themselves to collect the information
- check the accuracy of their results
- change their approach where necessary
- describe and explain the results they have collected.

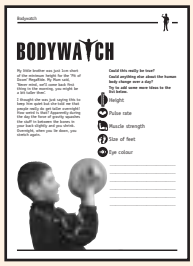
Introducing the task 15 minutes
Ask the children what they know about keeping track of themselves or the things around them (relate this back to the generic When I went to… task). Use the sheet, 'Bodywatch', to introduce the idea that some changes happen in our body which we're not always aware of… and rarely keep track of. Discuss with the children ideas about long term changes in people as they get older, e.g. increase in weight, height, strength and then explain that others happen over shorter periods of time, even within a single day.

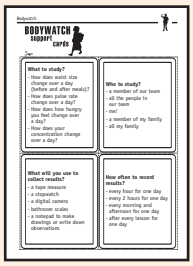
Encourage the children to extend the list started on the sheet. Discuss and share as a whole class any ideas they produce.

Running the task 30 minutes (plus time needed for collecting results)
1. Organise the children into teams of two to four.
2. Tell each team to decide on a factor that they will measure or observe over a day. How do they think it will change? Using their science knowledge they must predict what might happen – and give a reason for it.
3. Emphasise that they will be responsible for keeping track of what happens. They will have to remember to collect enough results to make a good scientific study. The results must be accurate and recorded carefully and checked if necessary. Use the Bodywatch Support Cards to help as appropriate.
4. Ask the teams to note down how they will collect their data on the Bodywatch Activity Planner. Some teams may also need to draft a table for recording results.
5. Encourage them to consider what they will do if they notice that things aren't going well. Reinforce the idea that by collecting plenty of results patterns can be recognised and the reliability of the data is improved. Data could be collected over the course of a school day or as 'homework'.

Reviewing the task 15 minutes
Ask the children how successful they were at keeping track of what was happening and how they collected the data. Were they able to collect results at all of the times they planned? Did anyone check the accuracy of the data and how? Ask the teams to describe their results to the rest of the class and give an explanation of what they found, comparing the results to their prediction. Once the discussion is complete, involve the children in making an overall judgement about how well they worked using the assessment for learning Smart Grid (see back cover).

Resources





BODYWATCH

My little brother was just 1cm short of the minimum height for the 'Pit of Doom' MegaRide. My Mum said, 'Never mind, we'll come back first thing in the morning, you might be a bit taller then'.

I thought she was just saying this to keep him quiet but she told me that people really do get taller overnight! How weird is that? Apparently during the day the force of gravity squashes the stuff in between the bones in your back slightly and you shrink. Overnight, when you lie down, you stretch again.

Could this really be true?

Could anything else about the human body change over a day?

Try to add some more ideas to the list below.

- Height
- Pulse rate
- Muscle strength
- Size of feet
- Eye colour

_____

_____

_____

_____

_____

_____

BODYWATCH Activity Planner

We predict that _____

_____

because _____

_____

_____

_____

The person (or people) we will measure/observe is _____

We will take our results with _____

The person/people responsible for this is/are _____

_____

We will record our results every _____ for _____

The person/people responsible for this is/are _____

We will record the results: in a table _____

on a graph _____

another way _____

BODYWATCH
results sheet

Table or graph of results

What we found out

BODYWATCH support cards

What to study?

- How does waist size change over a day (before and after meals)?
- How does pulse rate change over a day?
- How does how hungry you feel change over a day?
- How does your concentration change over a day?

Who to study?

- a member of our team
- all the people in our team
- me!
- a member of my family
- all my family

What will you use to collect results?

- a tape measure
- a stopwatch
- a digital camera
- bathroom scales
- a notepad to make drawings or write down observations

How often to record results?

- every hour for one day
- every 2 hours for one day
- every morning and afternoon for one day
- after every lesson for one day

smart grid
Assessment *for* Learning

Ice Cream Heaven

Thumbs Up
We were great at the task because...

Thumbs Sideways
We were good at the task because...

Thumbs Down
We were OK at the task because...

we used the GRASP process to help us. It asked us to...

we thought about what might happen e.g....

we used what we know about materials and insulation, e.g....

we...

Next time we will...

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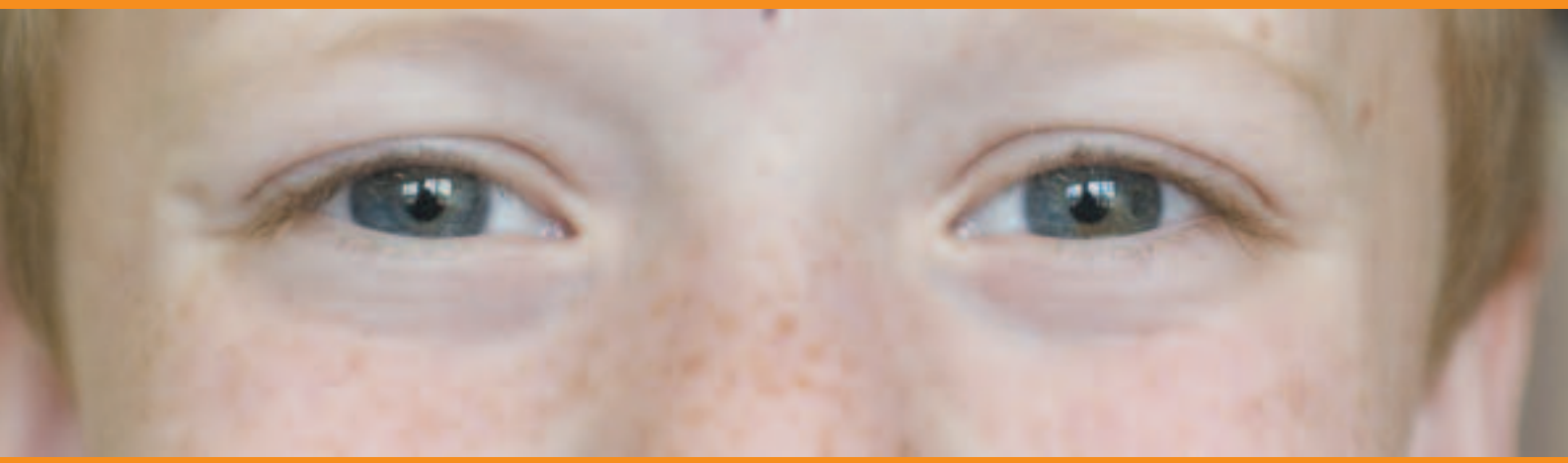


Ice Cream Heaven

Self Management: to clarify what needs to be done

Investigative skills: to relate properties of materials to their everyday uses

Activating Personal Capabilities in Science

Generic task
GRASP it!

35 minutes

Learning Objective
Self Management: to clarify what needs to be done

Introducing the task 10 minutes
Being good at managing yourself and your time is important for us all. This task introduces five important questions to ask yourself when you are starting a job or project. These are called 'GRASP' questions.

GRASP questions help us set realistic targets and deadlines. GRASP stands for 'Getting Results and Solving Problems'.

Running the task 25 minutes
You need: a partner, GRASP It! scenarios, GRASP It! cycle.

1 Organise the children into pairs.

2 Hand out the scenarios and the GRASP it! cycle sheet.

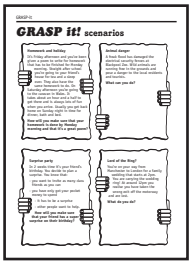
3 Each child must choose a scenario and talk through their GRASP analysis of it. They might find it useful to make notes on the GRASP it! cycle sheet.

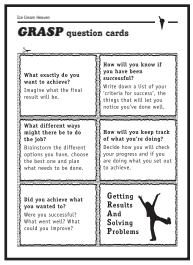
Helpful Hints
Work through one example with the children before asking them to work in pairs. Additional scenarios are given or you could use a problem or occurrence that is familiar to the children.

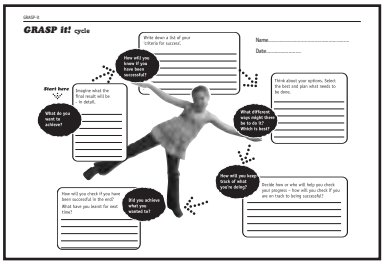
Encourage the children to work together, using the questions to structure their thinking.

Reinforce that we can GRASP lots of things. Display the GRASP It! Poster and actively use it to help children manage their way through science, literacy, geography or other tasks.

Resources







Science embedded task
Ice Cream Heaven

1 hour

Learning Objectives

National Curriculum Sc3: 1a Sc1: 2c

Science Investigative Skills to relate properties of materials to their everyday uses
to think about what might happen when deciding what to do

Success Criteria
To be successful the children will:

- use the GRASP process to make sense of a problem
- decide on what a successful outcome would be
- think about what might happen
- justify their ideas by applying their knowledge of materials.

Introducing the task 10 minutes
As a class, review the planning process used in the generic GRASP it! task. Ask the teams to arrange a set of GRASP question cards into a logical sequence. Remind the children how the GRASP questions can be used to clarify what needs to be done, i.e. helping them be clear about what they want to achieve or the different ways they could do it.

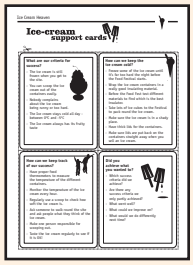
Running the task 40 minutes
1 Organise the children into teams of three to five.

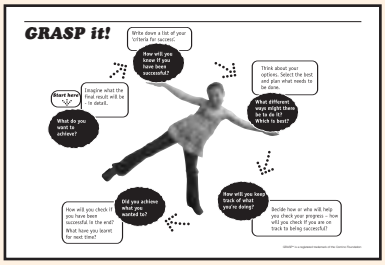
2 Hand out or read the All You Can Eat Competition sheet and hand out the Ice Cream GRASP it! cycle sheet.

3 Ask the children to fill in the sheet to show the team's GRASP thinking. Emphasise that they are aiming to clarify what needs to be done and what is needed to keep the ice cream at the best temperature. Encourage the children to think about different ways of providing a very cold environment which could involve insulating the containers etc. Emphasise that observations and temperature measurements would be useful to help keep track of the effects on the ice cream. Use the Ice Cream Support cards if appropriate.

Reviewing the task 10 minutes
Discuss with the children their ideas. Ask them how this links to their science knowledge of materials and insulation. Discuss with the children ways in which the GRASP questions helped them to be clear about what they had to do e.g. What did they think the success criteria were? What different ways of doing the job did they come up with? Involve the children in reviewing their work and making an overall judgement about how well they were able to clarify what needed to be done. Use the assessment for learning Smart Grid (see back cover).

Resources





GRASP it! scenarios

Homework and holiday

It's Friday afternoon and you've been given a poem to write for homework that has to be finished for Monday morning. Straight after school you're going to your friend's house for tea and a sleep over. They also have the same homework to do. On Saturday afternoon you're going to the caravan in Wales. It takes about an hour and a half to get there and is always lots of fun when you arrive. Usually you get back home on Sunday night in time for dinner, bath and bed.

How will you make sure that your homework is done by Monday morning and that it's a great poem?

Animal danger

A freak flood has damaged the electrical security fences at Blackpool Zoo. Wild animals are running free in the grounds and pose a danger to the local residents and tourists.

What can you do?

Surprise party

In 2 weeks time it's your friend's birthday. You decide to plan a surprise. You know that:

- you want to invite as many class friends as you can
- you have only got your pocket money to spend
- it has to be a surprise
- other people want to help.

How will you make sure that your friend has a super surprise on their birthday?

Lord of the Ring?

You're on your way from Manchester to London for a family wedding that starts at 2pm. You are carrying the wedding ring! At around 12pm you realise you have taken the wrong exit off the motorway and are lost.

What do you do?

GRASP question cards

What exactly do you want to achieve?

Imagine what the final result will be.

How will you know if you have been successful?

Write down a list of your 'criteria for success', the things that will let you notice you've done well.

What different ways might there be to do the job?

Brainstorm the different options you have, choose the best one and plan what needs to be done.

How will you keep track of what you're doing?

Decide how you will check your progress and if you are doing what you set out to achieve.

Did you achieve what you wanted to?

Were you successful? What went well? What could you improve?

Getting Results And Solving Problems

GRASP it! cycle

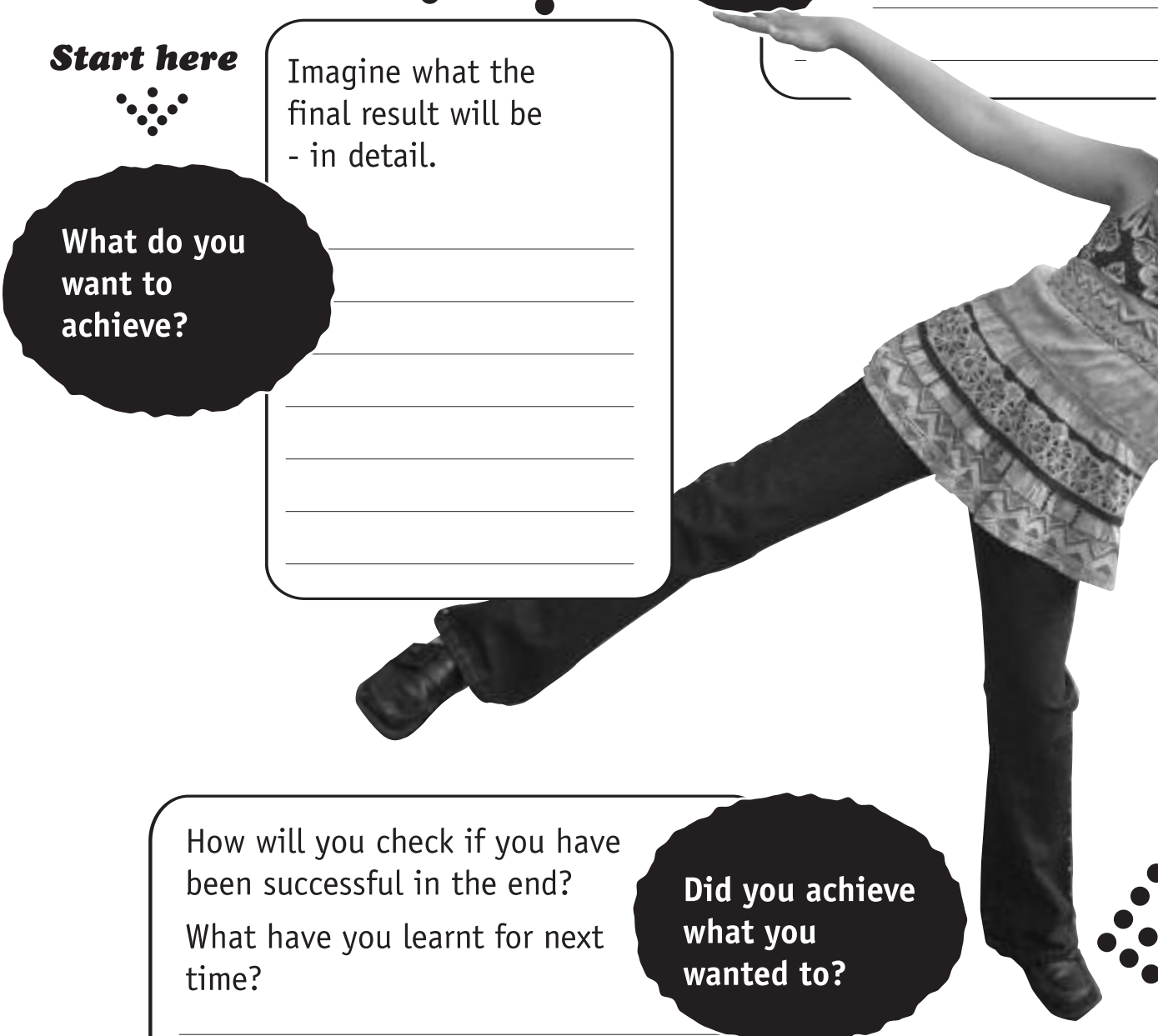
Start here

What do you want to achieve?

Imagine what the final result will be - in detail.

How will you know if you have been successful?

Write down a list of your 'criteria for success'.



Did you achieve what you wanted to?

How will you check if you have been successful in the end?

What have you learnt for next time?

Name.....

Date.....

What different ways might there be to do it? Which is best?

Think about your options. Select the best and plan what needs to be done.

How will you keep track of what you're doing?

Decide how or who will help you check your progress – how will you check if you are on track to being successful?

All you can eat competition

Win a lifetime's supply of Super Organic Ice Cream!

The best time to sell ice cream is in hot weather. Last year sales were at their highest during August's Food Festival – but this presented a big problem for retailers. Hot summer weather makes the ice cream melt more quickly. To win your lifetime's supply of Super Organic Ice Cream, send us your ideas to keep the ice cream at a temperature between 0°C and -5°C.

SUPER ORGANIC ICE CREAM:

- is really delicious with no artificial additives
- contains 58% cream and 27% fresh fruit
- tubs must be used on the same day of opening
- 'Is the best ice cream around,' says Mario Cornetto (Italian Food Critic)
- freezes at 0 degrees Celsius (°C)
- must be kept between 0°C and -5°C at all times otherwise it becomes too hard to scoop or too runny
- loses its fruity taste when it melts
- is sold in biodegradable containers.

Now GRASP it!

Use the GRASP questions to help you think through how you will keep the Ice cream between 0°C and -5°C. Remember it must stay at this temperature from the time it leaves the factory to the end of the first day of the festival.

Ice-cream support cards

What are our criteria for success?

- The ice cream is still frozen when you get to the site.
- You can scoop the ice cream out of the containers easily.
- Nobody complains about the ice cream being runny or too hard.
- The ice cream stays cold all day - between 0°C and -5°C
- The ice cream always has its fruity taste

How can we keep the ice cream cold?

- Freeze some of the ice cream until it's far too hard the night before the Food Festival starts.
- Wrap the ice cream containers in a really good insulating material.
- Before the Food Fest test different materials to find which is the best insulator.
- Take lots of ice cubes to the Festival to pack round the ice cream.
- Make sure the ice cream is in a shady place.
- Have thick lids for the containers.
- Make sure lids are put back on the containers straight away when you sell an ice cream.

How can we keep track of our success?

- Have proper food thermometers to measure the temperature of the different containers.
- Monitor the temperature of the ice cream every hour.
- Regularly use a scoop to check how soft the ice cream is.
- Ask someone to walk round the site and ask people what they think of the ice cream.
- Make one person responsible for scooping out.
- Taste the ice cream regularly to see if it is OK!

Did you achieve what you wanted to?

- Which success criteria did we achieve?
- Are there any success criteria we only partly achieved?
- What went well?
- What could we improve on?
- What would we do differently next time?

GRASP it!

Write down a list of your 'criteria for success'.

How will you know if you have been successful?

Imagine what the final result will be - in detail.

Start here

What do you want to achieve?

Did you achieve what you wanted to?

How will you check if you have been successful in the end?

What have you learnt for next time?

Think about your options. Select the best and plan what needs to be done.

What different ways might there be to do it? Which is best?

How will you keep track of what you're doing?

Decide how or who will help you check your progress – how will you check if you are on track to being successful?

smart grid
Assessment *for* Learning

Roundhorn Reef

Thumbs Up
We were great at the task because...

Thumbs Sideways
We were good at the task because...

Thumbs Down
We were OK at the task because...

we organised and planned how to gather information by...

we broke a big question down into smaller questions, like...

we decided on what we needed to be do to answer the questions, e.g....

we explored different ways of communicating information, e.g....

we...

Next time we will...

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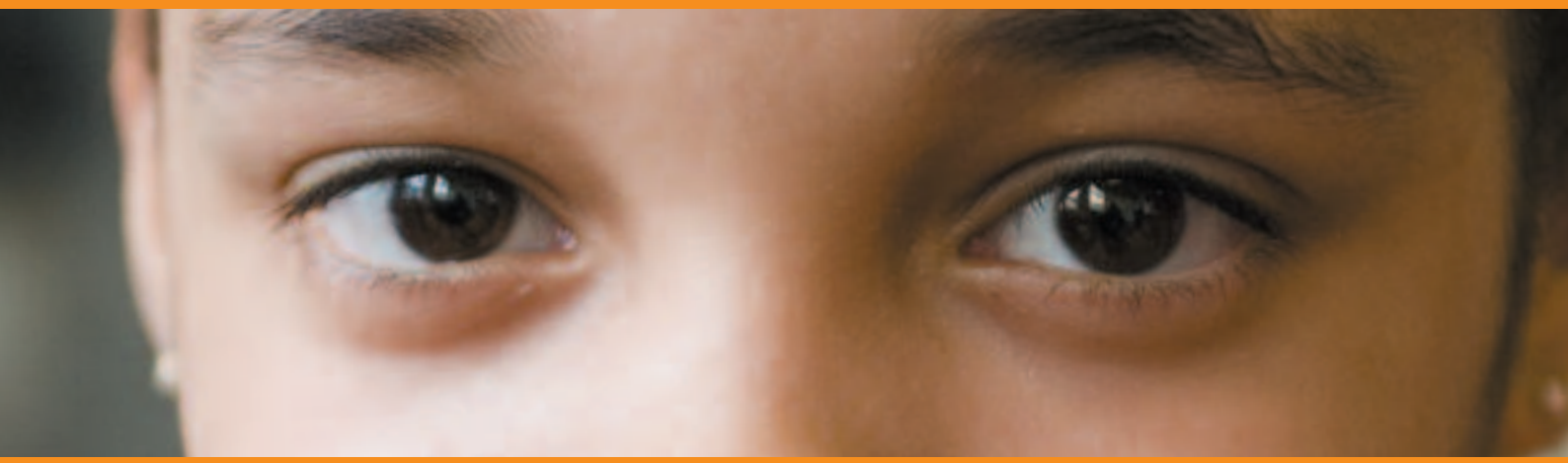


Roundhorn Reef

Self Management: to organise and plan how to go about a task

Investigative skills: to find answers to scientific questions

Activating Personal Capabilities in Science

Generic task

The big picture

30 minutes

Learning Objective

Self Management: to organise and plan how to go about a task

Introducing the task 5 minutes

Every day people give us jobs to do – 'Can you get me this…?' 'Can you do that for me?' 'Make sure you don't forget to…'.

How often do we really think about how we go about something? Being organised and planning how to go about some jobs can help us do them better and more quickly. Organising our time means we can do the jobs we need to and still have some time left over for having fun.

The Big Picture challenges children to work in a team to organise a job. Explain that the picture shows an image of a TV studio (but do not show them this until you start the task). The task is to redraw the picture as accurately as possible including as many features as possible. Only one child from the team is allowed to look at the page at a time. Every member of the team (except the recorder) will get a chance to see it. The teacher should keep time because there is a time limit!

Running the task 25 minutes

You need: the News Update Picture sheet, pencils, A3 paper, a stopwatch.

1 Organise the children into teams of four or five. Ask one child to volunteer to be the recorder. The recorder stays at the table and only the recorder is allowed to draw the information the other children bring back.

2 Tell the children to decide on the order in which the team members will go up to look at the picture. Call the first child from each team to go up to have a 45 second look at the picture placed on a separate table in the room, a little way away from the teams. When they come back to their team tell the children that they have one minute to tell the rest of the team and the recorder what is on the picture.

3 This is repeated until each member of the team has had a look.

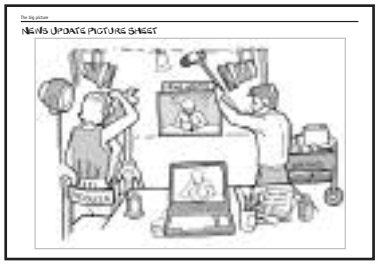
4 Each team then nominates someone to go up for the last time and look at the picture for 60 seconds.

5 The team then must finish their picture and choose two things that helped them work well together and one thing they could have done better. Emphasise successful approaches; these could be listed on the board for use with the embedded task.

Helpful Hints

Encourage the children to think carefully about who will do what. Who will go first? What will they look for? Who will go next? How will you be sure they don't just look at the same things? Encourage them to organise and plan their time so that they can reproduce the picture as best they can.

Resources



Science embedded task
Roundhorn Reef

1 hour

Learning Objectives

National Curriculum Sc1: 2a, 2h

Investigative Skills to decide how to find answers to scientific questions
to use a wide range of methods to communicate data

Success Criteria

To be successful the children will:

- organise and plan how to gather information
- break a task and/or questions down into smaller parts
- decide on what needs to be done
- explore different methods of communicating scientific information.

Introducing the task 10 minutes

Brainstorm the question, 'What helps us organise and plan a complicated task?' encouraging the children to think back to the generic task. Draw out elements that made them successful, such as: breaking a large task into smaller parts; deciding the order of the smaller tasks; dividing up the smaller tasks between the children in the team. Decide on success criteria for this task.

Running the task 40 minutes

1 Organise the children into teams of four or five.

2 Hand out or read out Sea Quest Divers, checking that children understand the task.

3 Tell the children that they will be gathering information from the Roundhorn Reef picture in the same way that they did in the generic task.

4 Allow five minutes for the teams to consider the approach(es) they may use to collect the information from the picture. Use the Roundhorn Reef Support Cards as appropriate.

5 Run the activity and later review how the teams organised and planned how they would go about it. Did they plan the way they would tackle the task before they started? Did they encounter any problems?

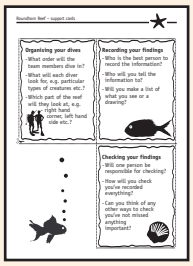
6 Now use the Roundhorn Reef picture to explore the 'big' scientific question 'Is pollution affecting the reef?'. Tell the children that tackling this question might be difficult and that it may be useful to organise their thinking using a thinking diagram. Explain that before they were organising each other, but now they are organising a piece of work.

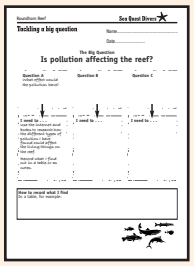
7 Use the partly completed thinking diagram to start exploring questions that could be asked to help find answers; the things that would need to happen to find out more; the ways that the answers could be recorded or displayed. Consider the order in which to tackle the smaller questions (a completed diagram is provided for support).

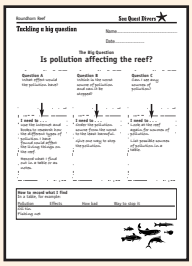
Reviewing the task 10 minutes

In their teams ask the children to review how well they feel they organised and planned and how useful they thought the thinking diagram was to organise a task? Did they think it was necessary to organise and plan at all? Was breaking down a big question and ordering the stages helpful, and why? Would they use this technique again or would they change it? Ask one member of each team to report back to the whole class. Involve the children in making an overall judgement about how well they organised and planned the task using the assessment for learning Smart Grid (see back cover).

Resources





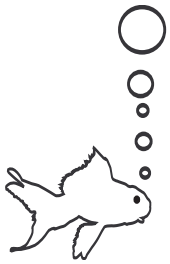


NEWS UPDATE PICTURE SHEET


UPDATE
DRINKS
Script

Sea Quest Divers

Sea Quest divers are a team of scientists working in the Indian Ocean.
They are exploring a newly discovered coral reef.
They are the first people to see this reef.



Imagine you are working with the Sea Quest team to make a complete scientific record of the reef. You only have enough air for each diver to spend 30 seconds looking at the reef. You will have to plan how to make the most of this time and work as a team to get this important job done.

Instructions

1 Briefly look at the reef picture and decide how you will organise and plan your dives. Think about the different ways you could record what you see. Decide how you will do it.

