The National Strategies
Secondary

Assessing pupils' progress in science at Key Stage 3: Standards File

Pupil M

department for children, schools and families

QCA Qualifications and Curriculum Authority

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Pupil M

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Pupil M Year 7 Secure level 3 Science Standards File

Pupil profile

Pupil M's teacher uses a particularly varied range of evidence, taking advantage of good IT resources, and these allow Pupil M to express himself and develop his communication skills. The evidence here reveals that Pupil M has made progress further in AF1 than elsewhere, with his achievements varying from low level 3 to some secure level 4. An overall judgement places him at secure level 3.

The evidence

1. Investigating the runniness of oil
2. Modelling particles using animations
3. Animal adaptations
4. Reporting on cyclone Sidr
5. Constructing spaghetti bridges
6. Reproduction

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1. Investigating the runniness of oil

Assessment focuses

AF1, AF3, AF4, AF5

Context

Pupils were working on the effects of temperature on the physical behaviours of materials, so that they could experience a range of practical investigations and could begin to move towards particle explanations. In this activity, the teacher asked them to investigate whether temperature made a difference to the flow rate of oil through a funnel. The teacher gave them the equipment they needed and supplies of oil at different temperatures. Some photos were taken and the teacher then asked the pupils to use comic strip software to create a sequential account of the activity, including:

- what they were trying to find out;
- what they controlled and changed;
- what they measured but did not control;
- the equipment used;
- what they did;
- their results;
- a scientific explanation of the results.

The pupils also produced bar charts to show their results.

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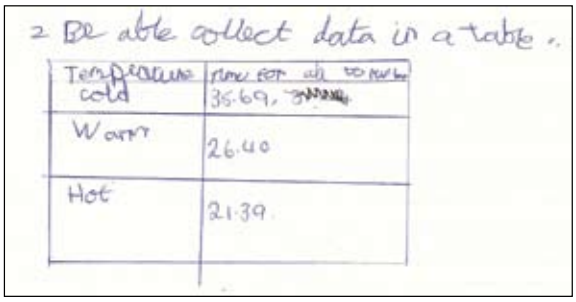
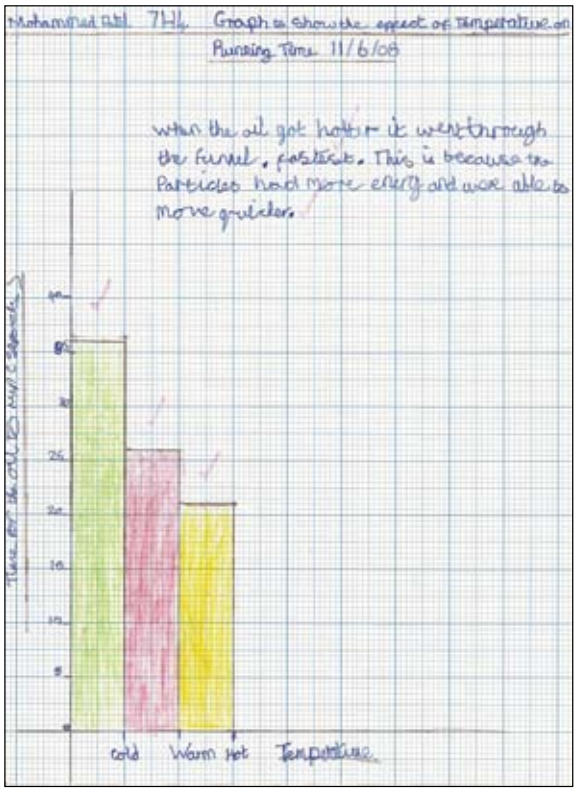
Pupil M's work


2 Be able collect data in a table.

Temperature	time for oil to run through
cold	35.69
Warm	26.40
Hot	21.39



Teacher's notes

AF1

With guidance, Pupil M linked the idea that particles move faster in hotter oil with the faster flow, and with this help he has used a model to write an explanation of a phenomenon. However, he was not yet using a particle model independently to explain observed behaviour.

AF3

The teacher provided the formats of the table and bar chart to the pupils, and with these prompts Pupil M successfully presented data clearly in more than one way. The combination of the briefing given and the use of comic strip software allowed him to structure his work to describe how he carried out the investigation and what he found out.