2 Each team member will now have 30 seconds to dive to the reef and observe it. Remember as much as you can!

3 When your dive is over tell the rest of the team what you saw on the reef so that it can be recorded.

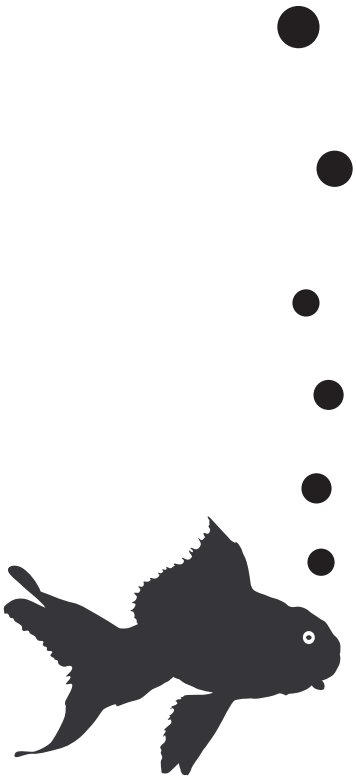
4 When you have all finished your dives, think about how well you:
- organised and planned the dive
- recorded your observations.

Organising your dives

- What order will the team members dive in?
- What will each diver look for, e.g. particular types of creatures etc.?
- Which part of the reef will they look at, e.g. right hand corner, left hand side etc.?

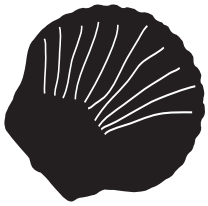
Recording your findings

- Who is the best person to record the information?
- Who will you tell the information to?
- Will you make a list of what you see or a drawing?

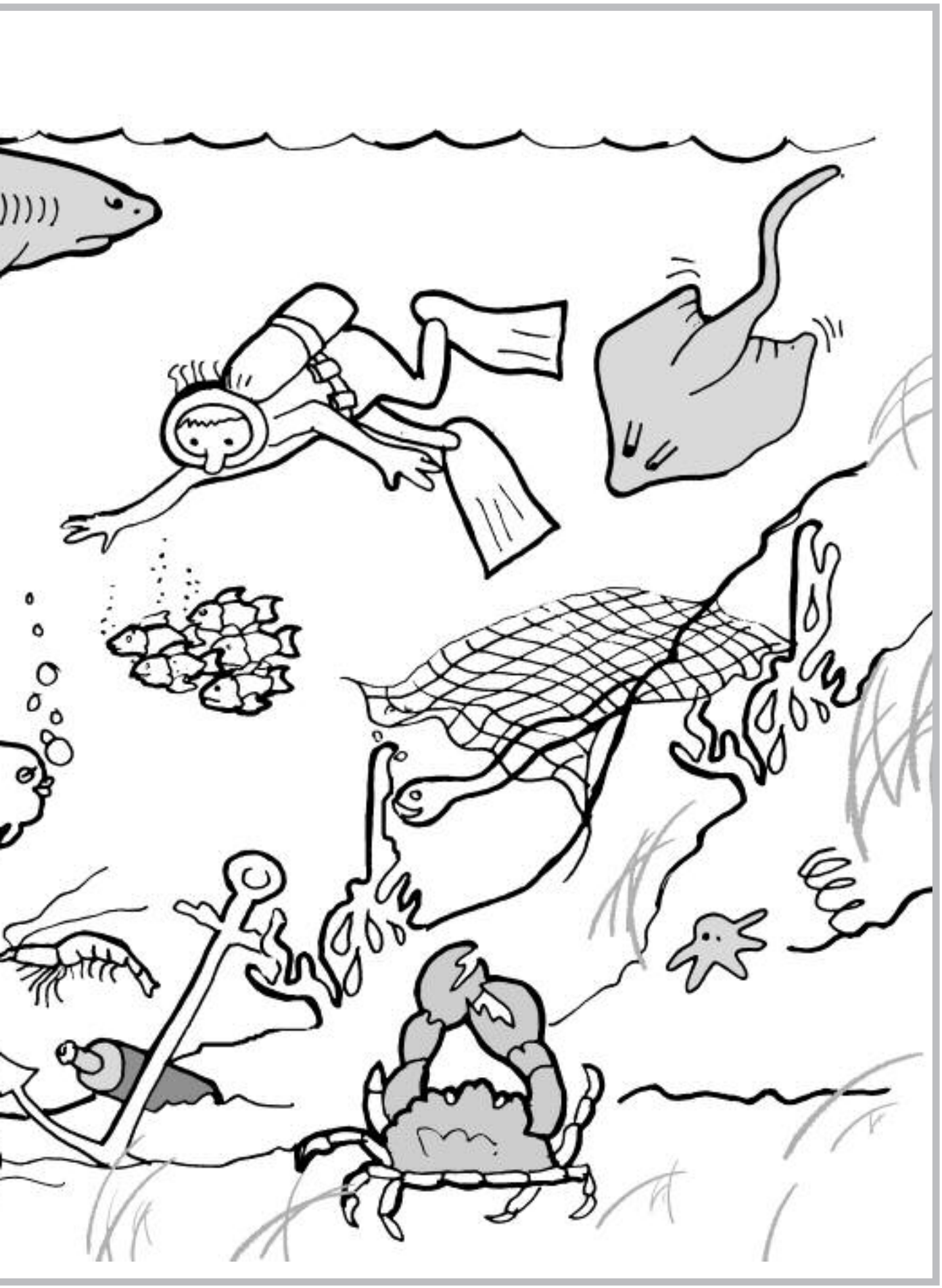


Checking your findings

- Will one person be responsible for checking?
- How will you check you've recorded everything?
- Can you think of any other ways to check you've not missed anything important?



This is the best picture of Roundhorn Reef we have been able to capture with our underwater camera.



Tackling a big question

Name.....

Date.....

The Big Question

Is pollution affecting the reef?

Question A
What effect would the pollution have?

I need to . . .
Use the internet and books to research how the different types of pollution I have found could affect the living things on the reef.

Record what I find out in a table or as notes.

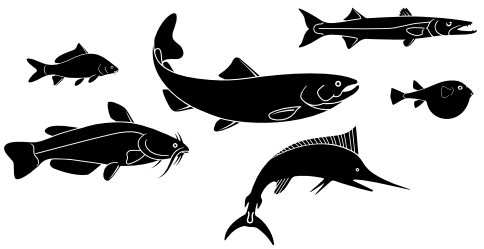
Question B

I need to . . .

Question C

I need to . . .

How to record what I find
In a table, for example:



Tackling a big question

Name.....

Date.....

The Big Question

Is pollution affecting the reef?

Question A
What effect would the pollution have?

I need to . . .
Use the internet and books to research how the different types of pollution I have found could affect the living things on the reef.

Record what I find out in a table or as notes.

Question B
Which is the worst source of pollution and can it be stopped?

I need to . . .
Order the pollution source from the worst to the least harmful.

Give one way to stop the pollution.

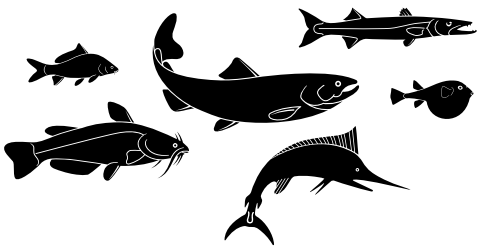
Question C
Can I see any sources of pollution?

I need to . . .
Look at the reef again for sources of pollution.

List possible sources of pollution in a table.

How to record what I find
In a table, for example:

Pollution	Effects	How bad	Way to stop it
Oil tin			
Fishing net			



smart grid
Assessment *for* Learning

Thumbs Up
We were great at the task because...

Thumbs Sideways
We were good at the task because...

Thumbs Down
We were OK at the task because...

we overcame our frustration by...

we persevered and concentrated on the job by...

we modified our plans to overcome hitches, e.g....

we modelled how the bacteria multiplied by...

we were able to give examples of factors that may speed up or slow down the multiplication process e.g....

we...

Next time we will...

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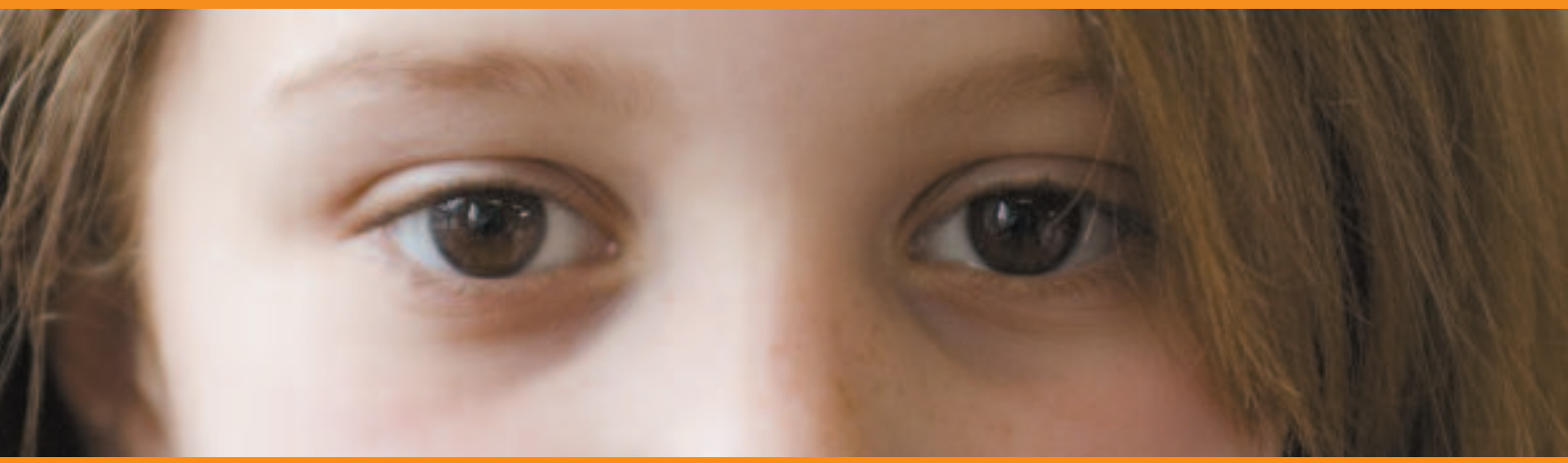


Bacteria and Custard

Self Management: to avoid giving up easily

Investigative skills: to think creatively to explain how living things work

Activating Personal Capabilities in Science

Generic task

Topple Towers

30 minutes

Learning Objective

Self Management: to avoid giving up easily

Introducing the task 5 minutes

Explain that it's easy to get fed up or frustrated when things are difficult. We can feel annoyed, irritated and bothered. Topple Towers challenges us to persevere and work through our frustrations on our own or with other people to help us. Lots of things in life make us want to give up, but to be successful we must overcome difficult feelings. Be prepared for it to challenge your patience!

Running the task 25 minutes

You need: a pack of cards, a clock.

1 Organise the children into teams of three or four.

2 Give each team a pack of cards and ask them to build a card tower. Tell them they have 5 minutes to experiment with the best way to build it.

3 After the first 5 minutes of experimenting, ask the children how they are feeling - whether they are frustrated, confident, excited, anxious etc. Ask them what they will need to do to be successful. Drawing on their comments, reinforce that they should:

- avoid giving up easily
- persevere if things don't go to plan
- try alternative methods
- concentrate and focus on the strategies that work
- plan how to go about it
- ask for help if they really need it
- work through frustrations.

4 Now, challenge them to build the largest and most elaborate card tower that they can in 10 minutes.

Helpful Hints

It's easier to build card towers with new cards rather than older ones!

Science embedded task
Bacteria and Custard

1 hour

Learning Objectives

National Curriculum Sc1: 1a, Sc2: 5f

Ideas & Evidence to think creatively to explain how living things work

Life processes to be aware that micro-organisms are living organisms that are often too small to be seen and may be beneficial or harmful

Equipment

- a container e.g. a Petri dish or empty margarine tub
- dried pasta e.g. small macaroni or pasta shells or rice crispies
- felt tip pens

Success Criteria

To be successful the children will:

- overcome frustration by persevering and concentrating on the job
- modify their plans to overcome hitches or difficulties
- model the process of how micro-organisms multiply
- give examples of factors that may speed up or slow down the multiplication of micro-organisms.

Introducing the task 15 minutes

Remind the children what micro-organisms are and discuss some examples. Discuss some of the problems caused by micro-organisms, e.g. some illnesses, and some benefits, e.g. yeast in bread making and bacteria in yoghurt. Introduce the idea that, like other living things, micro-organisms can reproduce. They usually do this by splitting into two to make a copy of themselves.

Explain that in this task the children are going to show how quickly the number of micro-organisms can rise. To do this they will need to persevere and avoid giving up easily; they may need to change their plans as they go along to overcome any difficulties they encounter. Discuss briefly how they avoided giving up easily in the generic task.

Running the task 30 minutes (plus time needed for collecting results)

1 Organise the children into teams of three or four.

2 Give each team a Splat Chart and the equipment listed above.

3 Read aloud Bacteria and Custard.

4 Tell the teams to allow their bacteria to build up over 4 minutes (this will model the multiplication over 4 hours in real time). Make sure they have all got the correct number of bacteria in their splats.

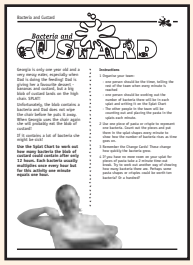
Time (hrs)	Bacteria
0	1
1	2
2	4
3	8
4	16

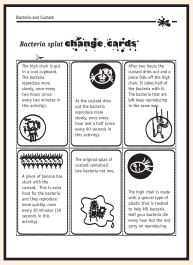
5 Then give out a Bacteria Splat Change Card to each team. Tell them to continue the experiment whilst taking into account the new rules on their Change Card. Ask them now to continue the activity for another 8 minutes (so that they have worked out the multiplication of bacteria for a whole 12 hour period in total).

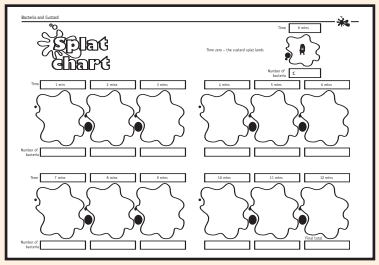
Reviewing the task 15 minutes

Ask the teams to describe how their bacteria built up on their Splat Charts. Discuss some of the strategies they used to avoid giving up easily. Identify the factors that slowed down and sped up bacterial growth and explain the implications for hygiene and food safety. Involve the children in making an overall judgement about how well they avoided giving up easily using the assessment for learning Smart Grid (see back cover).

Resources







Bacteria and CUSTARD

Georgia is only one year old and a very messy eater, especially when Dad is doing the feeding! Dad is giving her a favourite dessert - bananas and custard, but a big blob of custard lands on the high chair. SPLAT!

Unfortunately, the blob contains a bacteria and Dad does not wipe the chair before he puts it away. When Georgia uses the chair again she will probably eat the blob of custard!

If it contains a lot of bacteria she might be sick!

Use the Splat Chart to work out how many bacteria the blob of custard could contain after only 12 hours. Each bacteria usually multiplies once every hour but for this activity one minute equals one hour.

Instructions

1 Organise your team:
   - one person should be the timer, telling the rest of the team when every minute is reached
   - one person should be working out the number of bacteria there will be in each splat and writing it on the Splat Chart
   - The other people in the team will be counting out and placing the pasta in the splats each minute.

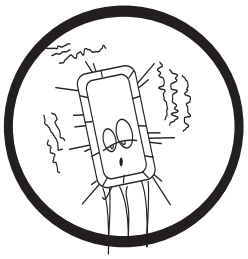
2 Use one piece of pasta or crispie to represent one bacteria. Count out the pieces and put them in the splat shapes every minute to show how the number of bacteria rises as time goes on.

3 Remember the Change Cards! These change how quickly the bacteria grow.

4 If you have no more room on your splat for pieces of pasta take a 2 minute time-out break. Try to work out another way of showing how many bacteria there are. Perhaps some pasta shapes or crispies could be worth ten bacteria? Or a hundred?

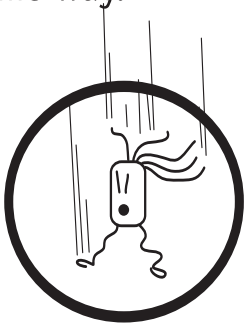
Bacteria splat change cards

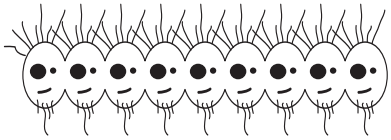
The high chair is put in a cool cupboard. The bacteria reproduce more slowly, once every two hours (once every two minutes in this activity).



As the custard dries out the bacteria reproduce more slowly, once every hour and a half (once every 90 seconds in this activity).

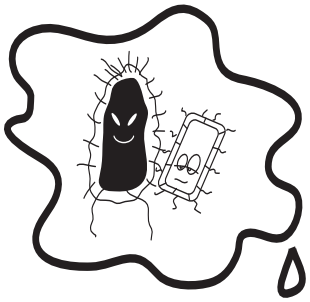
After two hours the custard dries out and a piece falls off the high chair. It takes half of the bacteria with it. The bacteria that are left keep reproducing in the same way.





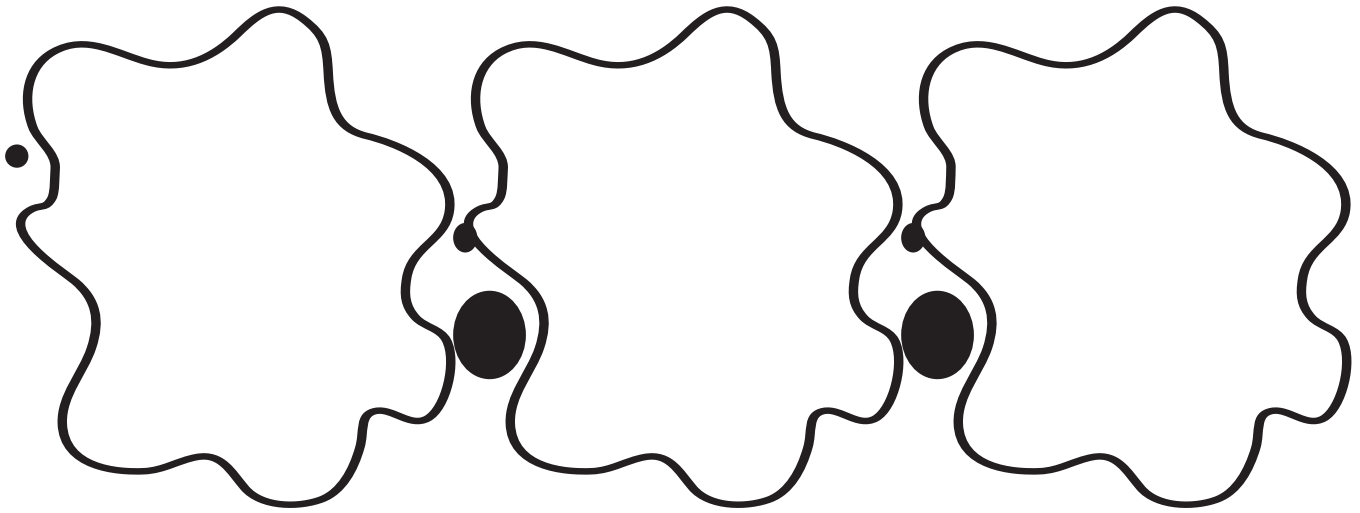
A piece of banana has stuck with the custard. This is extra food for the bacteria and they reproduce more quickly, once every 30 minutes (30 seconds in this activity).

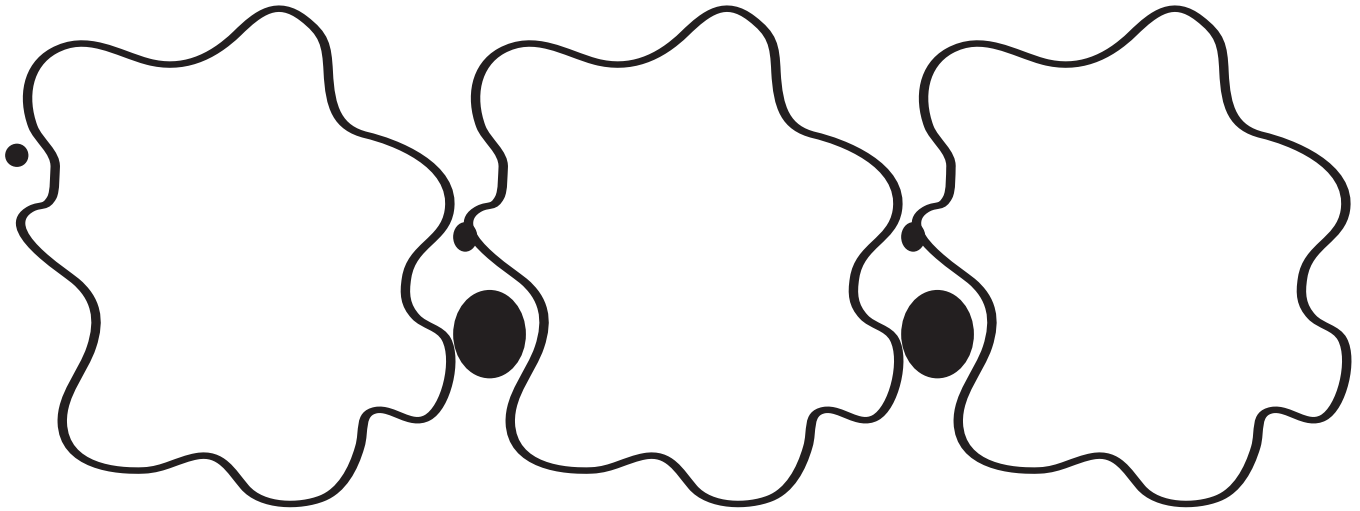
The original splat of custard contained two bacteria not one.



The high chair is made with a special type of plastic that is treated to help kill bacteria. Half your bacteria die every hour but the rest carry on reproducing.

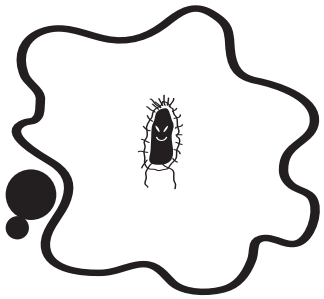
Splat chart

Time	1 min	2 mins	3 mins
			
Number of bacteria			

Time	7 mins	8 mins	9 mins
			
Number of bacteria			

Time | 0 mins

Time zero – the custard splat lands



Number of bacteria | 1

4 mins	5 mins	6 mins

10 mins	11 mins	12 mins

Final total

Communication

smart science

to ask different types of questions

Communication

smart science

to share

ideas, opinions and feelings with others

Communication

smart science

to **justify** opinions

Communication

smart science

to show

ideas and information

in different ways

smart grid
Assessment *for* Learning

Quick on the Draw

Thumbs Up
We were great at the task because...

Thumbs Sideways
We were good at the task because...

Thumbs Down
We were OK at the task because...

we thought about why people might have different ideas, opinions and feelings, some reasons were...

we shared our own ideas, opinions and feelings on different issues such as...

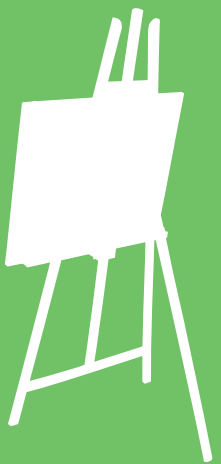
we presented a range of ideas by...

we explored how scientific developments improve everyday life, e.g....

we made links between scientific developments and other effects they have e.g....

we...

Next time we will...



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Quick on the Draw

Communication: to ask different types of questions

Investigative skills: to use a wide range of methods to communicate data

Activating Personal Capabilities in Science

Generic task

Electric Headband Game

25 minutes

Learning Objective

Communication: to ask different types of questions

Introducing the task 10 minutes

Effective communication often relies on good questions. Different types of questions help us to obtain information, explore our thinking, check we understand, reflect on what is happening and so on. This game involves us asking questions of different types, e.g. closed and open questions to identify objects or items related to the science topic – electricity and circuits.

A closed question is one that provides a straight forward answer, e.g. What is your name? Answer: John. Are you a boy? Answer: yes

An open question is one that provides answers which show more thinking, e.g. What do you think about this? How did you do that?

In both cases, questioning is not a one-way process. Listening to answers and asking your own questions in response can further clarify meaning.

Running the task 15 minutes

You need: thin card for a headband for each child, a group of friends.

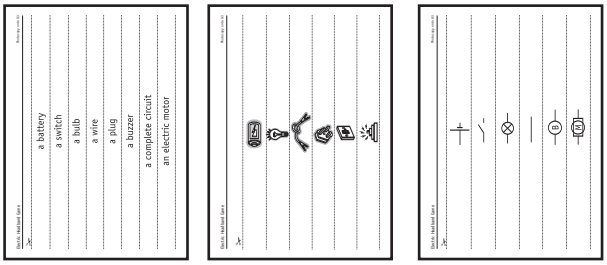
1. Ask the whole class to sit in a circle.
2. Give each child a headband with the word, picture or symbol facing outward so that they cannot see it.
3. One child stands up and asks a closed question to the child sitting to their right e.g. 'Am I part of a circuit?', 'Do I produce electricity?'. Questions can only be answered with 'Yes', 'No', or 'I don't know'. Once a question has been asked and answered another child has their turn.
4. The questioning and answering passes around the circle until the children can identify the items on their headbands.
5. Early finishers can take a spare headband to rejoin the game.

Helpful Hints

Allow the children to practice in pairs before the main game starts. Give support in framing closed questions that require 'yes', 'no' or 'I don't know' answers.

This game could be used in non-scientific contexts, e.g. famous people, places etc.

Resources



Science embedded task
Quick on the Draw

1 hour

Learning Objectives

National Curriculum Sc1: 2h. Breadth of Study: Communication 2a

Science Investigative skills to use a wide range of methods to communicate data
to use appropriate scientific language to communicate ideas and explain things

Success Criteria

To be successful the children will:

- ask questions to clarify and make sense of what they have heard
- use different types of questions
- draw and label scientific diagrams
- use scientific vocabulary.

Introducing the task 15 minutes

Remind the children about the Electric Headband game and mention the types of questions they used (open and closed). Discuss other types of questions that are useful, e.g.

Questions that ask people to explain their reasoning:
…Why do you think that…?

Questions which encourage people to think about what's happened:
…What do you think about what's been said so far?

Questions to find out how things were done:
…How did you do that?

It may be useful to display different question types on the board.

Explain that in this game the children will be communicating verbally, but with no restrictions on the types of questions or answers. The aim is to work with a partner to produce science diagrams that are detailed and accurate.

Running the task 30 minutes

1 Organise the children into pairs.

2 Distribute Quick on the Draw Diagram Cards, one to each child ensuring that they do not show their cards to their partner and that they do not have the same card as their partner.

3 Ask the children with the same symbol on their cards to get together for 5-10 minutes, with a support assistant or teacher, to discuss what they think the diagram should look like and contain. They should draw their diagram together before rejoining their partner (use Quick on the Draw Support Cards as appropriate).

4 Each pair should then sit back to back making sure that their partner doesn't see the diagram they have sketched.

5 One child in each pair should then ask questions of the other to find out what they should be drawing. They could ask about the shapes or objects that are in the diagram, the size or shape, the colours in the diagram, whether it is labelled or not etc. The pair can ask as many questions as they like but must not show each other their diagrams or say exactly what the diagram shows by name.

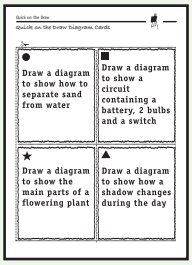
6 When they think they have finished, the drawer should guess what the diagram is showing and compare it with the original and the standard diagram. How similar are they?

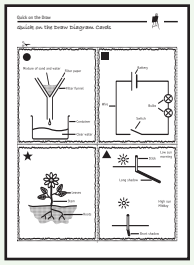
Reviewing the task 15 minutes

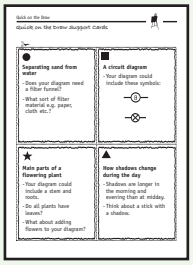
As a whole class discuss and review the meaning of the science diagrams using the standard set. Reinforce relevant scientific language. Review how important it was to ask different types of questions to help us find out about different things. Ask the children to give examples of questions they asked and the types of answers they stimulated. If appropriate, add to the question list that was previously created, focusing on key question words and what they help us find out. A support poster is provided called 'Thinking outside the box'.

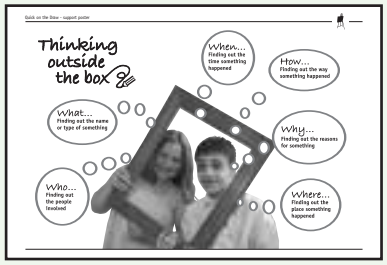
Involve the children in making an overall judgement about how well they worked at asking different types of questions using the assessment for learning Smart Grid (see back cover).

Resources









a battery

a switch

a bulb

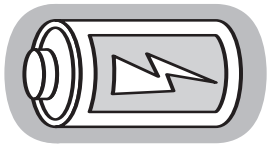
a wire

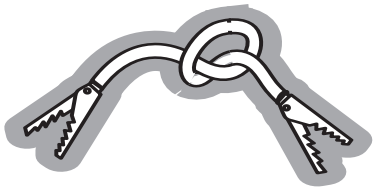
a plug

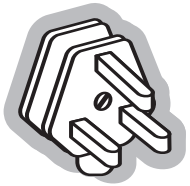
a buzzer

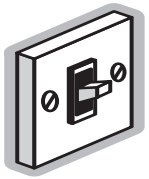
a complete circuit

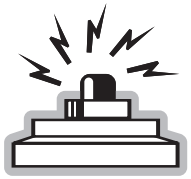
an electric motor












B


M

Quick on the Draw Diagram Cards

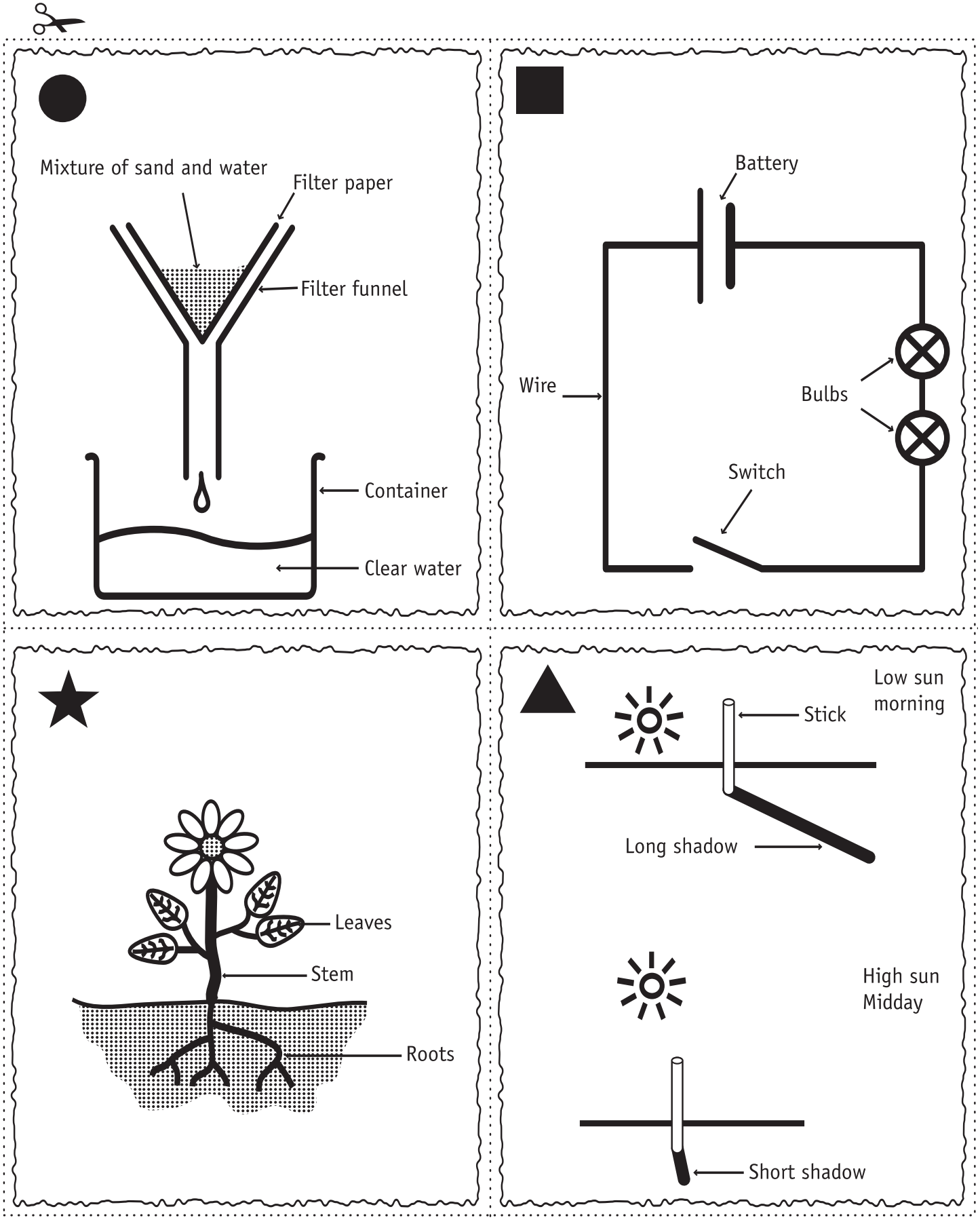
Draw a diagram to show how to separate sand from water

Draw a diagram to show a circuit containing a battery, 2 bulbs and a switch

Draw a diagram to show the main parts of a flowering plant

Draw a diagram to show how a shadow changes during the day

Quick on the Draw Diagram Cards



Quick on the Draw Support Cards

●

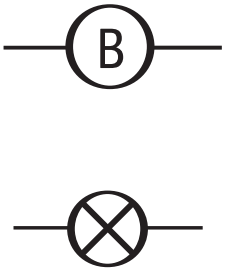
Separating sand from water

- Does your diagram need a filter funnel?
- What sort of filter material e.g. paper, cloth etc.?

■

A circuit diagram

- Your diagram could include these symbols:



★

Main parts of a flowering plant

- Your diagram could include a stem and roots.
- Do all plants have leaves?
- What about adding flowers to your diagram?

▲

How shadows change during the day

- Shadows are longer in the morning and evening than at midday.
- Think about a stick with a shadow.

Thinking outside the box

What...
Finding out the name or type of something

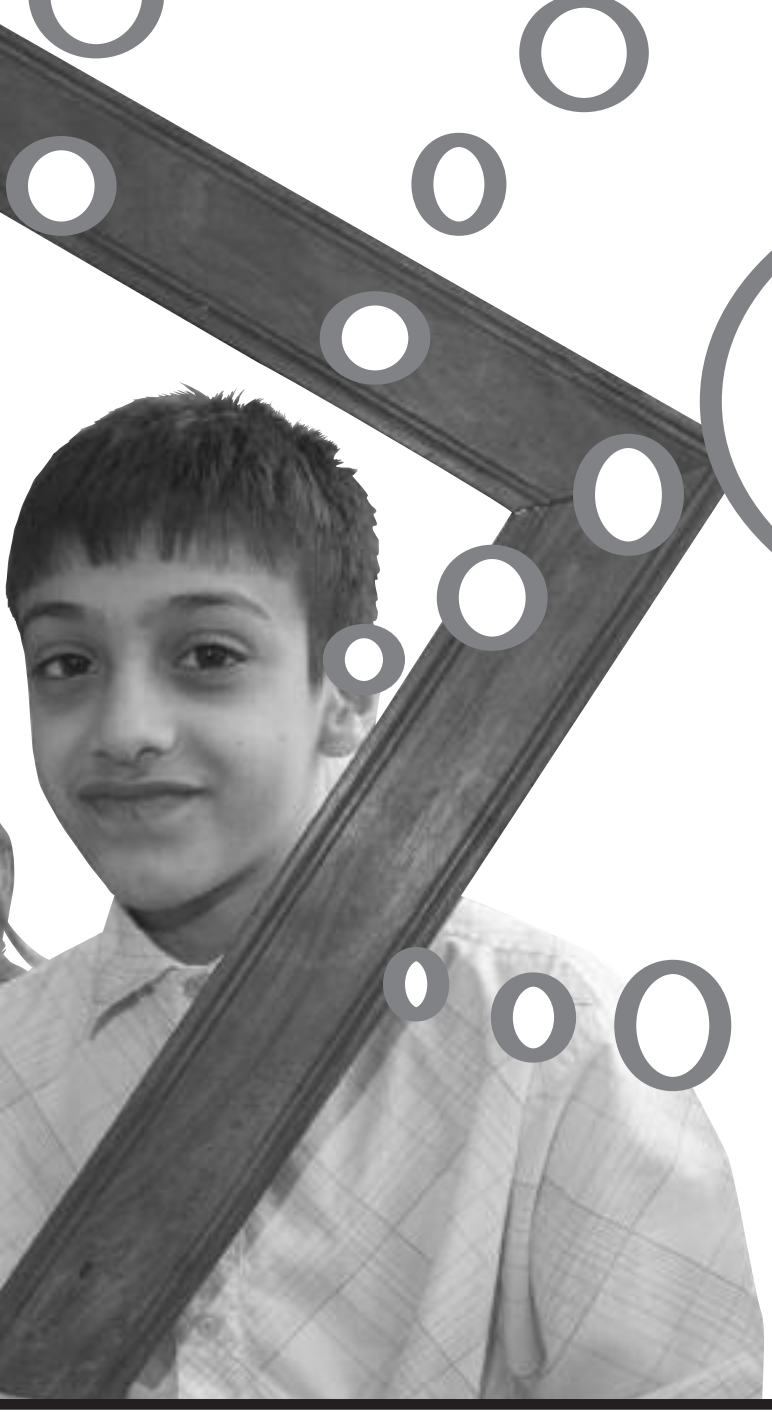
Who...
Finding out the people involved

When...

Finding out the time something happened

How...

Finding out the way something happened



Why...

Finding out the reasons for something

Where...

Finding out the place something happened

smart grid
Assessment *for* Learning

Thumbs Up
We were great at the task because...

Thumbs Sideways
We were good at the task because...

Thumbs Down
We were OK at the task because...

we thought about why people might have different ideas, opinions and feelings, some reasons were...

we shared our own ideas, opinions and feelings on different issues such as...

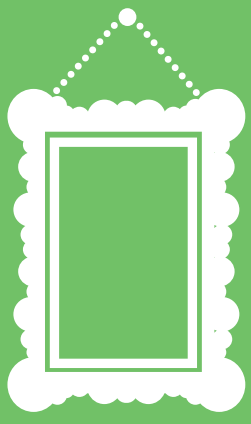
we presented a range of ideas by...

we explored how scientific developments improve everyday life, e.g....

we made links between scientific developments and other effects they have e.g....

we...

Next time we will...



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Picture Power

Communication: to share ideas, opinions and feelings with others

Investigative skills: to establish links between cause and effects

Activating Personal Capabilities in Science

Generic task

Chatterbox!

20 minutes

Learning Objective

Communication: to share ideas, opinions and feelings with others

Introducing the task 5 minutes

Say to the group that everyone knows a chatterbox and everyone knows what they're like. They talk and talk and talk! Unfortunately, that means that they don't always get their jobs done properly and often stop other people doing theirs. All they manage to do is chatter, chatter, chatter.

Ask the children – Do you know people who tell you to stop talking and get on with your work? This task is about doing just the opposite! This time we're all going to see how it feels to be a chatterbox – it may be harder than you think!

Running the task 15 minutes

You need: a stopwatch, a partner, to sit in a small group.

Optional: the storybook (Little Miss Chatterbox Book, ISBN: 0-7498-3865-5).

1 Organise the children into teams of three or four. Ask them to decide who will take the first turn.

2 Tell them that they must speak for 30 seconds about one of the topics below. But, they're not allowed to say 'umm…' or 'err…' or take a break for more than a second, otherwise their go passes to the person to their right.

3 The rest of the team have to listen carefully, making sure they really are a 'chatterbox'! If they manage to get to the end, they call out 'Chatterbox!' but they should call 'Stop!' or make a signal if they hear an 'umm', 'err' or a pause.

Topics to chatter about:

If you want it to be general…	If you want it to be science-linked…
- yourself	- plants
- your family	- minibeasts
- your school	- food types
- what you like	- materials and the way we use them
- what you don't like	- things that live in the garden
- what's in the news	- what we need light for
- what you ate last night	- why we need to eat
- just about anything at all!	- things that make sound

Helpful Hints

Increase or decrease the time depending on the level of challenge and age of the group. You could use prompt cards with keywords or phrases to help the group choose what to talk about. Don't let anyone spend too long thinking about what they will talk about – this should be a quick fire game.

Science embedded task
Picture Power

1 hour

Learning Objectives

National Curriculum Breadth of Study: 1b, Sc1: 1a

Scientific communication to look at the part science has played in the development of many useful things to think about and establish links between causes and effects

Success Criteria

To be successful the children will:

- consider why people's ideas, opinions and feelings can be different
- share and present their own ideas, opinions and feelings on different issues
- explore how scientific developments have positively affected everyday life
- make links between scientific developments and other effects.

Introducing the task 10 minutes

Discuss with the children that different people often have different ideas, opinions and feelings about the same situation. Emphasise that the way people communicate can also be very different (relate this back to the generic task). Briefly discuss an example, for instance views on siting of mobile phone masts or whether we should experiment on animals. Tell the children that they are going to look at situations where people might think and feel differently and where scientific understanding and ideas could affect what people think.

Running the task 25 minutes (plus time for presentations)

1 Read aloud or give out the Picture Power sheet and situations illustrations sheets. Set a time limit of 20 minutes. Use the Picture Power Support cards and the Picture Power Science Ideas cards, as appropriate, to help this process.

It may help to discuss the science ideas linked to each picture with the teams or whole class before they start to plan their presentations.

2 Ask each team in turn to give their presentation including their 2 minute 'mini play'.

Reviewing the task 10 minutes

After the presentations, the class should discuss:

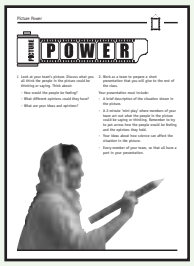
How well did the teams communicate the different ideas, opinions and feelings of the characters?

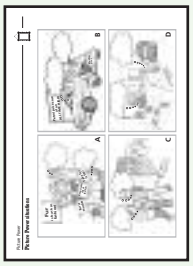
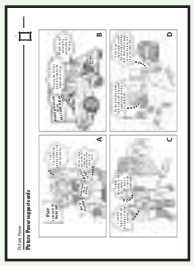
What their own opinions and feelings are on the issues discussed?

Discuss with the children some of the ways in which scientific developments affect each situation. Extend the work by asking if the children think that in future science could help to improve each situation?

Involve the children in reviewing their work and making an overall judgement about how well they shared their ideas, opinions and feelings. Use the assessment for learning Smart Grid (see back cover).

Resources




PICTURE POWER

1 Look at your team's picture. Discuss what you all think the people in the picture could be thinking or saying. Think about:

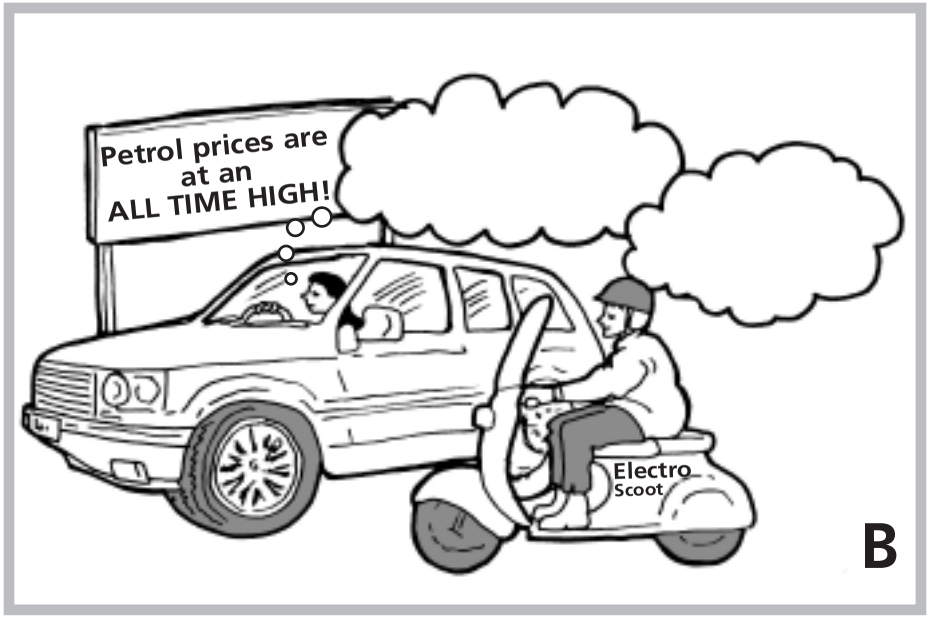
- How would the people be feeling?
- What different opinions could they have?
- What are your ideas and opinions?

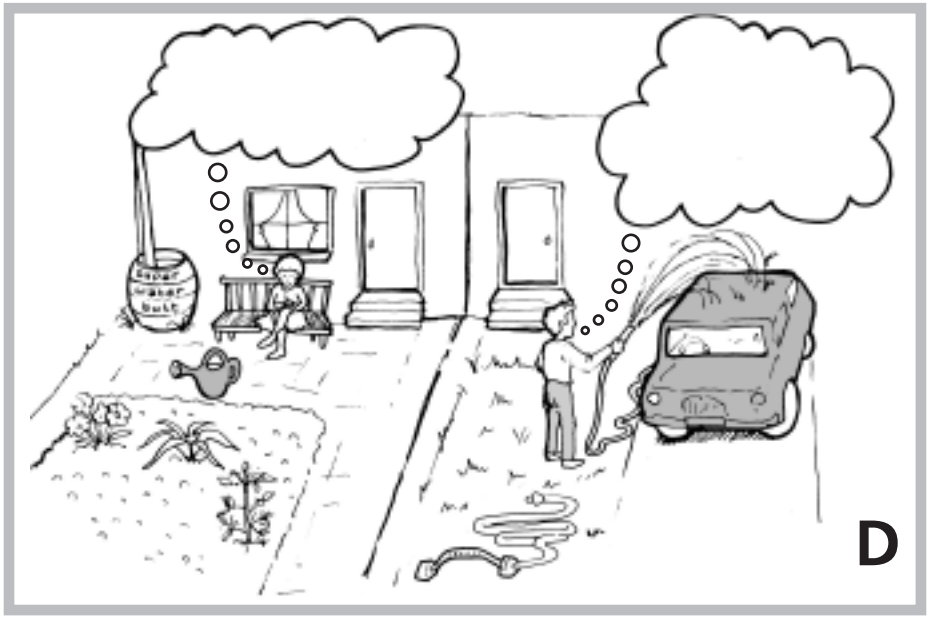
2. Work as a team to prepare a short presentation that you will give to the rest of the class.

Your presentation must include:

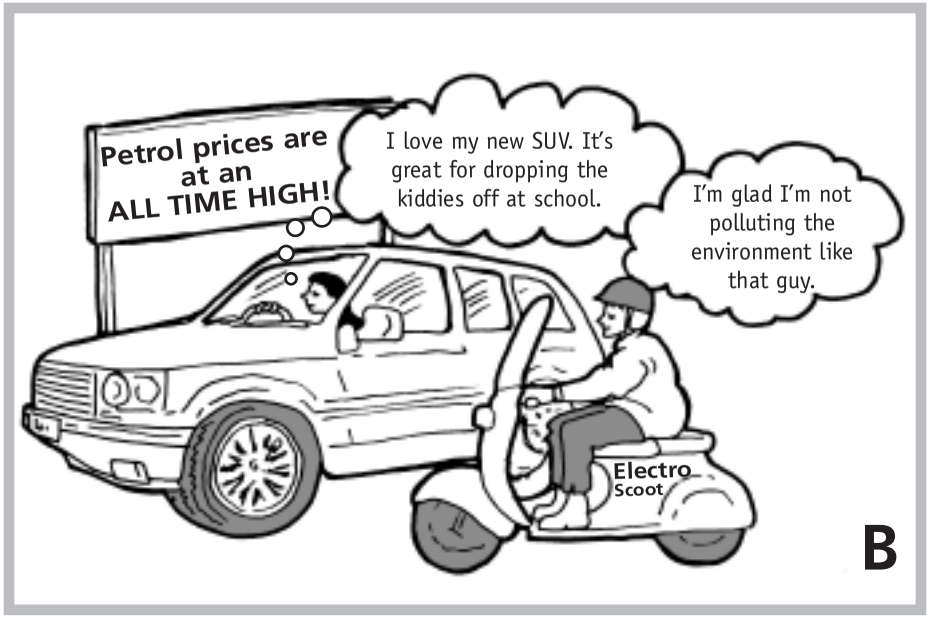
- A brief description of the situation shown in the picture.
- A 2-minute 'mini-play' where members of your team act out what the people in the picture could be saying or thinking. Remember to try to put across how the people would be feeling and the opinions they hold.
- Your ideas about how science can affect the situation in the picture.
- Every member of your team, so that all have a part in your presentation.

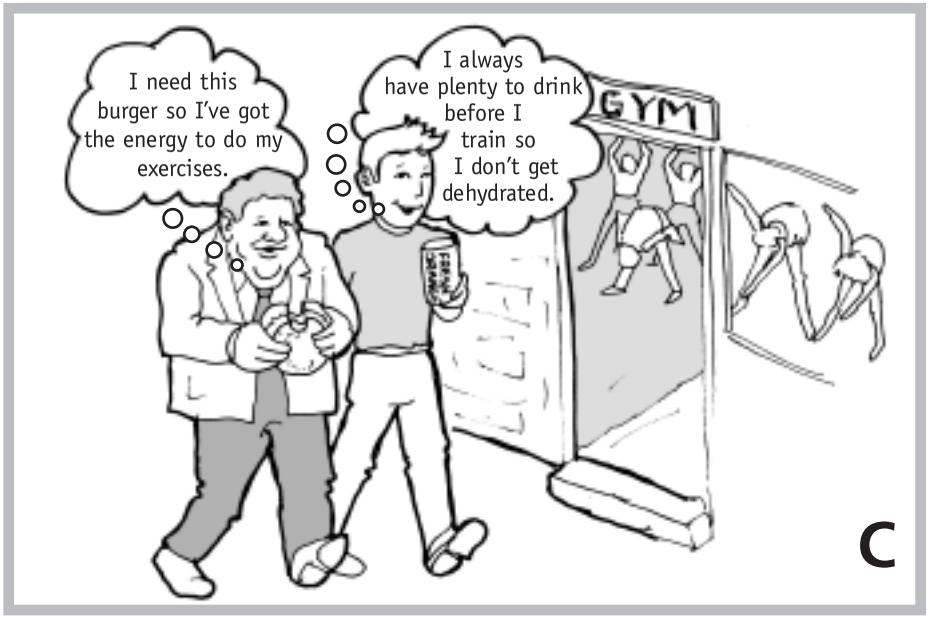
Picture Power situations

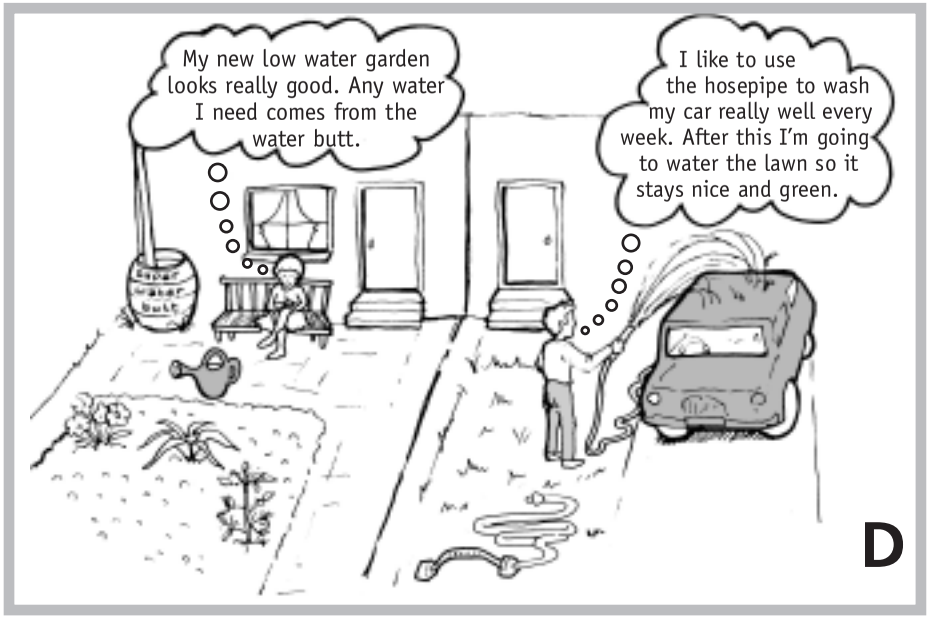




Picture Power support cards







Picture Power science ideas cards

Picture A

- Wildlife conservation is affected if animals are hunted for fur.
- Synthetic materials can be used to make fake fur that looks like the real thing.
- Animals bred for food can be used to make fur coats. Is this OK?

Picture B

- Driving children to school is unhealthy, they might be better off walking.
- Big 4x4 cars use a lot more fuel than ordinary cars, this increases air pollution.
- Electric vehicles may be developed in the future to replace petrol-driven vehicles.

Picture C

- People sweat when they exercise so this liquid needs to be replaced.
- To exercise we need energy from food but it can be unhealthy to take in too much fat.
- A balanced diet and exercise are both important for health.

Picture D

- Climate change may affect the water cycle.
- Rain water can be collected from rooves and used to water gardens and wash cars.
- Plants from dry climates need less water than lawns and flowers.

Thumbs Up
We were great at the task because...

Thumbs Sideways
We were good at the task because...

Thumbs Down
We were OK at the task because...

we described and explained what we thought about different inventions, e.g....

we explained our thinking, e.g....

we explored and discussed different inventions, for instance...

we explained how inventions worked using science, e.g....

we persuaded other people by...

we...

Next time we will...

smart science

Smart Scientific Inventions

Communication: to justify opinions

Investigative skills: to use scientific language to communicate ideas

Activating Personal Capabilities in Science

Generic task
But why?

20 minutes

Learning Objective
Communication: to justify opinions

Introducing the task 5 minutes

Explain to the group that having ideas or opinions about things is great, but being able to say why you think so helps even more. It helps us persuade or convince other people by letting them understand our thinking. 'But why?' is often a question we ask other people so that we understand them better, but how often do we really ask it of ourselves?

There are many questions that we rarely ask 'why' about, for example 'Why is chocolate so tasty?' or 'Why do we have friends?'. This task encourages us to ask 'But why?' to things we've not really thought about much before.

Running the task 15 minutes

You need: a partner or group of friends.

1 Organise the children into teams of four.

2 In teams, encourage the children to ask each other intriguing questions. Use the But why? sheet as a stimulus. Emphasise that they should always ask 'why?' after each answer they receive, until they can suggest no more answers.

3 Make up reasonable sounding answers or research the question by asking other people, looking in books etc.

Helpful Hints

A But why? poster is provided for stimulus. If necessary run through an example for the class, such as:

Why do we have friends?
…because we like to talk to other people and have things in common.

Why do we like to talk to other people?
…because it helps us share our feelings and thoughts, and helps us learn.

Why do we need to learn anything anyway?
…because it helps us become more clever about things so that we can get a job and be proud of ourselves.