AF4

Pupil M was able to use the stop clock, reading out the numbers. However, he was uncertain about how to write the values for the times into his table and so this was done for him. He followed instructions to wear eye protection.

AF5

Pupil M correctly identified the simple pattern in the data in the table and in his bar chart, making a good statement of what he had found out in the investigation ("Hot oil went through fastest") and providing an explanation linking cause and effect ("Particles in hot oil move faster").

Next steps

- Investigation of expansion of a gas as a further example of temperature-dependent behaviour, again using comic strip software to record the work.
- Investigating changes of state, and development of animations to show particle behaviours in different states of matter.

Assessment commentary

The use of the comic strip software provides Pupil M with a format that he uses to structure his work successfully. He uses straightforward scientific language to communicate his aim, his procedure, his results and his conclusion. There is the beginning of a linkage of cause and effect – in the statements that "Particles in hot oil move faster" and especially in "This is because the particles had more energy and were able to move quicker", although he is not yet confident in the use of particle ideas.

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2. Modelling particles using animations

Assessment focuses

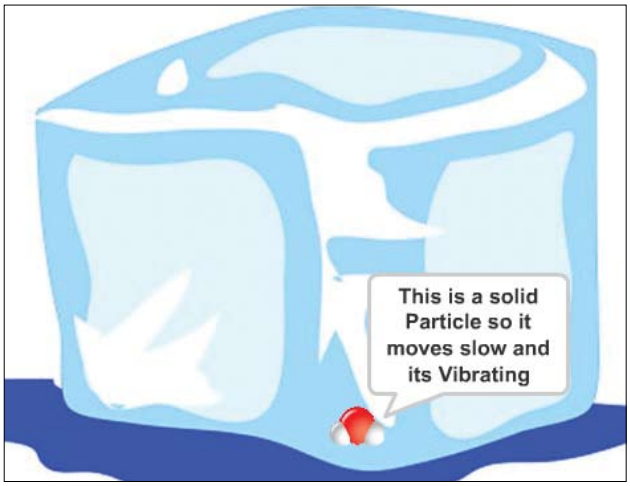
AF1, AF3

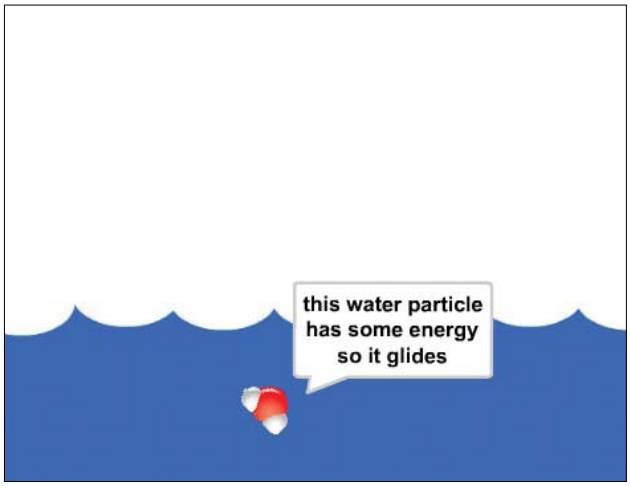
Context

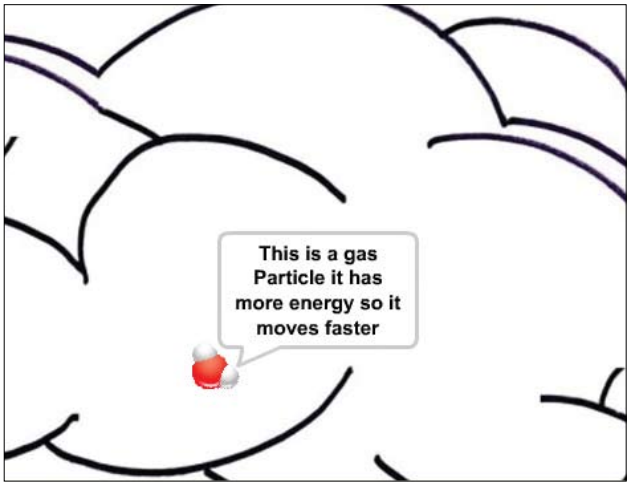
The teacher asked pupils to produce an animation to describe and explain the arrangement and movement of particles in solids, liquids and gases. The animations were produced using a freely available software download which uses sets of instructions called 'scripts'.