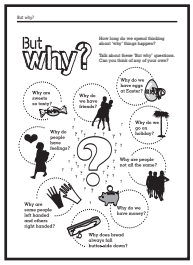
Why do we need to get a job?
…because we can't always live with our mums and dads, we have to be responsible and stand on our own two feet.

Why do we stand on two feet?
…because that's how many feet we have and we'd fall over if we only stood on one!

Encourage the children to come up with their own questions, or use the following suggestions to start things off.

If you want it to be general…	If you want it to be science-linked...
Why does bread always fall butter-side down?	Why does an apple a day keep the doctor away?
Why do we have friends?	Why are plants green?
Why do people have feelings?	Why are there more bees in summer?
Why are some people left handed and others right handed?	Why does the sun rise and set?
Why are sweets so tasty?	Why don't you get insects the size of elephants?
Why do we have eggs at Easter?	Why do I get thirsty and need water to drink?
	Why do we only see stars at night?

Resources



Science embedded task

Smart Scientific Inventions

1hour 30 mins

Learning Objective

National Curriculum Breadth of Study: 2a

Scientific communication to use appropriate scientific language to communicate ideas about living things, materials, phenomena and processes

Equipment

Information books, access to the internet would also be useful

Success Criteria

To be successful the children will:

- describe and explain what they think and why they think it
- persuade others by supporting opinions with information
- explore and discuss a variety of everyday inventions
- give simple scientific explanations, using appropriate scientific language, for how everyday inventions work.

Introducing the task 15 minutes

Involve the children in a discussion about the types of everyday objects that are scientific inventions, e.g. mobile phones, radios, televisions, fridges, computers etc. Explain that not all inventions are complex and even simple scientific inventions can be very important to people's lives, e.g. matches. Children would be interested to know that in the early 1900s workers making matches, mainly women, were poisoned by the chemicals they used. Their employer was taken to court and prosecuted for poisoning the workers – the first time this ever happened!

Brainstorm other examples and ask the children to talk with a partner to decide which of the suggestions they think was most important. If needed give them the examples of mobile phones and asthma inhalers to decide upon.

In deciding on their choice they could consider:

- How has this invention affected people's lives today?
- How would this invention have affected people if it was developed 100 years ago?
- Is the invention important for lots of different people, or just a few?
- Does the invention have any dangers?
- What would people use if this invention didn't exist?

Ask volunteers to explain their choice and allow them to give a simple justification for their opinions. Gather all the class's opinions in a class vote.

Running the task 1 hour

1 Divide the class into six teams.

2 Read aloud or hand out Smart Inventions.

3 Tell the children that each team must prepare an information poster to present their thinking on how the invention works and why it is important to us. They must justify their thoughts and opinions using scientific knowledge and by considering the pros and cons. Use Invention Uses and Invention Dangers Support Cards as appropriate.

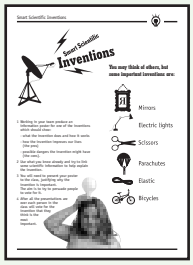
4 When the posters are complete give each team time to make their presentation and answer questions (2 to 5 minutes is suggested).

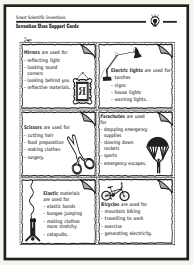
5 Ask the children to consider if the invention is as important for different groups of people, e.g. the elderly, babies and toddlers, men or women etc., and then to vote for the invention they consider is the most important in their lives.

Reviewing the task 15 minutes

Discuss some of the ways and reasons they used to justify their opinions and how they tried to persuade people to vote for their inventions. Which reasons were effective and why? Involve the children in reviewing their work and making an overall judgement about how well they communicated and justified their opinions. Use the assessment for learning Smart Grid (see back cover).

Resources





But why?

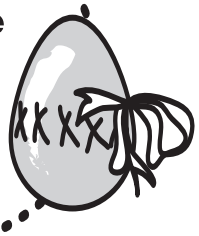
How long do we spend thinking about 'why' things happen?

Talk about these 'But why' questions. Can you think of any of your own?

Why are sweets so tasty?

Why do we have friends?

Why do we have eggs at Easter?



Why do we go on holiday?

Why do people have feelings?

Why are people not all the same?

Why are some people left handed and others right handed?

Why do we have money?

Why does bread always fall butter-side down?

Smart Scientific Inventions

You may think of others, but some important inventions are:

Mirrors

Electric lights

Scissors

Parachutes

Elastic

Bicycles

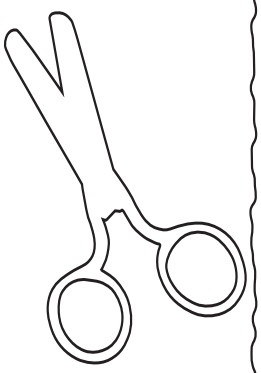
1 Working in your team produce an information poster for one of the inventions which should show:
   - what the invention does and how it works
   - how the invention improves our lives (the pros)
   - possible dangers the invention might have (the cons).
2 Use what you know already and try to link some scientific information to help explain the invention.
3 You will need to present your poster to the class, justifying why the invention is important. The aim is to try to persuade people to vote for it.
4 After all the presentations are over each person in the class will vote for the invention that they think is the most important.

Invention Uses Support Cards

Mirrors are used for
- reflecting light
- looking round corners
- looking behind you
- reflective materials.

Electric lights are used for
- torches
- signs
- house lights
- warning lights.

Scissors are used for
- cutting hair
- food preparation
- making clothes
- surgery.



Parachutes are used for
- dropping emergency supplies
- slowing down rockets
- sports
- emergency escapes.

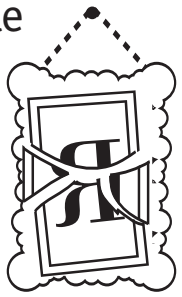
Elastic materials are used for
- elastic bands
- bungee jumping
- making clothes more stretchy
- catapults.

Bicycles are used for
- mountain biking
- travelling to work
- exercise
- generating electricity.

Invention Dangers Support Cards

Be careful with **mirrors** because

- the glass might break
- the light could dazzle people
- you might not want to see what you look like!

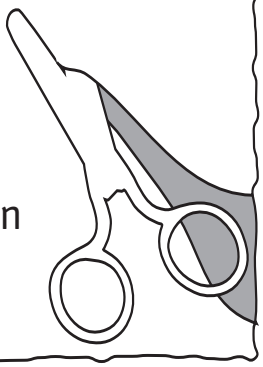


Electric lights

- can get very hot
- some need mains electricity which can kill
- bulbs break to give sharp glass fragments.

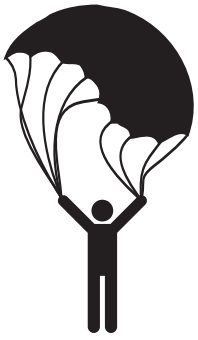
Handle **scissors** with care because

- you could cut yourself
- if you cut fabrics in the wrong place they cannot be repaired
- they're dangerous in the hands of very young children.



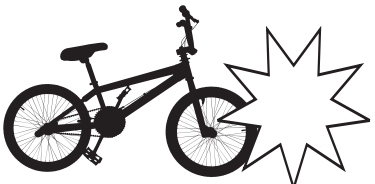
Parachutes

- may not open properly!
- may not be big enough
- could be blown off course by the wind.



Elastic hazards could be

- bungee ropes breaking
- trousers falling down!
- hurting yourself when the elastic snaps.



Bicycle hazards could be

- you could fall off them
- the saddle can give you a very sore bottom!
- you can crash into people.

smart grid
Assessment *for* Learning

Great Granny Green

Thumbs Up
We were great at the task because...

Thumbs Sideways
We were good at the task because...

Thumbs Down
We were OK at the task because...

we showed our ideas by...

we presented information clearly by ...

we identified the science ideas, e.g....

we explained the science behind some of the sayings, e.g....

we...

Next time we will...

COMINO FOUNDATION

centre for science education

smart science

Great Granny Green

Communication: to show ideas and information in different ways

Investigative skills: to use a wide range of methods to communicate data

Activating Personal Capabilities in Science

Generic task
Hear Say

20 minutes

Learning Objective
Communication: to show ideas and information in different ways

Introducing the task 5 minutes
Explain to the children that people communicate in lots of different ways, for example by letter, telephone, email, text message, picture messages, drawings and even by mime and hand signals! Showing our ideas in different ways helps us express ourselves clearly to different audiences. In school we usually talk and write about what we think but this task gets us to do much more. Prepare to be challenged to communicate ideas and information in different ways.

Running the task 15 minutes
You need: the spinner, paper, pencils, playdough or plasticine, stop watch or egg timer, words & phrases sheet cut into cards.

1 Organise the children into teams of four or five.

2 The first person chooses a card from the pack and reads it, without letting anyone else see.

3 They spin the spinner to see how they have to communicate the word or phrase to the rest of the team. There are five options:

- drawing without speaking
- miming
- make a model without speaking
- talking about the object or thing without using its name
- 'free choice' - you can choose whichever way you want to communicate from the other four options.

4 The team has to guess the card within one minute; if they don't the person can tell the group what the answer is.

5 When you've had your go, move to the next player.

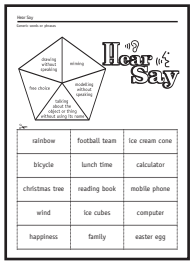
Helpful Hints
Encourage the children to play in pairs if they feel more confident with a partner. Increase or reduce the time if appropriate but keep the game moving at a reasonable pace.

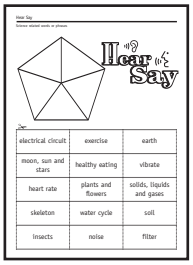
For further challenge, adapt the spinner to suit, e.g.

- drawing with your eyes closed and not speaking
- modelling only with one hand
- drawing with your non-writing hand
- singing.

Some words and phrases are given as examples – add to these once the children are familiar with the task.

Resources





Science embedded task
Great Granny Green

1 hour

Learning Objectives

National Curriculum Sc1: 1a, 2h

Ideas & Evidence to think creatively to explain how living and non-living things work

Investigative Skills to use a wide range of methods to communicate data

Success Criteria

To be successful the children will:

- show ideas in different ways, e.g. drawings, models etc.
- present information clearly, e.g. diagrams, tables etc.
- identify and explain science ideas linked to everyday sayings.

Introducing the task 10 minutes

Discuss with the children old wives tales like 'Red sky at night, shepherd's delight', 'An apple a day keeps the doctor away', etc. Explain that these sayings sometimes have some scientific basis but are not always true. Many are based on observations without scientific explanations to support them. For instance, scientists think that a red sky can be caused by light shining on dust particles carried into the upper atmosphere. This often happens in a period of settled fine weather. Apples are part of a healthy diet but cannot, by themselves, keep people well!

Other examples of 'old wives tales' are 'Washing your hair in rain water makes it shiny' or 'Milk goes sour in thunder storms'. Introduce these to the children and ask them why they think people say these things. Using their scientific knowledge, do they think these old wives tales are true?

Running the task 30 minutes (plus time for presentations)

1 Organise the children into teams of two to four.

2 Read or hand out Great Granny Green. Set a time limit to prepare a presentation (20 minutes is suggested).

3 Emphasise that children need to think carefully about the content of their presentation and how to communicate their ideas. Tables, drawings, diagrams or models might help (relate this back to the generic task). They should remember that Great Granny Green likes to ask questions!

4 Use the Great Granny Green Support Cards as appropriate.

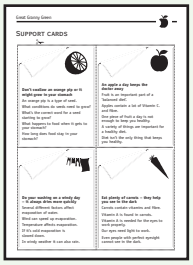
5 Give each team time to make their presentation to Great Granny Green and the rest of the class. Great Granny Green could be role played by the teacher, a teaching assistant or a member of the class.

Reviewing the task 10 minutes

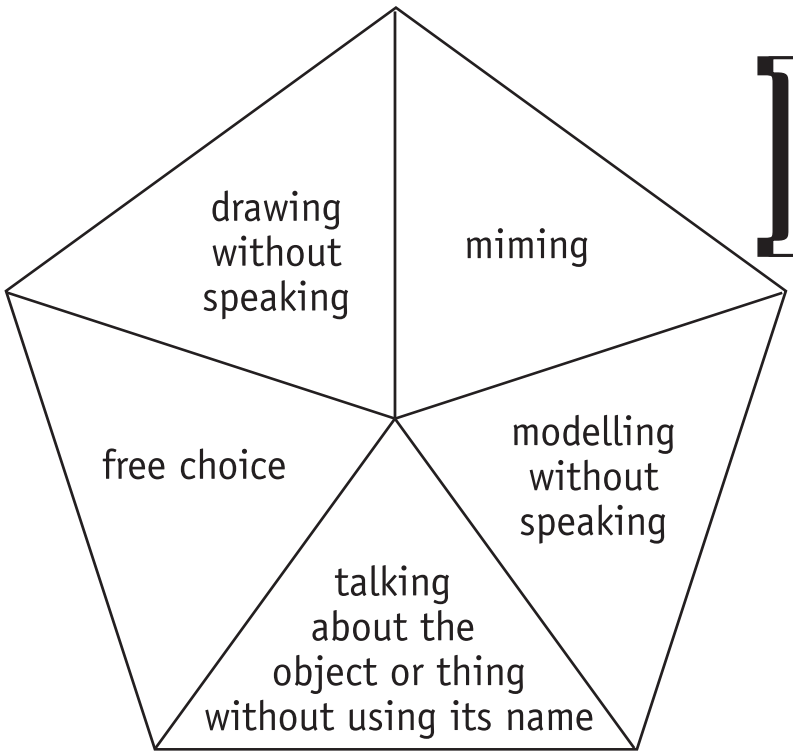
Ask the children for some of the reasons why they thought a particular 'old wives tale' might have arisen. Emphasise again that some were probably based on observations people made but often they did not have good scientific evidence or reasons to support them. Ask the children to comment on which parts of the presentations they thought were effective and why, drawing out the different methods of communication. As an extension the children could be asked to come up with old wives tales themselves, trying to support them with scientific knowledge, e.g. jumping up and down 10 times every morning makes you a better athlete etc.

Involve the children in making an overall judgement about how well they communicated their ideas and the information in this task using the assessment for learning Smart Grid (see back cover).

Resources



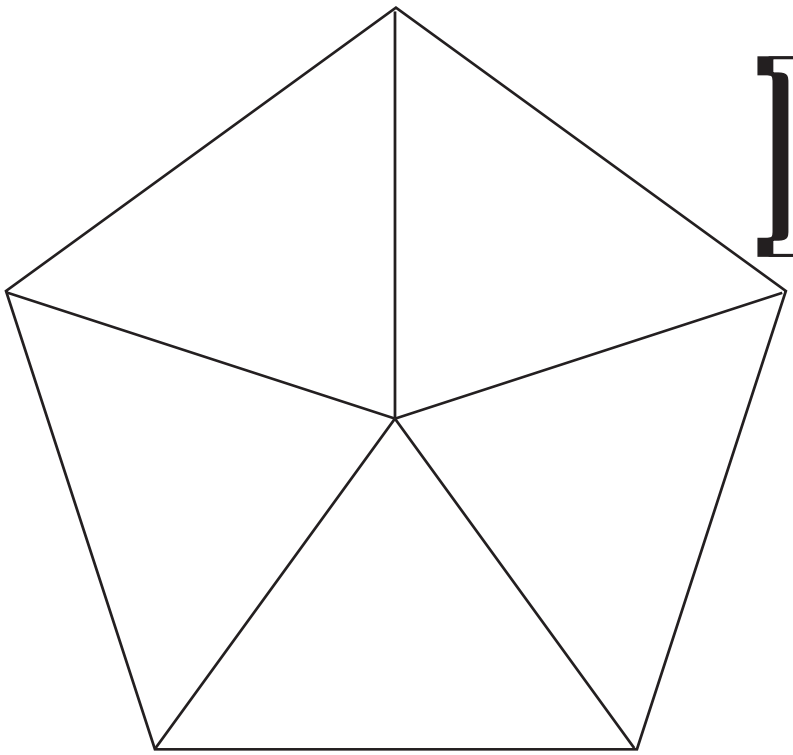
Generic words or phrases



Hear Say

rainbow	football team	ice cream cone
bicycle	lunch time	calculator
christmas tree	reading book	mobile phone
wind	ice cubes	computer
happiness	family	easter egg

Science related words or phrases



Hear Say

electrical circuit	exercise	earth
moon, sun and stars	healthy eating	vibrate
heart rate	plants and flowers	solids, liquids and gases
skeleton	water cycle	soil
insects	noise	filter

Great Granny Green

We didn't do science at school but I wish we had! People used to believe all sorts of things – old wives tales we used to call them! Things like:

Don't swallow an orange pip or it might grow in your stomach!

An apple a day keeps the doctor away!

Do your washing on a windy day – it always dries more quickly!

Eat plenty of carrots - they help you see in the dark!

I'm just not so sure about these things any more. What do you do in science in school? Do you know if these things are true or not?

Instructions

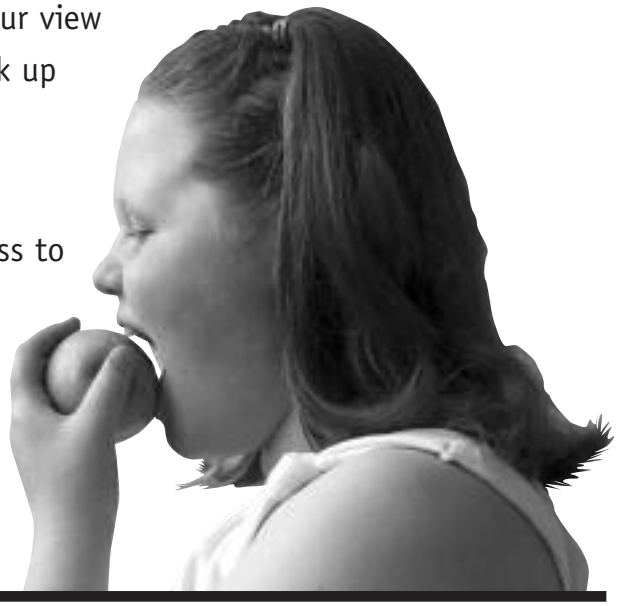
1 Before your next visit to Great Granny Green think about each of these old wives tales. Do you think they are true?

2 Choose one and prepare a two minute presentation for Great Granny Green. It should include:

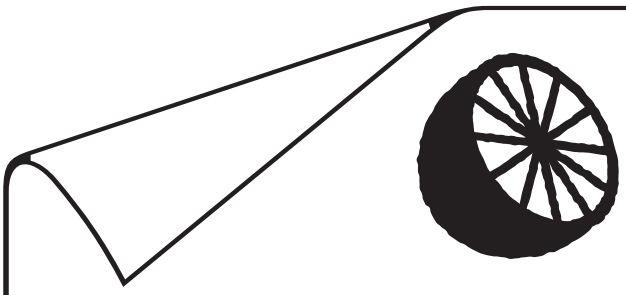
- your view on whether the old wives tale is true
- any science you already know about which supports your view
- an investigation or some research you could do to back up your thinking
- any ideas you have about why people many years ago might have thought it was true

3 Remember to use a range of ways to get your ideas across to Great Granny Green. You could think about using:

- diagrams
- pictures
- models
- tables



Support cards



Don't swallow an orange pip or it might grow in your stomach

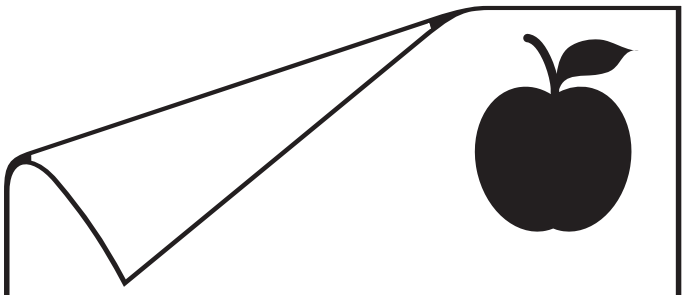
An orange pip is a type of seed.

What conditions do seeds need to grow?

What's the correct word for a seed starting to grow?

What happens to food when it gets to your stomach?

How long does food stay in your stomach?



An apple a day keeps the doctor away

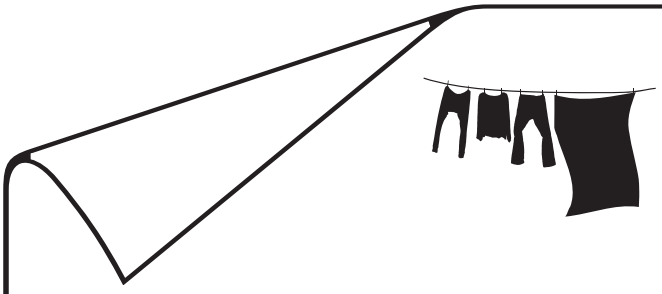
Fruit is an important part of a 'balanced diet'.

Apples contain a lot of Vitamin C. and fibre.

One piece of fruit a day is not enough to keep you healthy.

A variety of things are important for a healthy diet.

Diet isn't the only thing that keeps you healthy.



Do your washing on a windy day – it always dries more quickly

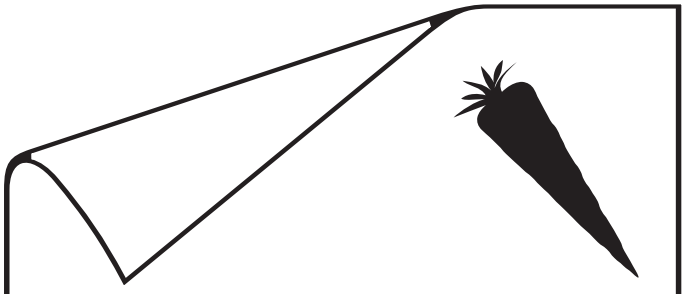
Several different factors affect evaporation of water.

Wind can speed up evaporation.

Temperature affects evaporation.

If it's cold evaporation is slowed down.

In windy weather it can also rain.



Eat plenty of carrots – they help you see in the dark

Carrots contain vitamins and fibre.

Vitamin A is found in carrots.

Vitamin A is needed for the eyes to work properly.

Our eyes need light to work.

Even people with perfect eyesight cannot see in the dark.

Teamwork

smart science

to

make sense

of what the team has done

Teamwork

smart science

to

overcome challenges

together

Teamwork

smart science

to

co-operate

with others

Teamwork

smart science

to help

reach agreements

with others

smart grid
Assessment *for* Learning

Thumbs Up
We were great at the task because...

Thumbs Sideways
We were good at the task because...

Thumbs Down
We were OK at the task because...

we identified the real issues beneath the challenges the crew faced, e.g....

we identified the science ideas behind the problems, e.g....

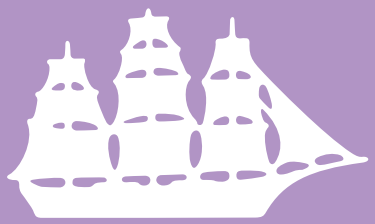
we suggested an investigation that could overcome the challenge, e.g....

we decided together how to go about the task, by...

we each took responsibility for part of the work, e.g....

we...

Next time we will...



COMINO FOUNDATION

centre for science education

smart science

Pirate Ship Orca

Teamwork: to overcome challenges together

Investigative skills: to ask questions that can be investigated scientifically

Activating Personal Capabilities in Science

Generic task

Dragon Mystery

45 minutes

Learning Objective

Teamwork: to overcome challenges together

Introducing the task 10 minutes

Explain that this challenge will bring up a lot of 'difficult' moments so the team will need to work well together to be successful. They will need to co-operate, reach agreements, listen to each other, respect each other's opinions and overcome frustrations.

Running the task 35 minutes

You need: a set of cut up clues in an envelope, 5 dragons names on the board or flip chart.

1 Organise the children into teams of four to six.

2 Read out the Five Dragons story:

'Once there were five evil dragons. Their names were Scorchbreath, Ironshanks, Firestorm, Morgana and Furniss. They captured Princess Tamara and held her prisoner. She was tied to a stake with ropes at her wrists and ankles. But she escaped and her father the King came back with knights and dragonslayers to punish the dragons. As the king was riding towards them the dragons were arguing about who had helped her to escape. They all suspected each other.'

3 Explain to the teams that they will be given some clues which may or may not be useful. They must not show anyone else their clue. They can read it aloud.

4 As a team, the children must consider all the information and try to agree on how Princess Tamara escaped. Did one of the dragons help her? And why?

5 Review the task by asking questions, such as:

- How did you deal with everyone talking at once?
- How did the team organise themselves?
- Was everyone involved in solving the mystery?
- Did the team show good co-operation skills?
- What went well?
- How were people feeling about the way the team were working together?

Helpful Hints

Observe the teams and help if you think they really need it.

The Solution - Furniss helped Tamara escape by cutting one of her ropes because he was tired of eating skinny Princesses.

Resources


Dragon Mystery Clue Cards

Science embedded task
Pirate Ship Orca

1 hour

Learning Objectives

National Curriculum Sc1: 2a

Science Investigative Skills to ask questions that can be investigated scientifically and decide how to find answers

Success Criteria

To be successful the children will:

- identify the real issues beneath a challenge or problem
- decide together how to go about the task
- take responsibility for part of the work
- identify science ideas and how they could be investigated.

Introducing the task 5 minutes

Discuss with the children the things they feel can help when working on a task as a team, encouraging them to draw on experiences they have had of working together (relate this back to the generic task). In particular, bring out the ideas of deciding as a team how to go about the task, e.g. dividing up and taking responsibility for smaller pieces of the task, either as pairs or individually, voting on who does what, coming together to review, draw together ideas and finish off the task.

Running the task 40 minutes

1 Organise the children into teams of four to six.

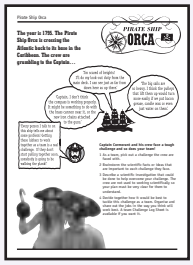
2 Read aloud or hand out Pirate Ship Orca; individual children should read out the different comments. Set the time limit of 30 minutes for the work and give reminders every 10 minutes.

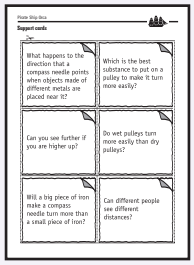
3 Supply Pirate Ship Orca Support Cards as appropriate to support the investigative part of the task. This task is intended to be discussion based, however where written evidence is required use the Pirate Ship Orca Challenge Log Sheet.

Reviewing the task 15 minutes

Discuss with the children some of the key science ideas they were able to link to the various conversations and also some of the investigations they suggested. Ask the children to discuss in their team how successful they were at identifying and overcoming the challenges together. Stress that they should focus on positive aspects of the way they worked as a team. Involve the children in making an overall judgement about how well they overcame challenges together using the assessment for learning Smart Grid (see back cover).

Resources





Dragon Mystery Clue Cards

Furniss, Scorchbreath and Ironshanks are male dragons.	Morgana will eat anything!	Princess Tamara is very thin.	Dragons sleep very soundly.
Princess Tamara is able to shrink quickly.	The dragons have eaten many princes and princesses in the past few months.	Local people are extremely scared of the dragons.	A dragon's claws are as sharp as knives.
Dragons are too clumsy to untie ropes.	Dragons are very choosy about their food.	Furniss prefers to eat plump village people.	No-one knows if Firestorm is male or female.
Morgana and Furniss have yellow scales all over their bodies.	Princess Tamara is good at making friends.	Morgana and Ironshanks were out all day.	Scorchbreath was supposed to be standing guard but fell asleep.
Firestorm and Scorchbreath have blue and red scales.	Morgana and Ironshanks have returned from an all day raiding party at the nearby village.	Scorchbreath and Ironshanks just breathe fire.	Firestorm is afraid that Tamara will return with an army.
Firestorm likes to burn food to a crisp.	Princess Tamara was tied to the stake for 21 days.	Ironshanks and Furniss often disagree.	Male dragons shed a few scales wherever they go (but females never do).
Morgana and Furniss don't know how to breathe fire yet.	Only yellow scales were found near the stake.	Morgana and Ironshanks brought back gold and jewels.	One rope was cut, the other was untied.
Ironshanks and Scorchbreath are hungry for royalty.	Nothing was burned anywhere near the stake.	Morgana is a female dragon.	

The year is 1795. The Pirate Ship Orca is crossing the Atlantic back to its base in the Caribbean. The crew are grumbling to the Captain…

'I'm scared of heights! I'll do my look-out duty from the main deck. I can see just as far from down here as up there.'

'The big sails are so heavy. I think the pulleys that lift them up would turn more easily if we put bacon grease, candle wax or even just water on them.'

'Captain, I don't think the compass is working properly. It might be something to do with the brass cannon near it, or the new iron chains attached to the guns.'

'Every person I talk to on this ship tells me about some problem! Getting these lubbers to work together as a team is a real challenge. If they don't start pulling together soon, somebody is going to be walking the plank!'

Captain Cormorant and his crew face a tough challenge and so does your team!

1 As a team, pick out a challenge the crew are faced with.

2 Brainstorm the scientific facts or ideas that are important to each challenge they face.

3 Describe a scientific investigation that could be done to help overcome your challenge. The crew are not used to working scientifically so your plan must be very clear for them to understand.

4 Decide together how it would be best to tackle this challenge as a team. Organise and share out the jobs in the way you think will work best. A team Challenge Log Sheet is available if you want it.

Challenge log sheet

Important facts and scientific ideas linked to your challenge

Our recommended investigation

Support cards

What happens to the direction that a compass needle points when objects made of different metals are placed near it?

Which is the best substance to put on a pulley to make it turn more easily?

Can you see further if you are higher up?

Do wet pulleys turn more easily than dry pulleys?

Will a big piece of iron make a compass needle turn more than a small piece of iron?

Can different people see different distances?

smart grid
Assessment *for* Learning

Thumbs Up
We were great at the task because...

Thumbs Sideways
We were good at the task because...

Thumbs Down
We were OK at the task because...

we shared our ideas and what we already knew about...

we made links between our ideas by...

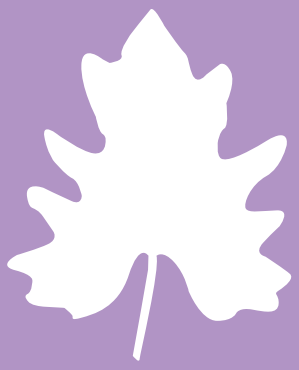
we agreed on an outcome by...

we talked about how different organisms in the food web could affect each other, e.g....

we explained how different factors affected the food web, e.g....

we...

Next time we will...



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EcoConsultants

Teamwork: to make sense of what the team has done

Investigative skills: to think creatively to explain how things work

Activating Personal Capabilities in Science

Generic task

The Blind Men & the Elephant

20 minutes

Learning Objective

Teamwork: to make sense of what the team has done

Introducing the task 5 minutes

Explain that very often we are asked to work with other people in teams. Sometimes it is useful to break big jobs up into smaller bits so that each person can do a different part. Working as a team means that we can share out the jobs fairly and co-operate together to be successful. However, the hard part is bringing all the information together so that it makes sense.

Explain that in this task the story of 'The Blind Men and The Elephant' will help us understand why it is so important to bring everyone's ideas and information together, to really make sense of what the team has been doing.

Running the task 15 minutes

You need: the Blind Men and the Elephant story.

1 Read the story to the children.

2 Discuss its meaning with the children – it's clearly not about elephants! The questions below might be useful.

- When the blind men were asked to examine the elephant what mistake did they make?
- What was the prince trying to prove to the wise men?
- Do you think this was a good way for the prince to prove his point? Justify your reasoning.
- Do you think the blind men worked as a team?
- When you are working in a team, what does this story encourage you to do?

Helpful Hints

Link to work in literacy on fables and tales where children can explore further the way that stories were used to teach and guide people about how to live well together.

Resources


The Blind Men and The Elephant

The blind man and the Elephant

Science embedded task
EcoConsultants

1 hour

Learning Objectives

National Curriculum Sc1: 1a

Ideas & Evidence to think creatively to explain how living and non-living things work

Equipment
PE Hoops, masking tape or chalk

Success Criteria
To be successful the children will:

- share their ideas and what they already know
- make links between different people's ideas
- agree on an outcome
- explain how different organisms in food chains and food webs can be affected.

Introducing the task 10 minutes
Explain that the children will be EcoConsultants working together in a team to make sense of the information they've been given. They will need to share their ideas in order to give advice to the wildlife conservation group about different food chains. Talk about different ways that ideas can be shared and what it means to link ideas (relate this back to the generic task).

Introduce the task by explaining that it will challenge the children to think creatively about the different ways in which plants and animals are linked. They will need to consider how changes in a habitat can affect the different living things.

Running the task 35 minutes
1 Organise the children into teams of four.

2 Read aloud or hand out the email from the Galapagos Conservation Group and describe the different food chains shown and how they overlap.

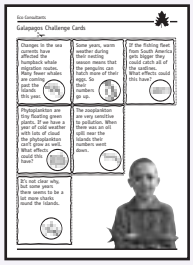
3 Arrange PE hoops on the floor in the same pattern as the food web shown. Use chalk or masking tape to create the arrows and labels for each hoop.

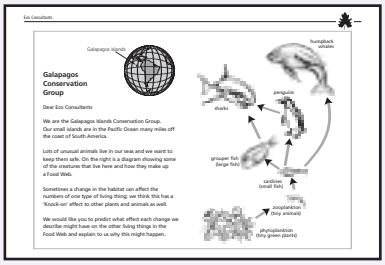
4 Give each team a Galapagos Challenge Card. Ask them to read it and work out what they think could happen to the numbers of organisms in the food web. Encourage them to use what they already know about food chains to help describe what is happening in the food web. Challenge them to consider different possibilities and to make sense of what could happen by agreeing on an explanation.

5 When taking feedback, ask the teams to demonstrate what they think would happen in the food web by physically modelling the process. Use class members to stand in the hoops to represent the organisms (one person in each hoop). Children should stand or sit depending on the changes the teams describe. Where numbers of an organism go down slightly children must sit down, and where numbers go up extra children should be asked to stand in the hoop. If the organism is wiped out completely, the hoop should be left empty.

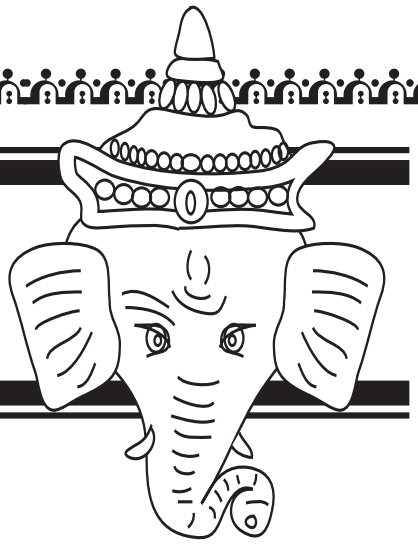
Reviewing the task 15 minutes
Discuss with the children how they made sense of the work. How did they work together to share and link ideas? How did they manage to agree on an explanation? Did they consider different possibilities? Involve the children in reviewing their work and making an overall judgement about how well they made sense of what the team has done by using the assessment for learning Smart Grid (see back cover).

Resources





The blind men and the **Elephant**



This story is from the Buddhist religion which can help illustrate how useful it is to look at ideas from different angles. It is important to work as a team and to consider the information from every team member.

Friends, long ago in this very city there lived a prince who became wary of listening to the so-called wise men. You see, each of these men of learning had different ideas about the gods and the sacred books, and they used to argue with tongues like razors. One day the prince gathered together in the market place all the blind men in the city. Near them he placed an elephant. Then he told each man to go to the great beast and feel it with his hands. The first blind man advanced to the elephant and felt its head. The second took hold of its ear, the third its tusk, the fourth its trunk, the fifth its foot, the sixth its back, the seventh its tail and the last the tuft of the tail.

"Now then," said the prince, "tell us what an elephant looks like."

The first, who had felt his head, said, "It's like a pot."

The next, the one who had touched the ear, said, "No, an elephant looks like a fan."

"Nonsense!" laughed the man who had fingered the tusk, "it's round, hard and smooth like the handle of a plough."

"Don't be daft," said the one who had felt the trunk "the elephant is like a snake."

To cut a long story short, each man described the animal differently. So the foot became a pillar, the back a barn, the tail a rope and the tuft a feather-duster. Each of the blind men was sure that he was right and all the others were wrong. At once a furious argument arose. Tempers rose and so did voices. Wild words were flung back and forth. One man punched another. There was a cry of pain. In a few moments the market place was a tangle of fighting bodies.

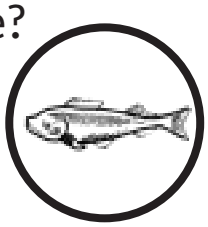
The city's learned men looked on at all this, amazed and amused. The prince turned to them and said, "I don't know why you're laughing, gentlemen. Your own squabbles are just like these poor fellows. You have your own narrow view of every question and you can't see anyone else's. You must learn to examine ideas all over, as the blind men should have examined the elephant. You'll never understand anything unless you look at it from many different angles."

Galapagos Challenge Cards

Changes in the sea currents have affected the humpback whale migration routes. Many fewer whales are coming past the islands this year.

Some years, warm weather during their nesting season means that the penguins can hatch more of their eggs. So their numbers go up.

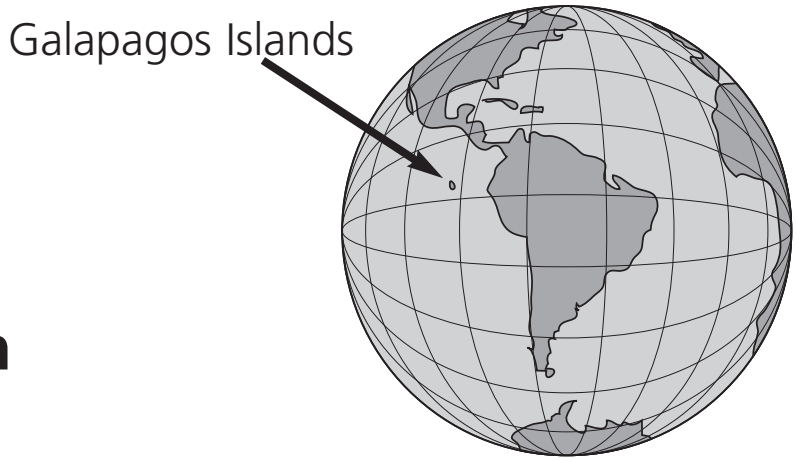
If the fishing fleet from South America gets bigger they could catch all of the sardines. What effects could this have?



Phytoplankton are tiny floating green plants. If we have a year of cold weather with lots of cloud the phytoplankton can't grow as well. What effects could this have?

The zooplankton are very sensitive to pollution. When there was an oil spill near the islands their numbers went down.

It's not clear why, but some years there seems to be a lot more sharks round the islands.



Galapagos Conservation Group

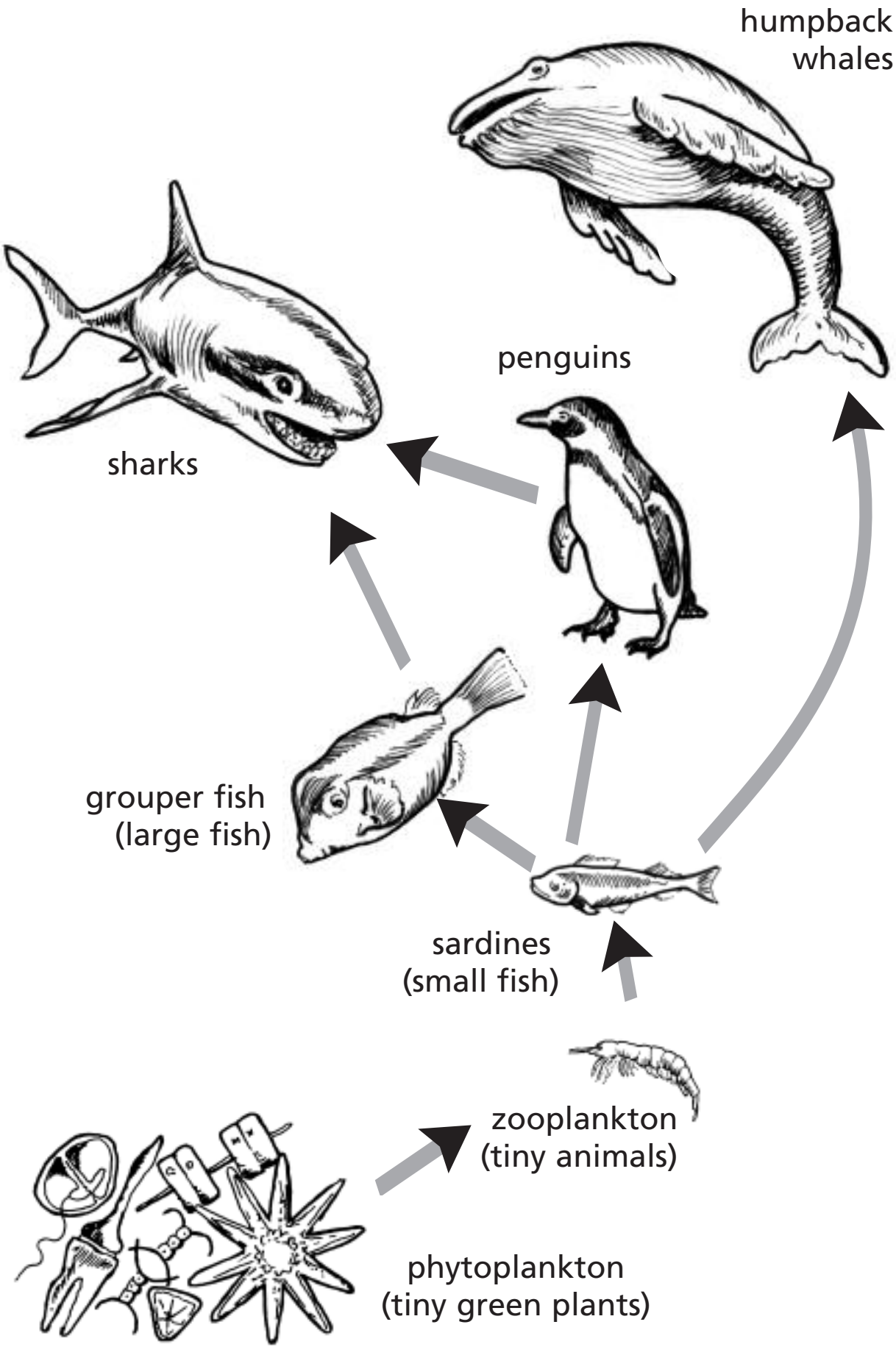
Dear Eco Consultants

We are the Galapagos Islands Conservation Group. Our small islands are in the Pacific Ocean many miles off the coast of South America.

Lots of unusual animals live in our seas and we want to keep them safe. On the right is a diagram showing some of the creatures that live here and how they make up a Food Web.

Sometimes a change in the habitat can affect the numbers of one type of living thing; we think this has a 'Knock-on' effect to other plants and animals as well.

We would like you to predict what effect each change we describe might have on the other living things in the Food Web and explain to us why this might happen.


humpback whales
penguins
sharks
grouper fish (large fish)
sardines (small fish)
zooplankton (tiny animals)
phytoplankton (tiny green plants)

smart grid
Assessment *for* Learning

Thumbs Up
We were great at the task because...

Thumbs Sideways
We were good at the task because...

Thumbs Down
We were OK at the task because...

we took turns by...

we let others have their say by...

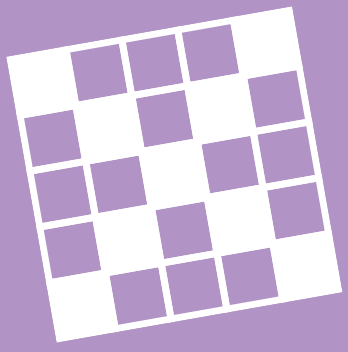
we made shared decisions by ...

we came up with different types of clues, e.g....

we used scientific information and vocabulary, such as...

we...

Next time we will...



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Crossword Compilers

Teamwork: to co-operate with others

Scientific Communication: to use scientific language to communicate ideas

Activating Personal Capabilities in Science

Generic task

Human Grid

30 minutes

Learning Objective

Teamwork: to co-operate with others

Introducing the task 5 minutes

We often need to work with other people. Working as a team means that we all help each other to do well. This task challenges you to co-operate as a team. You will need to talk to each other, listen and respond, reach agreements and think of others before yourselves. If you're ready for a team challenge… here we go.

Running the task 25 minutes

You need: 9 x A4 pieces of card with the numbers 1-9 written on (laminated if possible), sticky labels with the numbers 1-9.

1 Organise the children into teams of nine. One person should act as an observer.

2 Place the number cards on the floor in a 3 x 3 square.

3 Give everyone a sticky label and ask the children to stand on any square, but NOT the one that matches their sticker.

5 Make sure that one square is left empty on the grid.

6 When the observer says 'Start', the team must work co-operatively to make sure everyone gets to the square with their number on it. They cannot move into a square that is already occupied and they cannot step off the puzzle.

7 When everyone has arrived at the correct square the team shouts 'GRID!'

8 The observer will be looking at how the team co-operates, shares their opinions and listens to each other. They should report back at the end telling them two things they did well and one thing they could improve on.

Helpful Hints

To make it harder you could suggest that:

Moves can only be made vertically or horizontally, NOT diagonally.

Only non-verbal communication can be used.

To transfer Human Grid into a science context, use short questions on the floor cards and answers on the sticky labels, e.g.

Question	Answer
How many planets are there?	Nine
What vitamin do oranges contain?	Vitamin C
How many legs do insects have?	Six
What liquid do plants need to survive?	Water
What is a push or pull?	A force
How long does it take for the Earth to orbit the Sun?	365¼ days
What is the unit that forces are measured in?	Newton
Which organ in the body pumps blood?	Heart
What type of living thing starts every food chain?	Producer

Science embedded task
Crossword Compilers

1 hour

Learning Objectives

National Curriculum Breadth of Study: 2a

Scientific Communication to use appropriate scientific language to communicate ideas

Equipment
- puzzle books
- science dictionaries

Success Criteria
To be successful the children will:

- take turns and let others have their say
- make shared decisions
- come up with clues using scientific information and accurate scientific vocabulary.

Introducing the task 10 minutes
Explain that this challenge is about working co-operatively to construct different types of clues for a crossword puzzle. Ask for and discuss some examples of different types e.g. picture clues, anagrams, gaps in sentences, questions etc. A puzzle book or the Clue Ideas Sheet can be used to support this. Discuss with the children the idea of working co-operatively in a team and some of the key things that can help this e.g. taking turns, listening carefully, considering other people's ideas and feelings etc. (relate this back to the generic task).

Running the task 40 minutes
1 Organise the children into groups of four or six.

2 Read aloud Crossword Compilers. Explain that the activity involves working co-operatively, first in pairs, then as an editing team and, lastly, as a whole class to try the crosswords out.

3 Identify which half of the class should work on one crossword and which half on the other. Use the Crossword Answers Sheet.

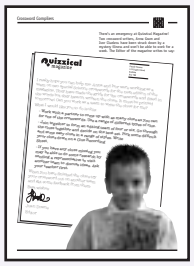
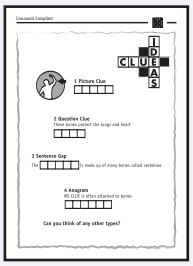
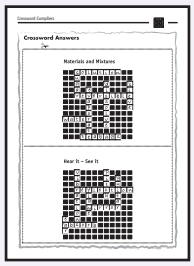
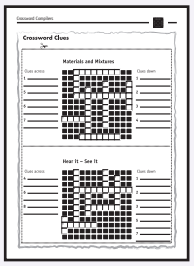
4 Starting in pairs the children should complete the tasks as described on Crossword Compilers. After about 30 minutes teams are allowed to ask other teams for help, if needed, on particular clues.

5 All clues must be recorded on the Crossword Clues Sheet or on a separate piece of paper.

6 The class can swap crosswords to test them out. Encourage any feedback to be constructive and related to the success criteria for the task.

Reviewing the task 10 minutes
Discuss with the children how well they were able to co-operate in teams to produce their crossword clues. What helped them to co-operate with each other? Did they understand and use scientific language? Involve the children in making an overall judgement about how well they co-operated as a team using the assessment for learning Smart Grid (see back cover).

Resources

There's an emergency at Quizzical Magazine! Two crossword writers, Anna Gram and Ivor Clueless have been struck down by a mystery illness and won't be able to work for a week. The Editor of the magazine writes to say:

Quizzical magazine

Puzzle Towers
123 Cryptic Road
Sudoku
S12 789

I really hope you can help me. Anna and Ivor were working as a team on two special Science crosswords for the next edition of the magazine. They have made the grids for the crosswords and fitted in the words but they haven't written the clues. It must be printed tomorrow! Can you work as a team to write the clues for me?

What I would like you to do is this:

- Work with a partner to come up with as many clues as you can for one of the crosswords. Use a range of different types of clue.

- Join together to form an editing team of four or six. Go through the clues together and decide on the best set. Pick some difficult and some easy clues in a range of styles. Write your clues down on a Clue Recording Sheet.

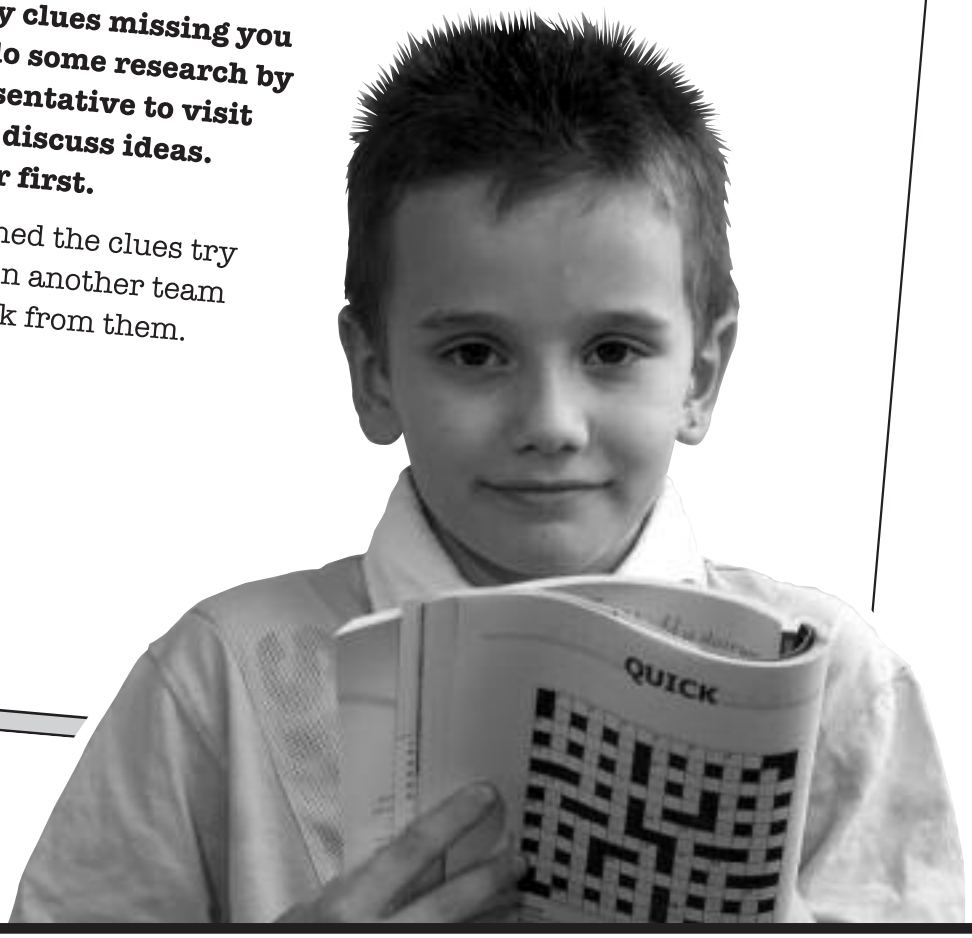
- If you have any clues missing you may be able to do some research by sending a representative to visit another team to discuss ideas. Ask your teacher first.

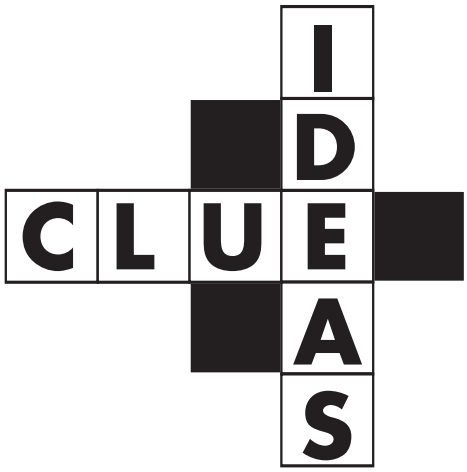
When you have finished the clues try your crossword out on another team and get some feedback from them.

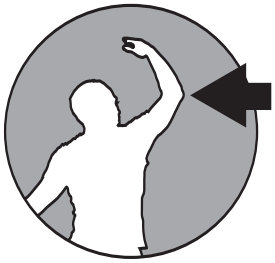
Best wishes

Juan Downe

Editor







1 Picture Clue

2 Question Clue

These bones protect the lungs and heart

3 Sentence Gap

The | | | | | | is made up of many bones called vertebrae

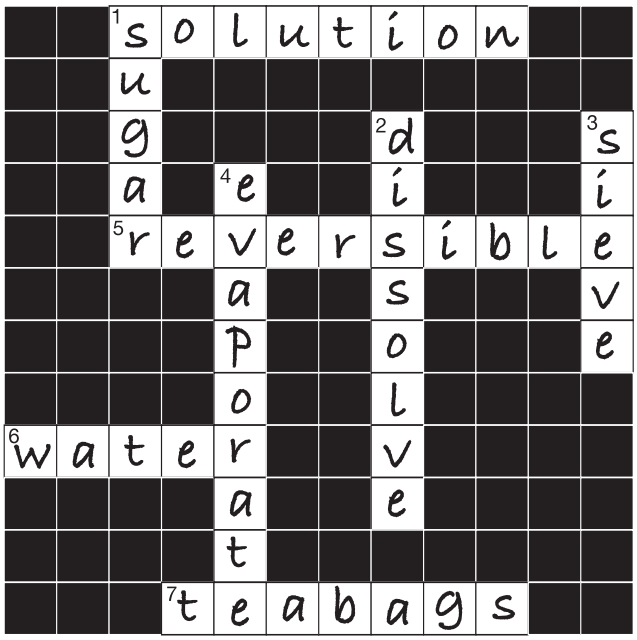
4 Anagram

MS CLUE is often attached to bones

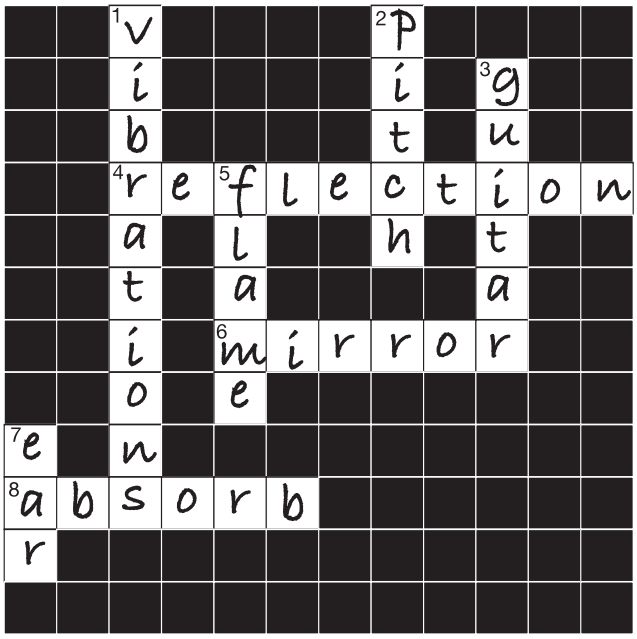
Can you think of any other types?