The activity was presented in a very structured way. Pupils were presented with three existing particle scripts. They decided which scripts represented which type of particle, and then selected appropriate backgrounds for each animation, from a library of available images, showing ice, water or steam. They chose sound files to fit the animations, with slow, medium or fast beats. Finally, pupils added their own speech bubble texts, using their own words to link the particle behaviour to the state of matter.

Pupil M's work







Teacher's notes

AF1

Pupil M used a model of particles in solids, liquids and gases, correctly linking the state with the motion and energy of the particles. He also used appropriate musical beats in the added sound files.

AF3

He used some simple scientific language such as 'energy' and 'vibrating' to communicate scientific ideas.

Next steps

- Comparison of the animated explanations produced here with pictorial explanations found in published resources, and discussion of the different kinds of images used.
- Role play on the arrangements and behaviour of particles in the three states.

Assessment commentary

Pupil M shows by his correct selection of background imagery (solid, liquid or gas), by selection of the pace of music and by his text, that he has understood and can use simple particle ideas and relate them to observed behaviour of material in the three states. He can also use appropriate forms of scientific language to communicate his ideas.

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3. Animal adaptations

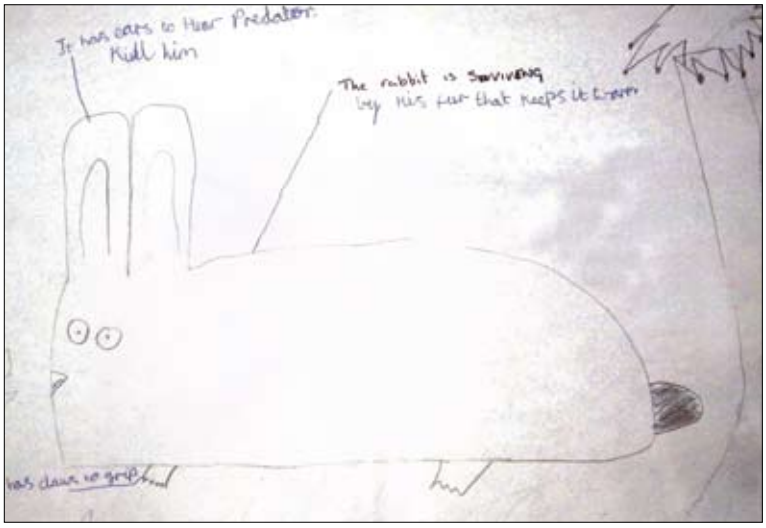
Assessment focuses

AF1, AF3

Context

The teacher asked pupils to show how an animal, chosen independently, could survive in its normal habitat. Pupil M decided to describe some of the adaptations of a rabbit.

Pupil M's work



Teacher's notes

AF1

Pupil M responded to given ideas to describe the adaptations of an animal in a particular habitat.

AF3

Pupil M used some simple scientific language such as 'surviving' and 'predator' to communicate scientific ideas.

Next steps

- Matching exercises on animals and their habitats
- Model a fictitious animal suited to a particular habitat, e.g. an annotated drawing or 3-D representation.

Assessment commentary

Pupil M provides a small number of examples of adaptations. He recognises that the rabbit is a potential prey and that its specialised ears increase its chances of survival. He also explains that fur and claws have survival value.

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4. Reporting on cyclone Sidr

Assessment focuses

AF1, AF2, AF3

Context

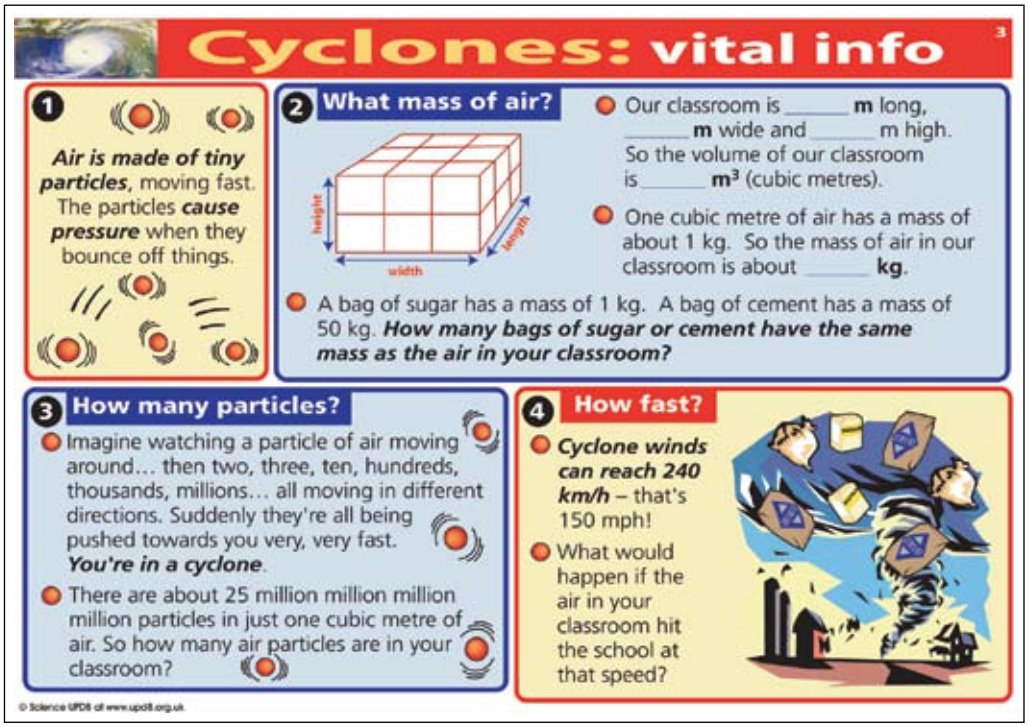
The teacher asked pupils to produce a brief news report on cyclone Sidr that struck Bangladesh in November 2007. This was based on an 'UPD8' resource, 'Cyclone' (http://www.upd8.org.uk/), with additional use of other newspaper reports and picture resources.

Pupils worked in groups of three to script their reports, and were asked to include reference to particle behaviour.

Pupil M acts as a scientist being interviewed.

Reports were filmed against a blue-screen, and the resulting videos were then edited using Windows MovieMaker using a blue-screen transition. This placed the pupils against a news programme and Bangladesh backgrounds to add authenticity.

UPD8 resource



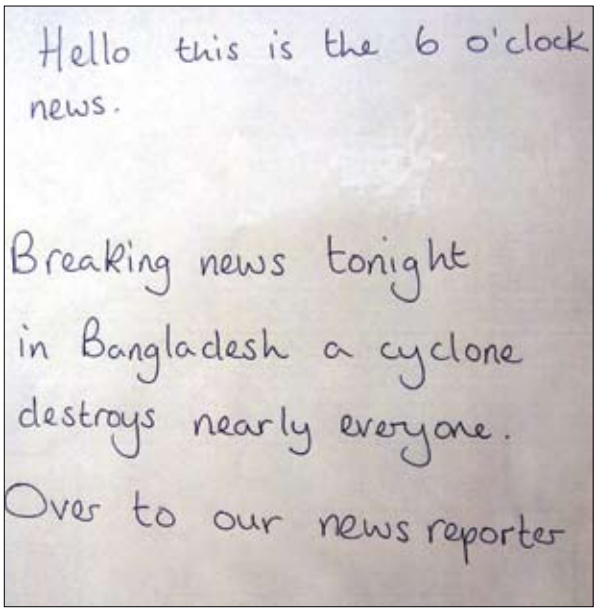
Pupil M's work

Background image, IR Photograph © Islamic Relief Worldwide. Used with kind permission.