Crossword Answers

Materials and Mixtures



Hear it – See it



Crossword Clues

Materials and Mixtures

Clues across

1 _____

_____

5 _____

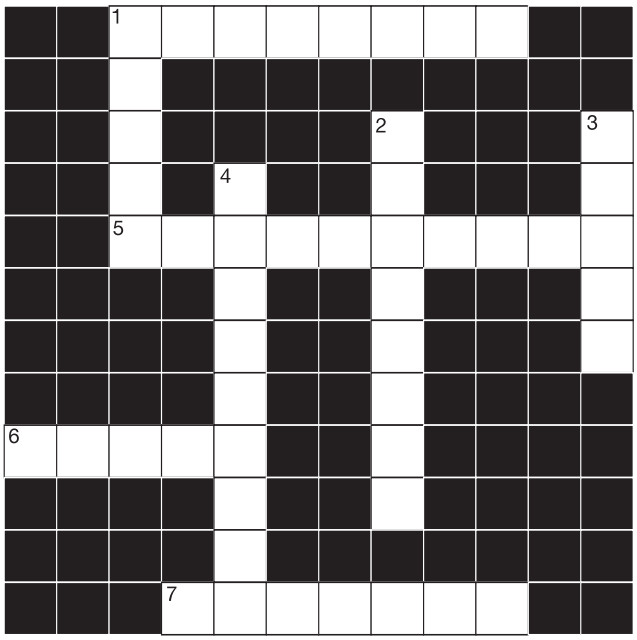
_____

6 _____

_____

7 _____

_____



Clues down

1 _____

_____

2 _____

_____

3 _____

_____

4 _____

_____

Hear it – See it

Clues across

4 _____

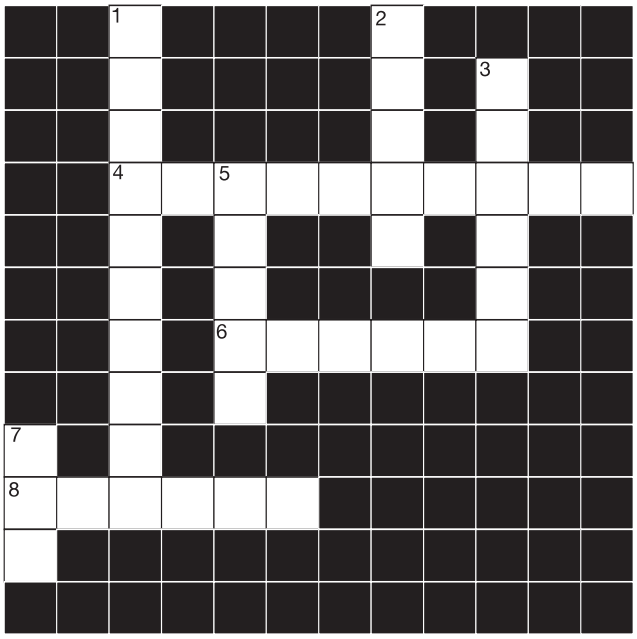
_____

6 _____

_____

8 _____

_____



Clues down

1 _____

_____

2 _____

_____

3 _____

_____

5 _____

_____

7 _____

_____

smart grid
Assessment *for* Learning

Safari Camp

Thumbs Up
We were great at the task because...

Thumbs Sideways
We were good at the task because...

Thumbs Down
We were OK at the task because...

we shared our opinions with the team, e.g....

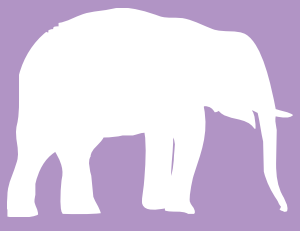
we explored other peoples' opinions by thinking them through, e.g....

we negotiated and compromised by ...

we used our science knowledge to suggest alternative ways to do the jobs, e.g....

we...

Next time we will...



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smart science

Safari Camp

Teamwork: to reach agreements with others

Scientific Communication: to look at how science affects the development of useful things

Activating Personal Capabilities in Science

Generic task

Scrambled Stories

30 minutes

Learning Objective

Teamwork: to reach agreements with others

Introducing the task 5 minutes

Explain that successful teamwork means being able to discuss ideas and decisions and to reach agreement. Reaching agreements can involve listening to and respecting other people's opinions, letting everyone feel part of the discussion, being fair and taking turns. Sometimes we need to compromise to reach an agreement.

Introduce this task as a fun way of working as a team to unscramble stories. Explain that the children will need to work together, discuss, take turns and compromise if necessary to reach agreements.

Running the task 25 minutes

You need: a partner, scrambled story cards.

1 Organise the children into pairs and give each pair a set of Scrambled Stories cards.

2 Ask them to discuss and reach agreement about the order in which the pictures or sentences should be placed to tell a story.

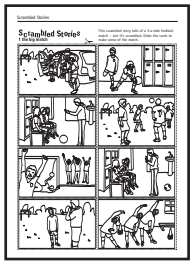
3 When they have finished the sequence ask them to tell their story to another pair.

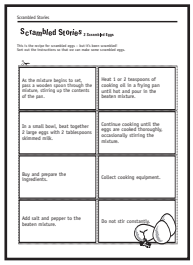
Would they have ordered the story differently or in the same way?

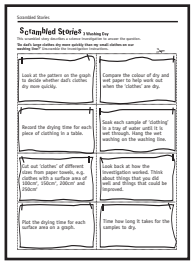
Helpful Hints

Cartoon strips from magazines are rich sources of stories, simple recipes can also be used for this purpose. To transfer this task into science context – provide shuffled sets of investigation instructions.

Resources







Science embedded task
Safari Camp

1 hour

Learning Objectives

National Curriculum Breadth of Study: 1b, 2a

Scientific Communication
to look at the part science has played in the development of many useful things
to use appropriate scientific language to communicate ideas

Success Criteria

To be successful the children will:

- explore other people's opinions
- negotiate and compromise to reach an agreement or settlement
- use their science knowledge to suggest alternatives to using electricity as an energy source.

Introducing the task 10 minutes

Explain that in this activity the children are going to work as a team to reach agreements. This may involve listening to and exploring other people's opinions and then using discussion to reach a settlement or compromise (relate this back to the generic task).

Running the task 40 minutes

1 Organise the children into teams of four.

2 Read aloud Safari Camp and the Electricity Information Sheet. Stress that the camp electricity supply comes from a small generator and the supply is limited. Only certain items will work at one time.

3 Give one Safari Camp Role Play Card to each member of each team. Allow time for individual children to read their role cards, think about the sorts of views their person might express and make brief notes about the ideas they want to put forward in the discussion. If appropriate, to support this process, cards could be given to pairs of children rather than individuals.

4 Ask the children to discuss, as a team, the issue of the electricity use on the safari camp. Emphasise that it is important to allow all team members to express their views, negotiate if necessary and to reach an agreement or suitable compromise.

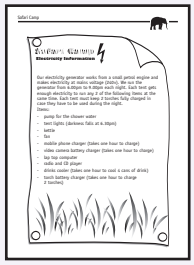
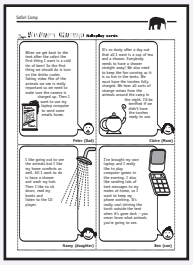
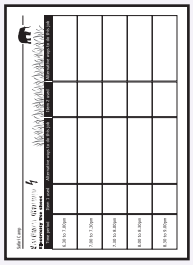
5 Once agreement is reached the teams should fill in the columns labelled 'Item 1' and 'Item 2' in the table on Electricity Use Sheet (15 minutes is suggested for this activity).

6 Now ask the teams to use their science knowledge to brainstorm alternative ways to do the jobs needed on camp without using electricity from the generator. Use the Electricity Alternatives Support Cards if appropriate. Teams should record their ideas in the table on Electricity Use Sheet.

Reviewing the task 10 minutes

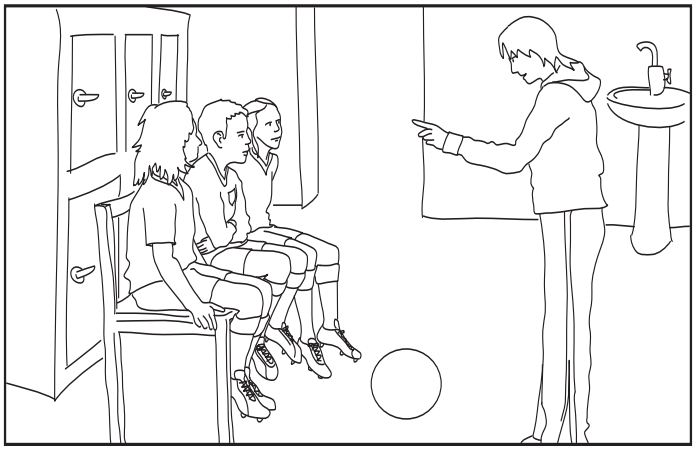
Discuss with the children some of the uses of electricity they have decided on and the agreements they reached. Consider those in which they negotiated and compromised, drawing out the features of these strategies. What alternative ideas did they have in order not to use electricity? Involve the children in making an overall judgement about how well they helped reach agreements using the assessment for learning Smart Grid (see back cover).

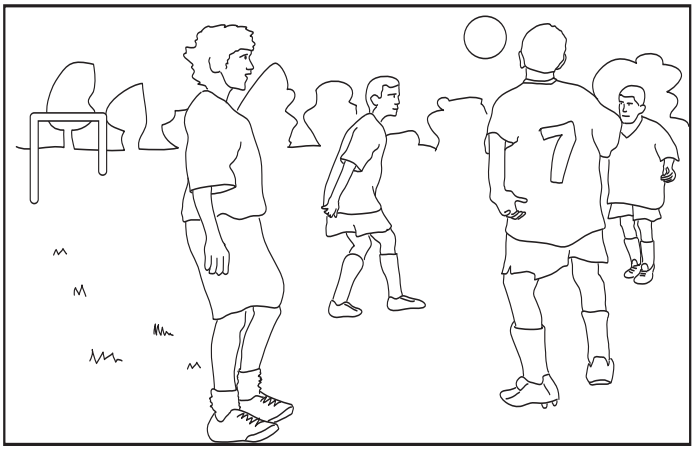
Resources

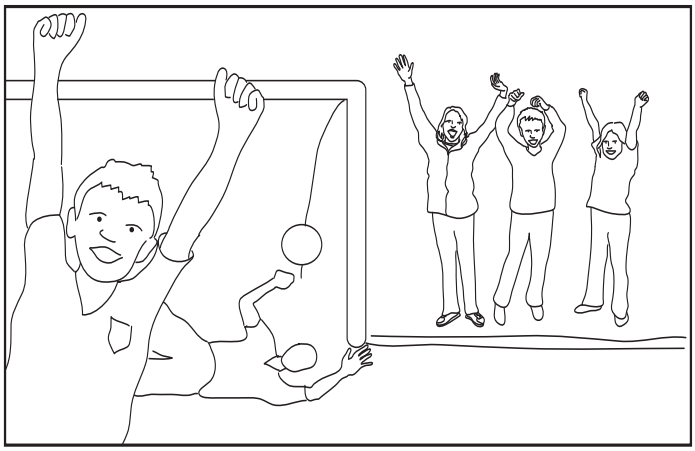





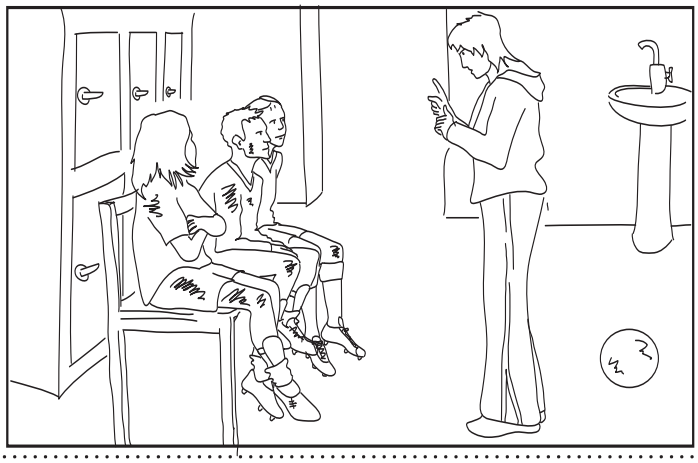

Scrambled Stories
1 the big match

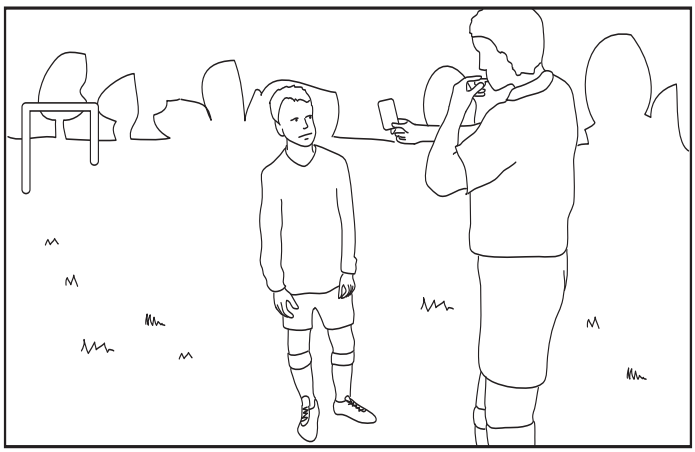
This scrambled story tells of a 5-a-side football match – but it's scrambled. Order the cards to make sense of the match.

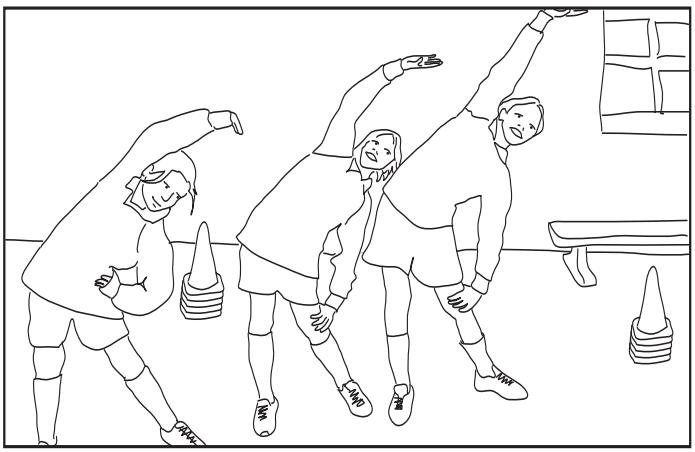








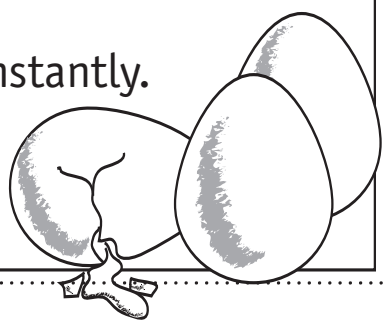




Scrambled Stories 2 Scrambled Eggs

This is the recipe for scrambled eggs – but it's been scrambled!
Sort out the instructions so that we can make some scrambled eggs.

As the mixture begins to set, pass a wooden spoon through the mixture, stirring up the contents of the pan.	Heat 1 or 2 teaspoons of cooking oil in a frying pan until hot and pour in the beaten mixture.
In a small bowl, beat together 2 large eggs with 2 tablespoons skimmed milk.	Continue cooking until the eggs are cooked thoroughly, occasionally stirring the mixture.
Buy and prepare the ingredients.	Collect cooking equipment.
Add salt and pepper to the beaten mixture.	Do not stir constantly.



Scrambled Stories 3 Washing Day

This scrambled story describes a science investigation to answer the question.

'Do dad's large clothes dry more quickly than my small clothes on our washing line?' Unscramble the investigation instructions.

Look at the pattern on the graph to decide whether dad's clothes dry more quickly.

Compare the colour of dry and wet paper to help work out when the 'clothes' are dry.

Record the drying time for each piece of clothing in a table.

Soak each sample of 'clothing' in a tray of water until it is wet through. Hang the wet washing on the washing line.

Cut out 'clothes' of different sizes from paper towels, e.g. clothes with a surface area of 100cm^2, 150cm^2, 200cm^2 and 250cm^2

Look back at how the investigation worked. Think about things that you did well and things that could be improved.

Plot the drying time for each surface area on a graph.

Time how long it takes for the samples to dry.

Safari Camp

POSTCARD

Safari camp

Dear Anna,

We are having a great time here at the safari camp. During the day it is really hot, sunny and dusty. We go out in the four-wheel drive vehicles and we have seen Elephants, Rhinos and Lions already.

The evenings are a bit of a problem though. It gets dark very early. It is not safe to wander away from the camp so we stay in the tents.

The tents are really well equipped but the electricity comes from a small generator that can only make a couple of things work at the same time. Last night we had a really big argument about what we were going to use. Tonight we are going to sit down together and work out the best way to use the electricity.

I'm sure Ben and I can use some of the science ideas we have learnt about to come up with a few alternatives to using electricity.

Love Nancy

Can you help Nancy and her family reach an agreement about using the electricity?

Instructions

1 Each person in your team should play the part of one family member. Use the role cards to help you understand how the person you are playing might want to use the electricity.

2 Take turns to present your views to the team then work together to reach agreement and fill in an electricity use sheet for the family.

Safari Camp

Electricity Information

Our electricity generator works from a small petrol engine and makes electricity at mains voltage (240v). We run the generator from 6.00pm to 9.00pm each night. Each tent gets enough electricity to run any 2 of the following items at the same time. Each tent must keep 2 torches fully charged in case they have to be used during the night.

Items:

- pump for the shower water
- tent lights (darkness falls at 6.30pm)
- kettle
- fan
- mobile phone charger (takes one hour to charge)
- video camera battery charger (takes one hour to charge)
- lap top computer
- radio and CD player
- drinks cooler (takes one hour to cool 4 cans of drink)
- torch battery charger (takes one hour to charge 2 torches)

Safari Camp Roleplay cards

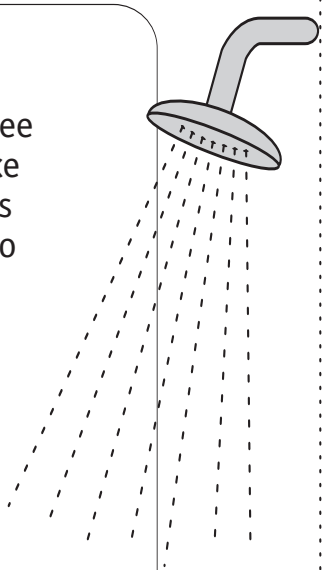
When we get back to the tent after the safari the first thing I want is a cold tin of beer! So the first thing we should do is turn on the drinks cooler. Taking video film of the animals we see is really important so we need to make sure the camera is charged up. Then I want to use my laptop computer to send some emails home.

Peter (Dad)

It's so dusty after a day out that all I want is a cup of tea and a shower. Everybody needs to have a shower straight away! We also need to keep the fan running as it is so hot in the tents. We must have the torches fully charged. We hear all sorts of strange noises from the animals around the camp in the night. I'd be terrified if we didn't have the torches ready to use.

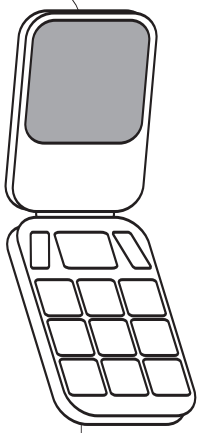
Claire (Mum)

I like going out to see the animals but I like my home comforts as well. All I want to do is have a shower and wash my hair. Then I like to sit down, read my books and listen to the CD player.

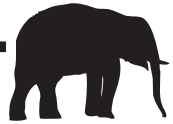


Nancy (daughter)

I've brought my own laptop and I really like to play computer games in the evening. I also like sending lots of text messages to my mates at home, so I want to keep my phone working. It's really cool shining the torch outside the tent when it's gone dark – you never know what animals you're going to see.



Ben (son)



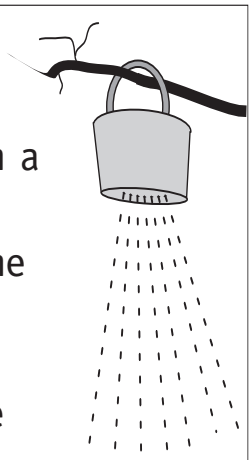
Safari Camp

Electricity Use sheet

Time period	Item 1 used	Alternative ways to do this job	Item 2 used	Alternative ways to do this job
6.30 to 7.00pm				
7.00 to 7.30pm				
7.30 to 8.00pm				
8.00 to 8.30pm				
8.30 to 9.00pm				

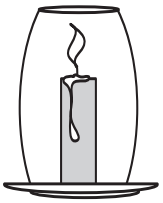
Safari Camp Electricity Alternatives Support Cards

Instead of the shower pump you could:



- lift water to a tank in a tree
- fill the tank during the day using buckets of water
- the sun will warm the water
- water will run down from the tank and out of the shower using gravity
- or...

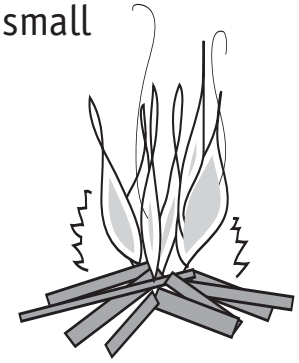
Instead of tent lights you could:



- provide candle lanterns
- candles will provide light without using electricity
- if the candles are in lanterns they will be safer than ordinary candles
- candles are made, and can be bought, locally
- or...

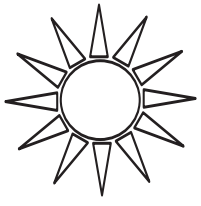
Instead of the kettle you could:

- have a camp fire and a pan of water
- a camp fire is often lit at night anyway
- animal droppings can be used as fuel for the fire instead of wood
- only a small fire is needed to boil a small pan of water
- or...



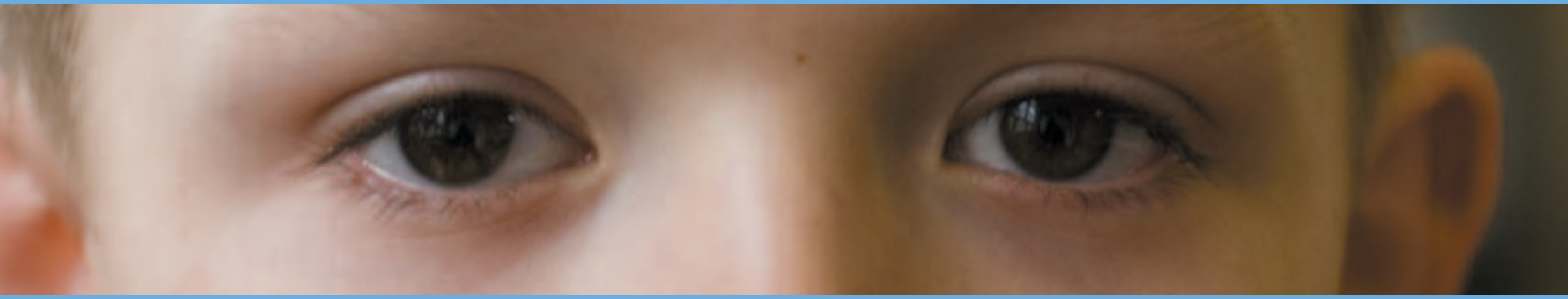
Instead of the mobile phone charger, video, radio/CD or laptop you could:

- use solar powered battery chargers
- energy from the sun is free
- spare batteries can be left on charge in the solar charger all day
- the weather is usually sunny in this part of Africa
- or...



Creativity & Problem Solving

smart science



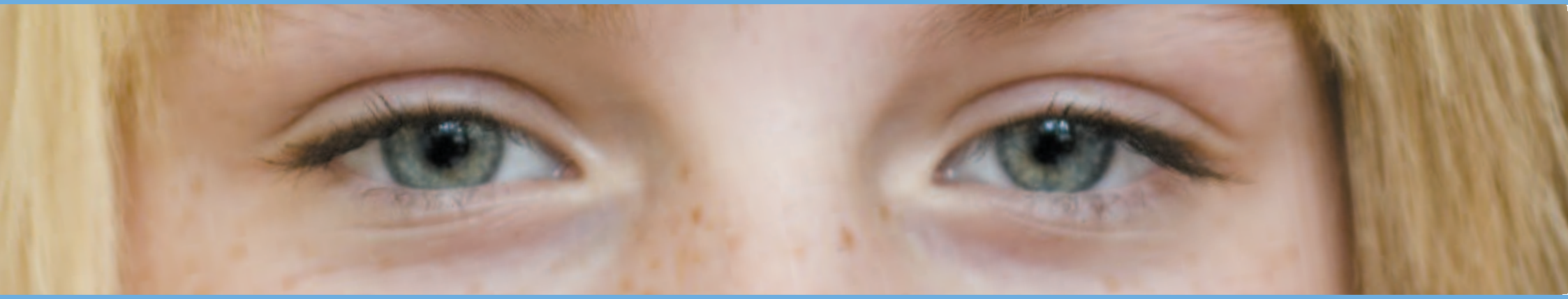
to consider

Why? How?

and What if?

Creativity & Problem Solving

smart science



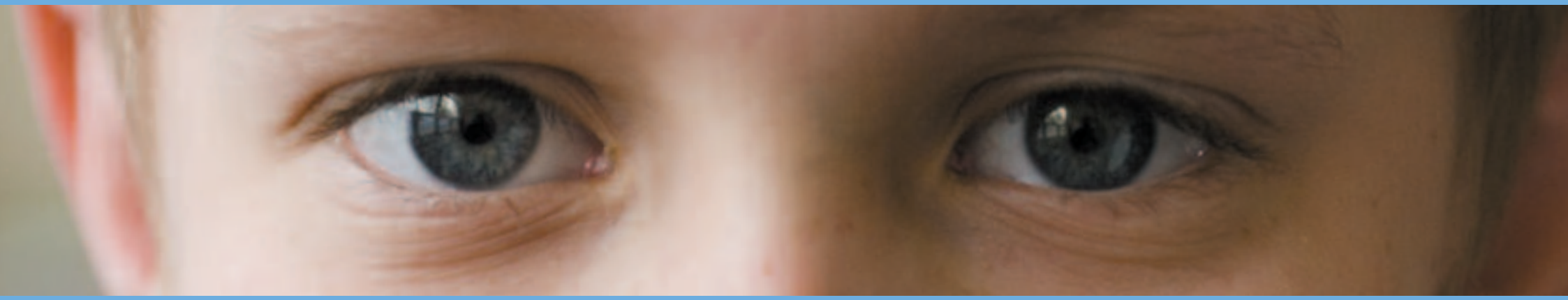
to use different

senses

to stimulate ideas

Creativity & Problem Solving

smart science



to take time to be

imaginative and curious

Creativity & Problem Solving

smart science

to make
decisions
after exploring
alternatives

smart grid
Assessment *for* Learning

Hedgehog Crime Scene

Thumbs Up
We were great at the task because...

Thumbs Sideways
We were good at the task because...

Thumbs Down
We were OK at the task because...

we described and explained how we thought things happened.

we considered 'What if...?' e.g....

we compared evidence from different sources, e.g....

we considered the value of different pieces of evidence.

we reached a possible conclusion by...

we...

Next time we will...

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Hedgehog Crime Scene

Creativity & Problem Solving: to consider Why? How? and What if...?

Investigative skills: to make comparisons between pieces of evidence

Activating Personal Capabilities in Science

Generic task
If... Then...

25 minutes

Learning Objective
Creativity & Problem Solving: to consider Why? How? and What if…?

Introducing the task 5 minutes
Explain that part of thinking creatively and solving problems involves us foreseeing what could happen in different situations. Reinforce that spending a few minutes thinking about 'If… then' or 'What if…?' questions before we tackle a problem can help us make good decisions and predict what might happen.

This task poses lots of different 'If… then…' scenarios which encourage the children to think about different possibilities. Tell the children that they should think freely and give a quick response to this task.

Running the task 20 minutes
You need: 'If… then…' cards, a partner or group.

1 Organise the children into pairs or teams of up to four.

2 Hand out some 'If… then…' cards.

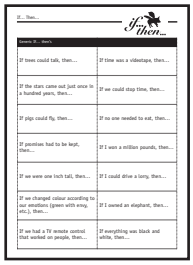
3 Tell the children that they have two minutes to ask 'What if…?' and suggest as many consequences (the 'then's) as possible for a variety of 'If… then…' scenarios.

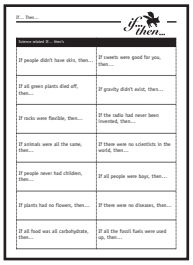
4 Ask them to think of other scenarios if they can.

Helpful Hints
This task is useful in developing the skill of prediction that is a necessary science process skill. If you wish to further develop this task, children could be encouraged to create stories or cartoon strips to illustrate their 'If… then…' thinking; or to extend the 'If… then…' thinking to a range of investigation scenarios.

*Some of the suggested ideas are from 'Imagine That… A Handbook of Creative Learning Activities for the Classroom'

Resources





Science embedded task
Hedgehog Crime Scene

1 hour

Learning Objectives

National Curriculum Sc1: 2i, 2j

Science Investigative Skills to make comparisons between pieces of evidence
to draw conclusions that are consistent with the evidence

Success Criteria

To be successful the children will:

- describe and explain how they think things happen
- consider 'what if…'
- compare evidence from different sources and consider their value
- reach a conclusion based on consideration of evidence and other people's views.

Introducing the task 5 minutes

Explain that this challenge is about thinking creatively to solve a problem (relate this back to the generic task). They will look at different sources of evidence and consider 'Why?' 'How?' and 'What if…?' As a team they will aim to reach a conclusion.

Running the task 40 minutes

1 Organise the children into teams of four.

2 Read through or hand out Hedgehog Crime Scene. Explain the task and set a time limit of 10 minutes. Use the Possible Cause of Injury Support Cards to help this process as appropriate.

3 After 10 minutes take feedback from the teams on how they think the injuries were caused, making a class tally chart showing the choices offered.

4 Then tell the children that extra evidence about the crime scene has been found. Read aloud or hand out Additional Evidence 1 and 2. Make sure everyone understands the new task. Set a time limit (15 minutes is suggested).

5 Later, take feedback from the teams, asking the children to explain and justify their conclusions as fully as possible. Decide as a whole class the most likely cause of injury. There's not one specific answer to this question. The evidence from his parents suggests that it is unlikely that Norman was run over or was attacked.

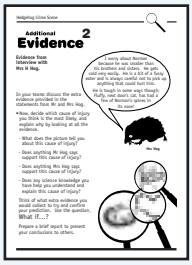
The fact that he is small and gets cold easily and is not a good swimmer suggests that he might have fallen in the pond. There are poisonous substances in the garden but the fact that Mrs Hog says he was careful not to pick up things that hurt him makes this cause of injury less likely.

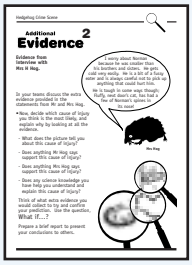
Reviewing the task 15 minutes

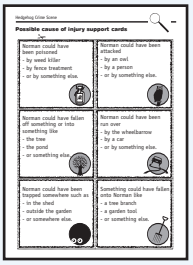
Review the task by emphasising the idea that in a complex situation like this, open questions, such as 'Why?' 'How?' and 'What if…?' can be useful to consider different possibilities in a problem-solving situation. They help us think more freely and creatively about the options. When new evidence is found it may affect people's first thoughts or conclusions and it is important to review this with an open mind and share views as a team.

Involve the children in reviewing their work and making an overall judgement about how well they used creative thinking to help solve the problem. Use the assessment for learning Smart Grid (see back cover).

Resources







Generic If... then's	
If trees could talk, then...	If time was a videotape, then...
If the stars came out just once in a hundred years, then...	If we could stop time, then...
If pigs could fly, then...	If no one needed to eat, then...
If promises had to be kept, then...	If I won a million pounds, then...
If we were one inch tall, then...	If I could drive a lorry, then...
If we changed colour according to our emotions (green with envy, etc.), then...	If I owned an elephant, then...
If we had a TV remote control that worked on people, then...	If everything was black and white, then...

Science related If... then's	
If people didn't have skin, then...	If sweets were good for you, then...
If all green plants died off, then...	If gravity didn't exist, then...
If rocks were flexible, then...	If the radio had never been invented, then...
If animals were all the same, then...	If there were no scientists in the world, then...
If people never had children, then...	If all people were boys, then...
If plants had no flowers, then...	If there were no diseases, then...
If all food was all carbohydrate, then...	If all the fossil fuels were used up, then...


WEED KILLER
SLUG PELLETS
SLUG OFF

Hedgehog Crime Scene

A family of hedgehogs had been visiting the garden for the last few months. Look at the picture of the hedgehog crime scene.

In your team make a list of all the possible causes of injury you can identify.

e.g.

What if... a tree branch fell on his head?

Discuss your list and decide on the two causes of injury that you think are most likely.

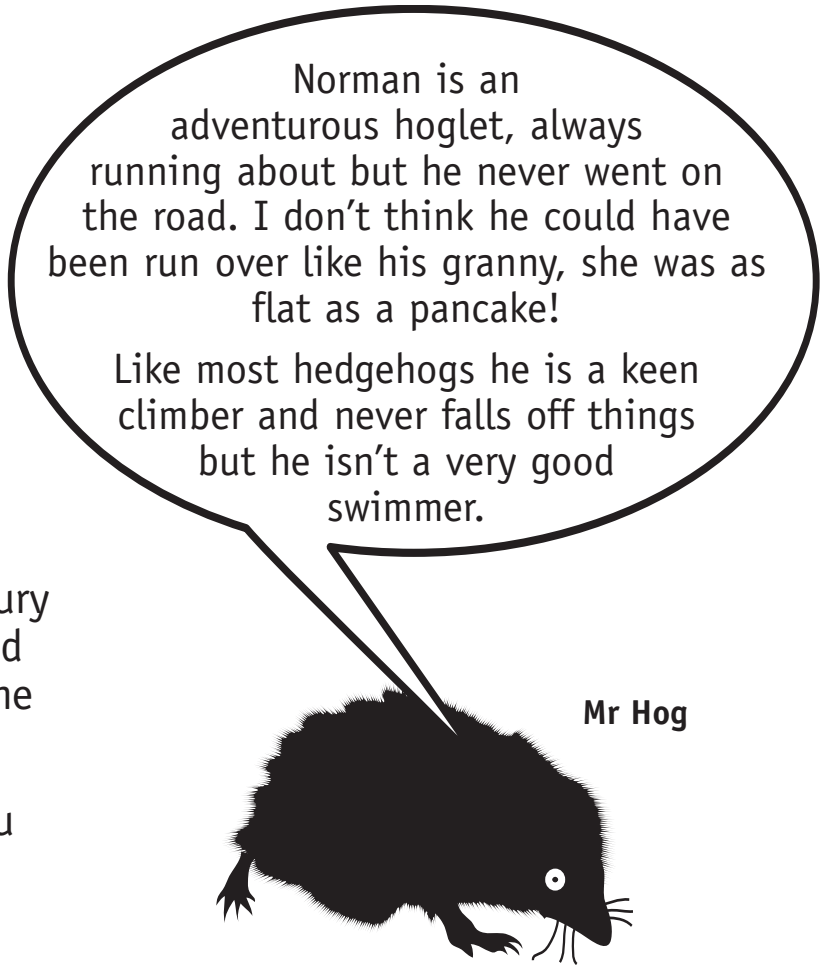
Mum, Dad, one of the young hedgehogs is on the lawn.

Is it dead?

No, it's not dead. **What if** it's just unconscious - **how** could that have happened?

Additional Evidence 1

Evidence from interview with Mr H Hog.



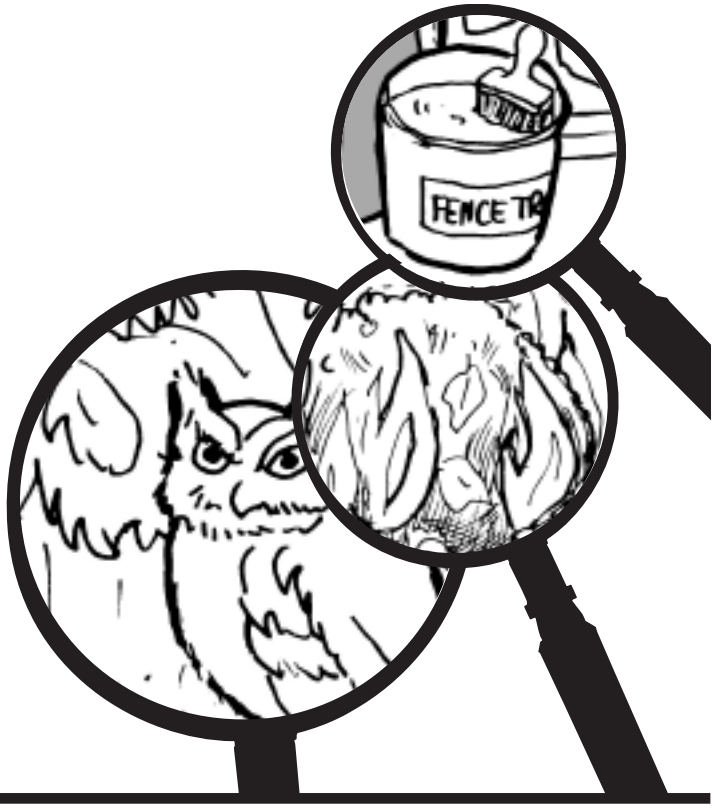
In your teams, discuss this extra evidence.

- Now, decide which cause of injury you think is the most likely, and explain why by looking at all the evidence.
  - What does the picture tell you about this cause of injury?
  - Does anything Mr Hog says support this cause of injury?
  - Does any science knowledge you have help you understand and explain this cause of injury?

Think of what extra evidence you would collect to try and confirm your prediction. Use the question,

What if...?

Prepare a brief report to present your conclusions to others.



Additional Evidence 2

Evidence from interview with Mrs H Hog.

I worry about Norman because he was smaller than his brothers and sisters. He gets cold very easily. He is a bit of a fussy eater and is always careful not to pick up anything that could hurt him.

He is tough in some ways though; Fluffy, next door's cat, has had a few of Norman's spines in its nose!

Mrs Hog

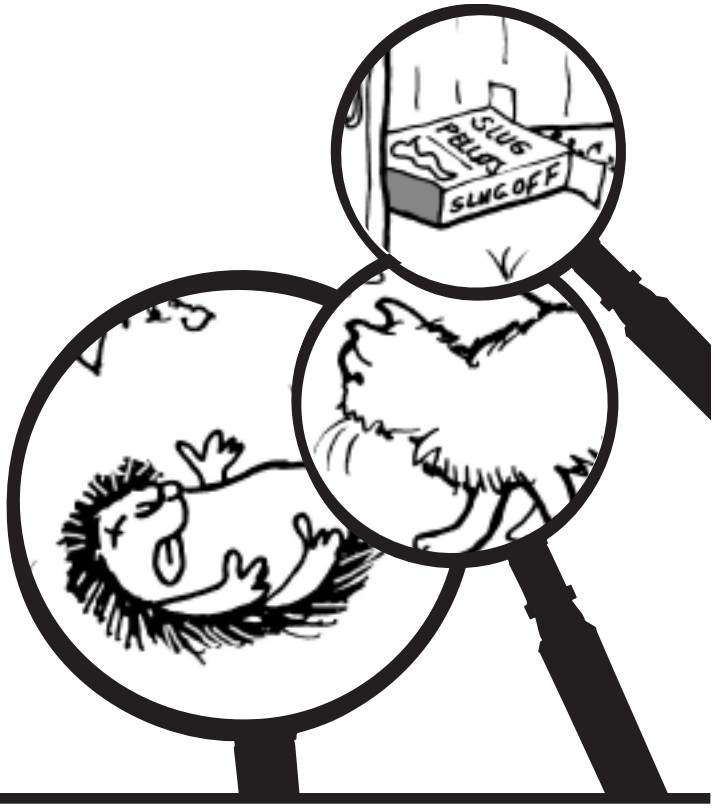
In your teams discuss this extra evidence.

- Now, decide which cause of injury you think is the most likely, and explain why by looking at all the evidence.
  - What does the picture tell you about this cause of injury?
  - Does anything Mrs Hog says support this cause of injury?
  - Does any science knowledge you have help you understand and explain this cause of injury?

Think of what extra evidence you would collect to try and confirm your prediction. Use the question,

What if...?

Prepare a brief report to present your conclusions to others.



Possible cause of injury support cards

Norman could have been poisoned

- by weed killer
- by fence treatment
- or by something else.

Norman could have been attacked

- by an owl
- by a person
- or by something else.

Norman could have fallen off something or into something like

- the tree
- the pond
- or something else.

Norman could have been run over

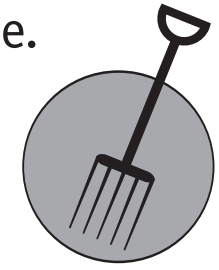
- by the wheelbarrow
- by a car
- or by something else.

Norman could have been trapped somewhere such as

- in the shed
- outside the garden
- or somewhere else.

Something could have fallen onto Norman like

- a tree branch
- a garden tool
- or something else.



Thumbs Up
We were great at the task because...

Thumbs Sideways
We were good at the task because...

Thumbs Down
We were OK at the task because...

we used our senses to...

we described the similarities and differences between objects, e.g....

we made sense of our observations and measurements, e.g....

we used scientific language to explain what we found, e.g....

we described the results we collected by...

we...

Next time we will...

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smart science

Sensory Science

Creativity & Problem Solving: to use different senses to stimulate ideas

Investigative skills: to make systematic observations and measurements

Activating Personal Capabilities in Science

Generic task

Feely Snap

30 minutes

Learning Objective

Creativity & Problem Solving: to use different senses to stimulate ideas

Introducing the task 5 minutes

Explain to the children that our ideas are influenced by things around us – what we see, hear, smell, touch and taste. Our senses are important when we are learning about something for the first time, or in helping us remember people, places or events. This task involves us using our sense of touch to play the game 'Feely Snap'. We will need to rely on what we feel, or even hear!

Running the task 25 minutes

You need: a stopwatch, at least 6 bags or boxes containing small household objects such as balls, pens, tea strainer, electric plug, sponge, children's toy, tea bag etc. **Note: two bags must have the same contents.**

1. Organise the children into six teams. Each team must have one bag.
2. Explore the bag by feeling the things inside and describing them to each other. It may help to make a few notes about what you are feeling.
3. Each team in turn should describe out loud to the whole class what they feel in the bag… remember, no looking… only feeling!
4. The other teams must listen and consider if they have the same items in their bag - use your notes as a check list. When a team is absolutely sure they have the same items, they should shout 'Feely Snap!'

Rule: If a team shouts 'Feely Snap' too soon they have to wait 1 minute before rejoining the game.

Helpful Hints

In a science context you may include: pieces of sand paper (coarse to smooth), plastic bottles containing different amounts of water, plastic bottles containing water at different temperatures, rubber bands of different thicknesses, pencils or pens of different lengths, balls of increasing diameter etc. In this case you would encourage the children to use scientific language relating to the texture, hardness, shape, weight, size etc.

Science embedded task
Sensory Science

1 hour

Learning Objectives

National Curriculum Sc1: 2f. Breadth of Study: 2a

Science Investigative Skills to make systematic observations and measurements

Scientific Communication to use appropriate scientific language to communicate ideas and explain things

Equipment

- a soft ball for each investigation team
- flooring materials e.g. carpet, cardboard, wood, tile etc
- metre sticks
- blindfolds

Success Criteria

To be successful the children will:

- describe similarities and differences between objects using different senses
- be able to make sense of and explain observations and measurements
- use a range of descriptive and scientific language.

Introducing the task 10 minutes

Read aloud 'Dans le Noir' (from Sensory Science). If appropriate, display on overhead or whiteboard. Discuss with the children some of the issues involved. How would fully sighted people cope with this situation? What senses could you use to replace sight? Ask the question, "Could using our senses, other than sight, help when making some observations?" (relate this to the generic task).

Running the task 40 minutes

1 Read aloud the instructions for the task, this challenges the children to plan and carry out an investigation which involves them in using their senses. Ask them to think about how their senses can help them to investigate the question.

2 Explain that it is likely the children have done this type of investigation before, but not quite like this because 2 people in the team will have to rely on all their senses other than sight – they will be blind folded!

3 As a class, discuss ideas for how the results could be collected, e.g. feeling for how high the bounce reaches, listening to the number of bounces the ball makes etc. Take time to discuss the idea of repeating tests to help ensure reliable results. Set a time limit for the teams (30 minutes is suggested).

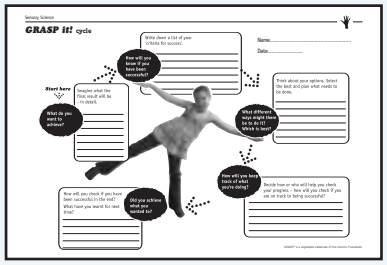
Note: It may be useful to use the GRASP-it cycle from 'Ice Cream Heaven' to structure the investigation plan.

Reviewing the task 10 minutes

Discuss with the children the results obtained. How did they use their senses to get the results? What problems did they encounter? How did they overcome them?

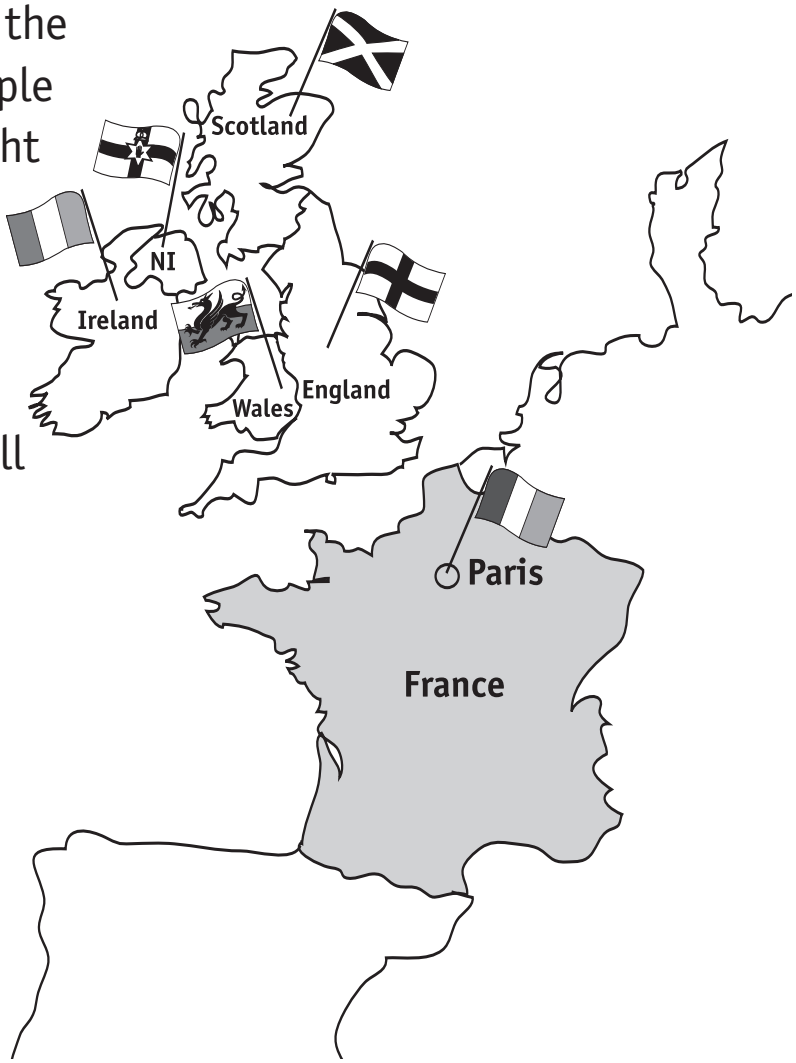
Focus on making sense of the observations and measurements, interpreting the results or patterns they have found using scientific vocabulary. Reinforce the meaning of particular language such as reliability, accuracy, unusual results etc. Once the discussion is complete, involve the children in making an overall judgement about how well they worked using the assessment for learning Smart Grid (see back cover).

Resources



Dans le Noir

Near the middle of Paris you can find an unusual restaurant called Dans le Noir. When you arrive all seems normal, but when you go into the dining room it is completely dark. You have to find and eat your food using sense of touch. Fortunately, the drinks are served in unbreakable glasses! The idea of the restaurant is to give sighted people a chance to find out what it might be like to be visually impaired. For some people the experience is difficult or even a bit scary, but others find that in the dark they can concentrate on the smell and taste of their food and they enjoy it more.



The sensory investigation

Your task is to plan and carry out an investigation to answer the question:

Which floor surface makes the ball bounce best?

But when you do this investigation two of your team will be blindfolded!

Make sure each member of your team has a job. These could be:

- Results taker – Blindfolded team member
- Ball dropper – Blindfolded team member
- Results recorder – Sighted team member
- Helper and guide – Sighted team member

Your results must be taken by one of the people wearing a blindfold.

Good luck!

GRASP it! cycle

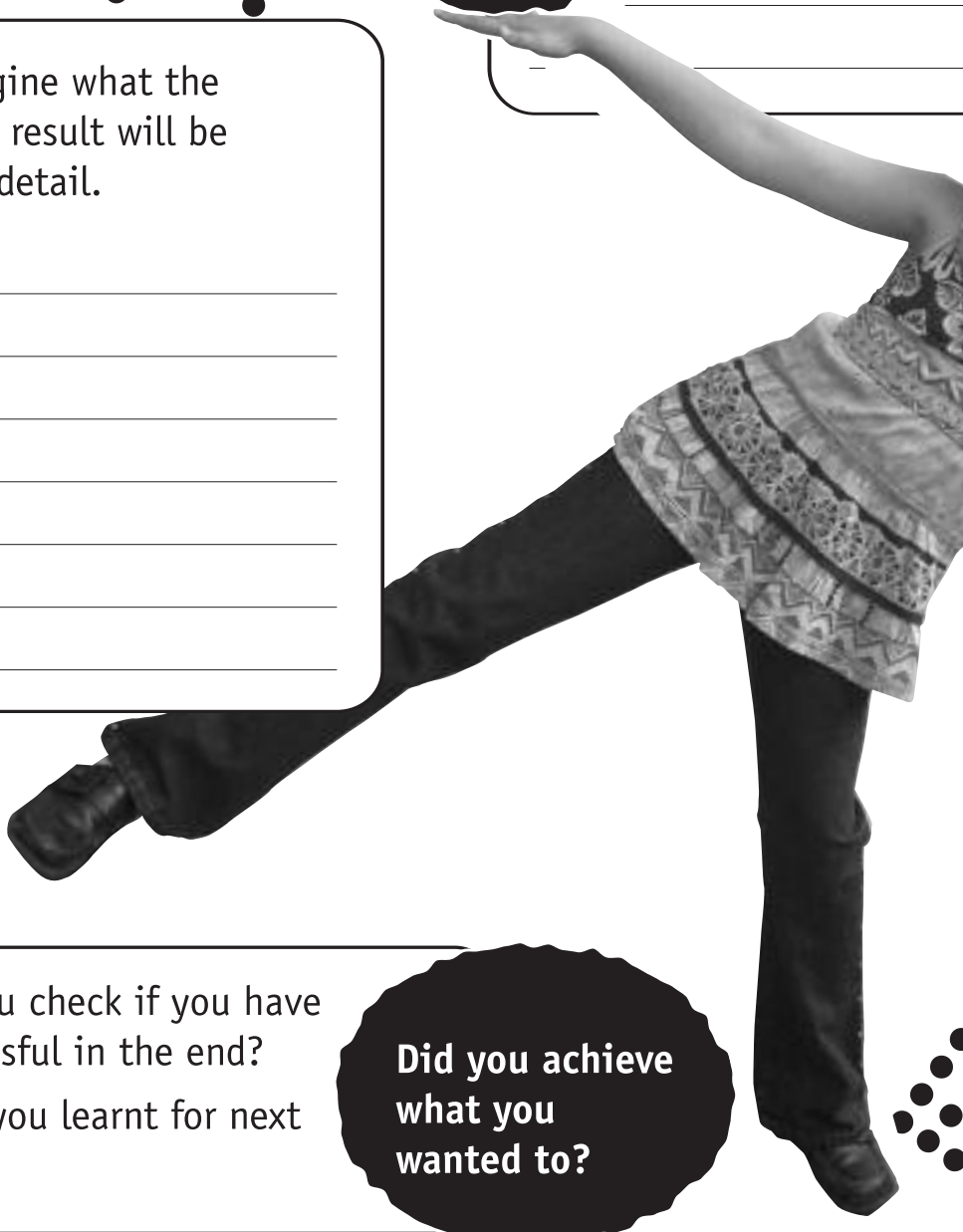
Start here

What do you want to achieve?

Imagine what the final result will be - in detail.

How will you know if you have been successful?

Write down a list of your 'criteria for success'.



Did you achieve what you wanted to?

How will you check if you have been successful in the end?

What have you learnt for next time?

Name.....

Date.....

What different ways might there be to do it? Which is best?

Think about your options. Select the best and plan what needs to be done.

How will you keep track of what you're doing?

Decide how or who will help you check your progress – how will you check if you are on track to being successful?

smart grid
Assessment *for* Learning

Thumbs Up
We were great at the task because...

Thumbs Sideways
We were good at the task because...

Thumbs Down
We were OK at the task because...

we came up with ideas and possibilities, e.g....

we asked questions, because these helped to...

we explored the consequences of our ideas from different viewpoints, e.g....

we started to explain our ideas using scientific knowledge and understanding e.g....

we...

Next time we will...

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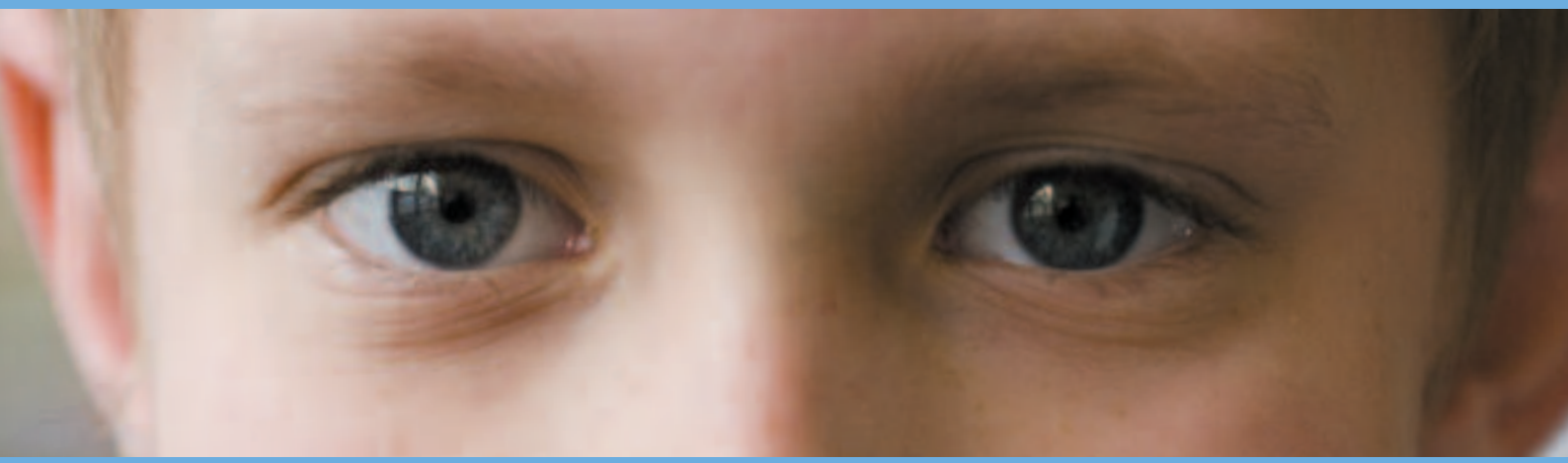


Rescue Venice

Creativity & Problem Solving: to take time to be imaginative and curious

Investigative skills: to think creatively to explain science ideas

Activating Personal Capabilities in Science

Generic task

Tall Stories

30 minutes

Learning Objective

Creativity & Problem Solving: to take time to be imaginative and curious

Introducing the task 5 minutes

Ask the children, "When was the last time you heard a really scary story? Or a really, really funny story?" Explain that many of the stories we hear are about beautiful characters, like Cinderella or Snow White. Some are about magic and mystery, like Harry Potter or the Lord of the Rings. Some stories tell us what is happening in our world, like stories on the news or in the paper.

Some of the most unusual stories are those that we imagine. This task encourages us to use our imagination so that we can build up elaborate, imaginative, captivating, exciting and unusual stories. How 'tall' will your story be?

Running the task 25 minutes

You need: a circle of friends, some story starters written on the board, a large soft ball.

1. The children should stand in a circle. Ask for a volunteer to start telling a story. They should hold the soft ball while they are talking. The volunteer tells the group the first line – try to be as imaginative as possible! Some ideas are given on the Tall Stories sheet.
2. Once they've said their line, the child throws the ball to anyone else in the circle and sits on the floor.
3. The person who catches the ball continues the story, adding another sentence that follows on. Try to keep the story moving quickly. When they have added their line, they throw the ball to another person and sit on the floor.
4. As the number of people gets to just a few, those still standing should try to bring the story to the end. The last person standing finishes it off.

What made the story unusual, interesting, captivating, funny, scary etc.?

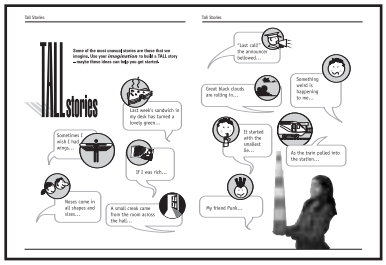
Helpful Hints

As the stories progress, encourage the children to introduce new characters, surprises or funny elements. See how long one story can keep going by letting everyone have two goes before sitting down.

Children should be able to pass if they wish to, in order to avoid being singled out or if they feel less confident. Helpers could be ready to begin or continue stories, where children find it difficult.

Reinforce that it is great to use our imagination; it's where all our new ideas come from. Where would we be if we didn't have ideas?

Resources



Science embedded task
Rescue Venice

1 hour

Learning Objectives

National Curriculum Sc1: 1a

Ideas and Evidence to think creatively to try and explain how things work and to establish links between causes and effects

Success Criteria

To be successful the children will:

- come up with ideas and possibilities
- ask questions
- explore the consequences of an action from different viewpoints
- explain ideas using scientific knowledge and understanding.

Introducing the task 10 minutes

Ask the children, "What does it mean to be imaginative and curious?" "What helps you to come up with lots of ideas and suggestions?" Reinforce that ideas often help us to be imaginative and curious about things around us (relate this back to the generic task).

Running the task 40 minutes

1 Organise the children into teams of four.

2 Read aloud Information Sheet 1 and 2 and ask the teams to make sense of and summarise the information.

3 Read aloud Instruction Sheet checking that the children understand the task. Give out Response Sheet that will be used throughout the task.

4 Ask the children to think about as wide a range of ideas as possible and list these on the Response Sheet. (Use Rescue Venice Support Cards 1, if appropriate). After a few minutes they should bring their ideas together, initially in pairs and then as a whole team.

5 Teams select and record their best idea – which may involve voting on one, linking ideas or choosing the most 'imaginative' or 'scientific'. As a teacher, try not to endorse only the strongest scientifically appropriate ideas.

6 Use Rescue Venice Support Cards 2 to encourage the children to link some of their ideas to science topics. Ask them to explain and record the scientific basis of how their 'best' idea could work. Encourage them to think about what other things they will need to know or find out, if their idea is to move on.

Specific detail is not expected but they should try to identify some key science ideas involved, e.g. if they are considering:

- supporting buildings, they should consider the properties of materials
- propping buildings up, they should consider that there will be certain forces acting on the materials.

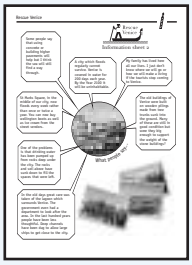
As an extension:

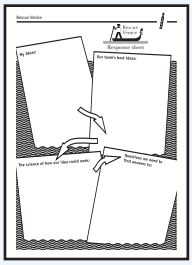
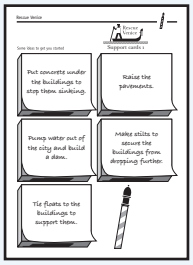
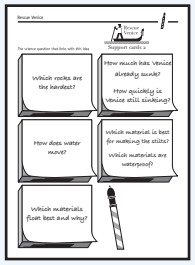
Ask the children to briefly discuss the consequences and potential impact of their idea on the three characters on the Instruction Sheet. Discuss the different viewpoints and role play the views of different characters when presented with the team's idea.

Reviewing the task 10 minutes

Ask the children: Do they think they were imaginative? What helped to produce a wide range of ideas? Can the science they know be used to explain how some of the ideas might work? Reinforce that no actual solutions to Venice's problems have yet been found, and that often many ideas will eventually be considered before successful action is taken. Involve the children in making an overall judgement about how they worked on the task using the assessment for learning Smart Grid (see back cover).

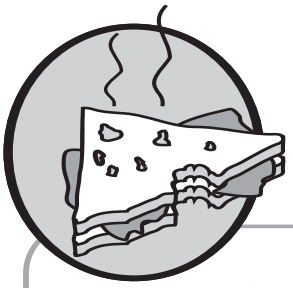
Resources

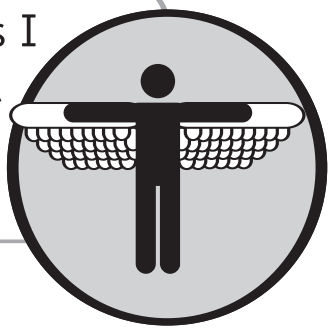
TALL stories

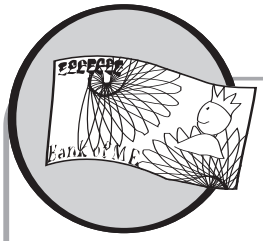
Some of the most unusual stories are those that we imagine. Use your *imagination* to build a TALL story – maybe these ideas can help you get started.



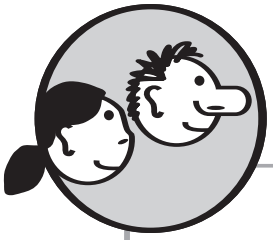
Last week's sandwich in my desk has turned a lovely green...

Sometimes I wish I had wings...



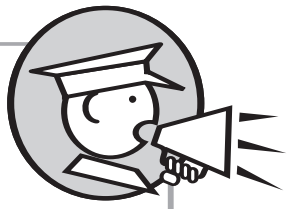


If I was rich...

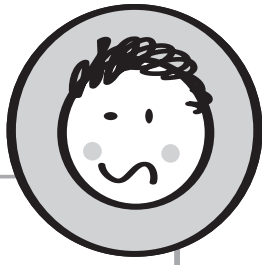


Noses come in all shapes and sizes...

A small creak came from the room across the hall...

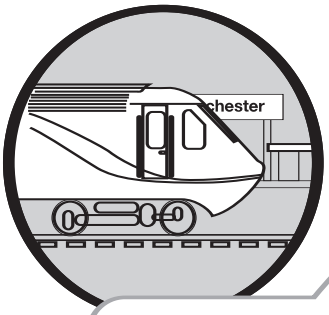


"Last call!" the announcer bellowed...



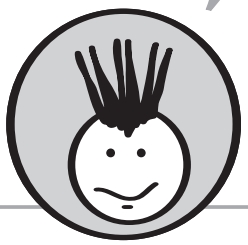
Something weird is happening to me...

Great black clouds are rolling in...



As the train pulled into the station...

It started with the smallest lie...



My friend Punk...

Rescue Venice

Information sheet 1

The sinking city of Venice

The beautiful city of Venice has been sinking very slowly for hundreds of years, but in recent years it has started to sink more quickly. In the last 30 years it has sunk by 30cms!

As well as the city sinking, the waters around Venice are rising. People think this is because global warming is causing sea levels to rise.

Venice is in serious trouble.

Rescue Venice

Information sheet 2

Some people say that using concrete or building higher pavements will help but I think the sea will still find a way through.

A city which floods regularly cannot survive. Venice is covered in water for 200 days each year. By the Year 2100 it will be uninhabitable.

My family has lived here all our lives. I just don't know where we will go or how we will make a living if the tourists stop coming to Venice.

St Marks Square, in the middle of our city, now floods every week rather than once or twice a year. You can now buy wellington boots as well as ice cream from the street vendors.

The old buildings of Venice were built on wooden pilings made from tree trunks sunk into the ground. Many of these are still in good condition but were they big enough to support the weight of the stone buildings?

What people say...

One of the problems is that drinking water has been pumped up from rocks deep under the city. The rocks and soil above have sunk down to fill the spaces that were left.

In the old days great care was taken of the lagoon which surrounds Venice. The government even had a department to look after the area. In the last hundred years people have been less thoughtful. Deep channels have been dug to allow large ships to get close to the city.

Rescue Venice

Venice will continue to be drowned by floods if someone doesn't come up with a really good idea to save it.
Can you help save Venice?

Instruction sheet

1 By yourself come up with as many ideas as you can. It's important you don't throw any ideas away, even those that may seem silly!

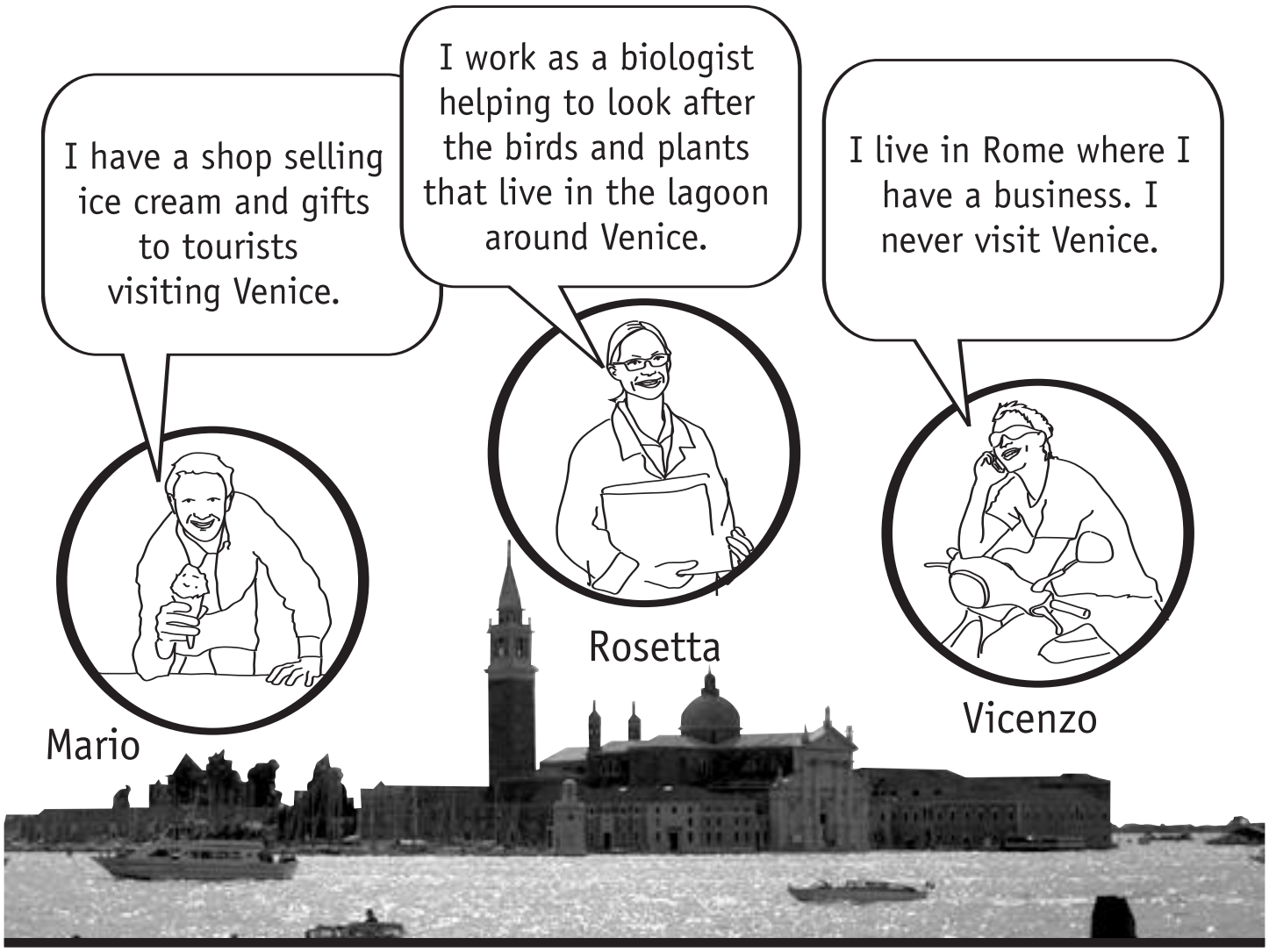
Ask yourself:

- How could the people in Venice stay dry?
- How could the buildings in Venice be stopped from sinking?
- How could the water level be changed to stop Venice flooding?

2 Now share your ideas in a pair. Decide which you think is your best idea.

3 Now share your ideas as a team. Choose what you think is your best idea. Using your science knowledge and understanding make some notes on your Response Sheet to explain how it could work.

4 In your team, discuss and decide what these 3 people might think about your idea.



Rescue Venice

Response sheet

My Ideas:

Our team's best ideas:

The science of how our idea could work:

Questions we need to find answers to:

Rescue Venice

Some ideas to get you started

Support cards 1

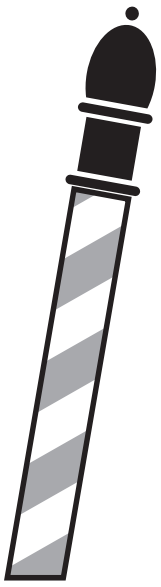
Put concrete under the buildings to stop them sinking.

Raise the pavements.

Pump water out of the city and build a dam.

Make stilts to secure the buildings from dropping further.

Tie floats to the buildings to support them.



Rescue Venice

Support cards 2

The science question that links with this idea

Which rocks are the hardest?

How much has Venice already sunk?

How quickly is Venice still sinking?

How does water move?

Which material is best for making the stilts?

Which materials are waterproof?

Which materials float best and why?

smart grid
Assessment *for* Learning

Professor Bill

Thumbs Up
We were great at the task because...

Thumbs Sideways
We were good at the task because...

Thumbs Down
We were OK at the task because...

we considered different possibilities for what caused the problems, e.g....

we came up with alternatives of our own, such as...

we shared information, ideas and opinions to make a decision. We did this by...

we came up with a suitable question and a prediction for our investigation, e.g....

we described how to do the investigation, e.g....

we gave creative suggestions about how the company could solve their problem, e.g....

we...

Next time we will...

COMINO FOUNDATION

centre for science education

smart science

Professor Bill

Creativity & Problem Solving: to make decisions after exploring alternatives

Investigative skills: to ask questions that can be investigated scientifically

Activating Personal Capabilities in Science

Generic task
Call My Bluff

20 minutes

Learning Objective
Creativity & Problem Solving: to make decisions after exploring alternatives

Introducing the task 5 minutes
Explain to the group that decisions are made every day. Some decisions are based on gut reactions (when it just feels right), and others are made because we know enough about something to help us decide. Every decision we make comes from having choices – shall we do this? shall we do that? what will happen if I do this? what will happen if I do that?

In this task you will be making lots of decisions about the meaning of unusual words. Do you decide to go with a 'gut reaction' or do you make a decision because of what you already know? Whichever way, it's important to think about the choices or alternatives you have and to think and discuss the decisions you are making and why.

Running the task 15 minutes
You need: Meaning cards.

1 Organise the children into teams of four or five (or this could be done as a whole class). Each team must choose two children: one to be the card holder and the other to have the answer sheet.

2 The card holder should pick a card, read the word and the possible meanings to the team and place it word-up in front of them on the table.

3 The rest of the team should consider the meanings they are given. They should discuss and make a decision about which they think is the most likely meaning. They should explain why they are choosing one meaning over another.

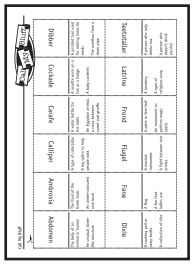
4 When the decision is made, the person with the answers reveals the correct meaning.

5 After five cards choose a new card holder and have another go.

Helpful Hints
Provide time limits for decision if teams labour over making their choices.

Word	Correct meaning
Abdomen	The belly of an animal or human
Ambrosia	The food of the Greek Gods
Calliper	A leg splint to help people walk
Carafe	A water bottle for the table
Cockade	A rosette worn on a hat as a badge
Dibber	A pointed tool used for making holes for seeds
Dixie	A cooking pail or camp kettle
Fane	A flag
Flugel	A musical instrument
Frond	A palm or fern leaf
Latrine	A lavatory
Teetotaller	A person who doesn't drink alcohol

Resources



Science embedded task
Professor Bill

1 hour

Learning Objectives

National Curriculum Sc1: 2a, 2c

Investigative Skills to ask questions that can be investigated scientifically
to think about what might happen, what kind of evidence to collect and what equipment to use

Success Criteria

To be successful the children will:

- consider different possibilities
- share information, ideas and opinions to help make decisions
- come up with a suitable question and prediction for the investigation
- describe a suitable approach for carrying out the investigation.

Introducing the task 15 minutes

Discuss with the children the idea that solving problems can involve thinking creatively about different possibilities and exploring different solutions. Working as a team to share information, ideas and opinions can be helpful before a final decision is made (relate this back to the generic task).

Running the task 30 minutes

1 Organise the children into teams of four.

2 Read aloud the e-mail message and task description from Professor Bill. Tell the children that their challenge is to think about and decide what the causes of the problem may be and to decide which is the most likely cause.

3 Read or hand out Professor Bill's Problems. The problems could be allocated to particular teams or the children could make a choice.

4 The children are asked to devise a question that they could investigate to confirm the cause of the problem. They need to predict what will happen and describe how they would carry out the investigation. Use the Investigation Question Support Cards to help if appropriate.

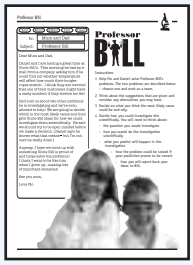
5 Encourage them to explore the alternatives they are provided with, but also to consider any ideas of their own. As an extension, children could think about ways in which the companies may resolve their problems. If written evidence is required, teams should produce a summary as a paragraph for an email, letter or poster.

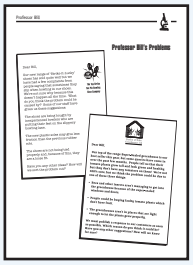
Reviewing the task 15 minutes

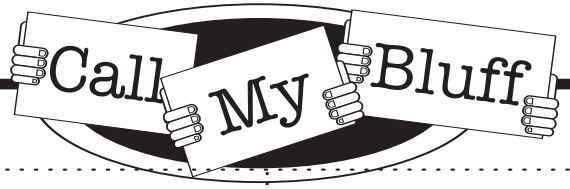
Discuss with the children their views and decisions on the most likely cause of each problem, and the reasons for their choices. What alternatives did they explore? Ask them for examples of the investigation questions they identified and ask them to describe how their investigations would be carried out. What solutions could they suggest to the problems Bill is faced with?

Involve the children in reviewing the task using the assessment for learning Smart Grid (see back cover).

Resources







Abdomen	Ambrosia	Calliper	Carafe	Cockade	Dibber
The belly of an animal or human An unusual dome-like structure	The food of the Greek Gods An amber-coloured rose bush	A type of caterpillar A leg splint to help people walk	A water bottle for the table An Egyptian animal, a cross between camel and giraffe	A rosette worn on a hat as a badge A baby cockerel	A pointed tool used for making holes for seeds The overflow from a drain pipe
Dixie	**Fane**	**Flugel**	**Frond**	**Latrine**	**Teetotaller**
A cooking pail or camp kettle A collection of dice	A flag A fan that ladies use	A musical instrument A fight between two armies	A palm or fern leaf An instrument to perform magic spells	A lavatory A type of religious song	A person who only drinks tea A person who doesn't drink alcohol

Send | Attach | Address | Font | Colour

To: Mum and Dad

Subject: Professor Bill

Dear Mum and Dad,

Daniel and I are having a great time at Uncle Bill's. This morning he had an e-mail from a company asking him if he could find out whether temperature will affect how much their bungee ropes stretch. I think they are worried that one of their customers might have a nasty accident if they stretch too far!

He's told us about two other problems he is investigating and we're even allowed to help! We are going to decide which is the most likely cause and then give Uncle Bill ideas for how we could investigate them scientifically. He said we should try to be open minded before we make a decision. (Daniel says he knows what that means – but I'm not sure he really does!)

Anyway, I hope we come up with something Uncle Bill is proud of and helps solve the problems! I think I want to be like him when I grow up...making lots of important decisions!

See you soon,

Love Flo

Professor BILL

Instructions

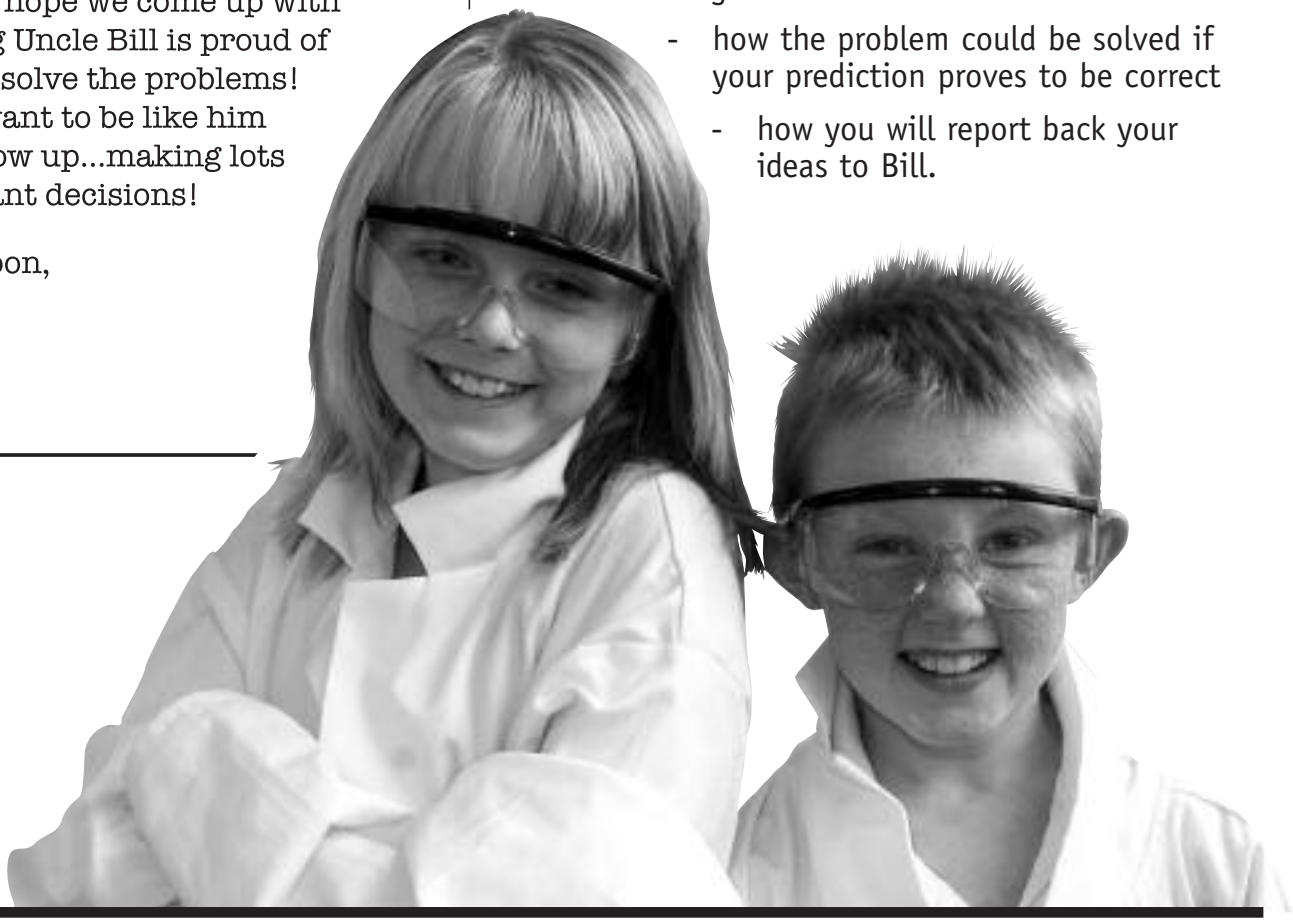
1 Help Flo and Daniel solve Professor Bill's problems. The two problems are described below – choose one and work as a team.

2 Think about the suggestions that are given and consider any alternatives you may have.

3 Decide on what you think the most likely cause could be and why.

4 Decide how you could investigate this scientifically. You will need to think about:

- the question you would investigate
- how you would do the investigation scientifically
- what you predict will happen in the investigation
- how the problem could be solved if your prediction proves to be correct
- how you will report back your ideas to Bill.



Professor Bill's Problems

Dear Bill,

Our new range of 'Strike-it-Lucky' shoes has sold quite well but we have had a few complaints from people saying that sometimes they slip when bowling in our shoes. We're not sure why because this doesn't happen all the time. What do you think the problem could be caused by? Some of our staff have given us these suggestions:

The shoes are being bought by inexperienced bowlers who are putting their feet on the slippery bowling lane.

The new plastic soles may give less friction than the previous rubber sole.

The shoes are not being tied properly and, because of this, they are a loose fit.

Have you any other ideas? How will we sort the problem out?

TOP STRIKE

The Top Strike
Ten Pin Bowling
Shoe Company

Garden of Eden
Greenhouses Ltd

Dear Bill,

Our top of the range Super-Sealed greenhouse is our best seller this year, but some queries have come in over the past few months. People tell us that their tomato plants grow tall and look green and healthy, but they don't have any tomatoes on them! We're not 100% sure, but we think the problem could be due to one of these three things:

- **Bees and other insects aren't managing to get into the greenhouse because of the super-sealed windows and doors.**
- **People could be buying faulty tomato plants which don't have fruit.**
- **The greenhouses aren't in places that are light enough to let the plants grow properly.**

We must publish a response to our customers as soon as possible. Which reason do you think it could be? Have you any other suggestions? How will we know for sure?

Investigation question support cards

When we change

_____

what will happen to

_____

_____

_____?

Which is the best

_____

_____

_____?

How does

_____

affect

_____

_____

_____?

How many different kinds of

_____

_____

_____

are there?

How can we make

_____

_____

_____?

How quickly does

_____

_____

_____?