Transcript

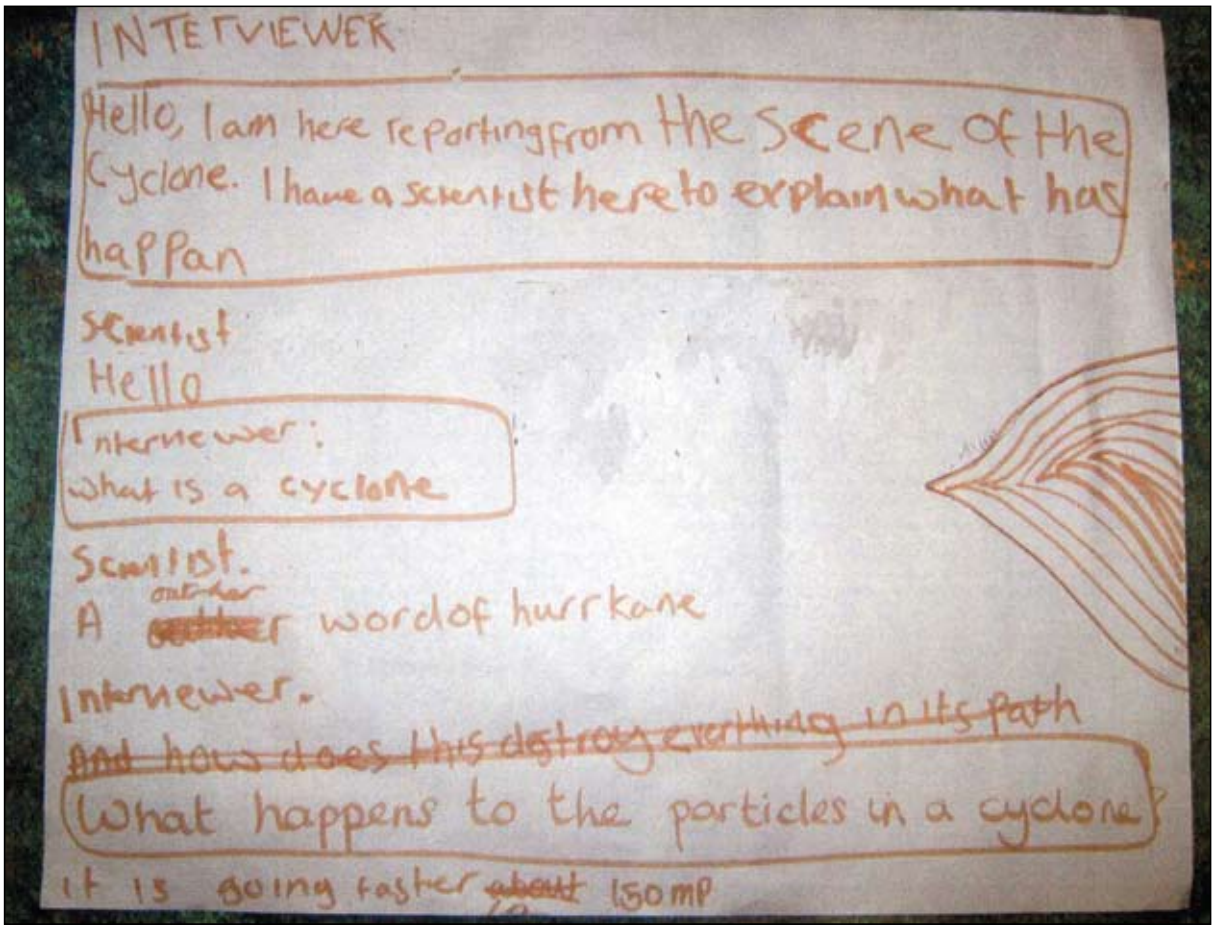
Pupil X:	Hello this is the six o'clock news. Breaking news tonight. In Bangladesh a cyclone destroyed nearly everyone. Over to our news reporter at the scene.
Pupil Y:	Hello, I am here reporting from the scene of the cyclone. I have a scientist here to explain what has happened.
Pupil M:	Hello.
Pupil Y:	What is a cyclone?
Pupil M:	Uh… another word.. of.. hurricane.
Pupil Y:	What happen to the particles in a cyclone?
Pupil M:	It is going fast, uh… 150 miles per hour
Pupil Y:	So how fast and this destroying everything into.. in.. in.. its path?
Pupil M:	There is a big force to strike away everything.
Pupil Y:	So how fast can these air particles move?
Pupil M:	Uh... 150 miles per hour
Pupil Y:	And what problem… problems now face the people living here?
Pupil M:	No home - no medicine - no tent. Uh… no food - no water - no clothes.
Pupil Y:	Thank you and now it's back to the studio.
Pupil X:	Thank you. That's all for now. More on this story at nine o'clock.

The pupils' scripts also act as transcripts. The script for one of the pupils was written down by a teaching assistant.


Hello this is the 6 o'clock news.

Breaking news tonight in Bangladesh a cyclone destroys nearly everyone.

Over to our news reporter


INTERVIEWER

Hello, I am here reporting from the Scene of the Cyclone. I have a scientist here to explain what has happan

Scientist

Hello

Internewer:

what is a cyclone

Scientist.

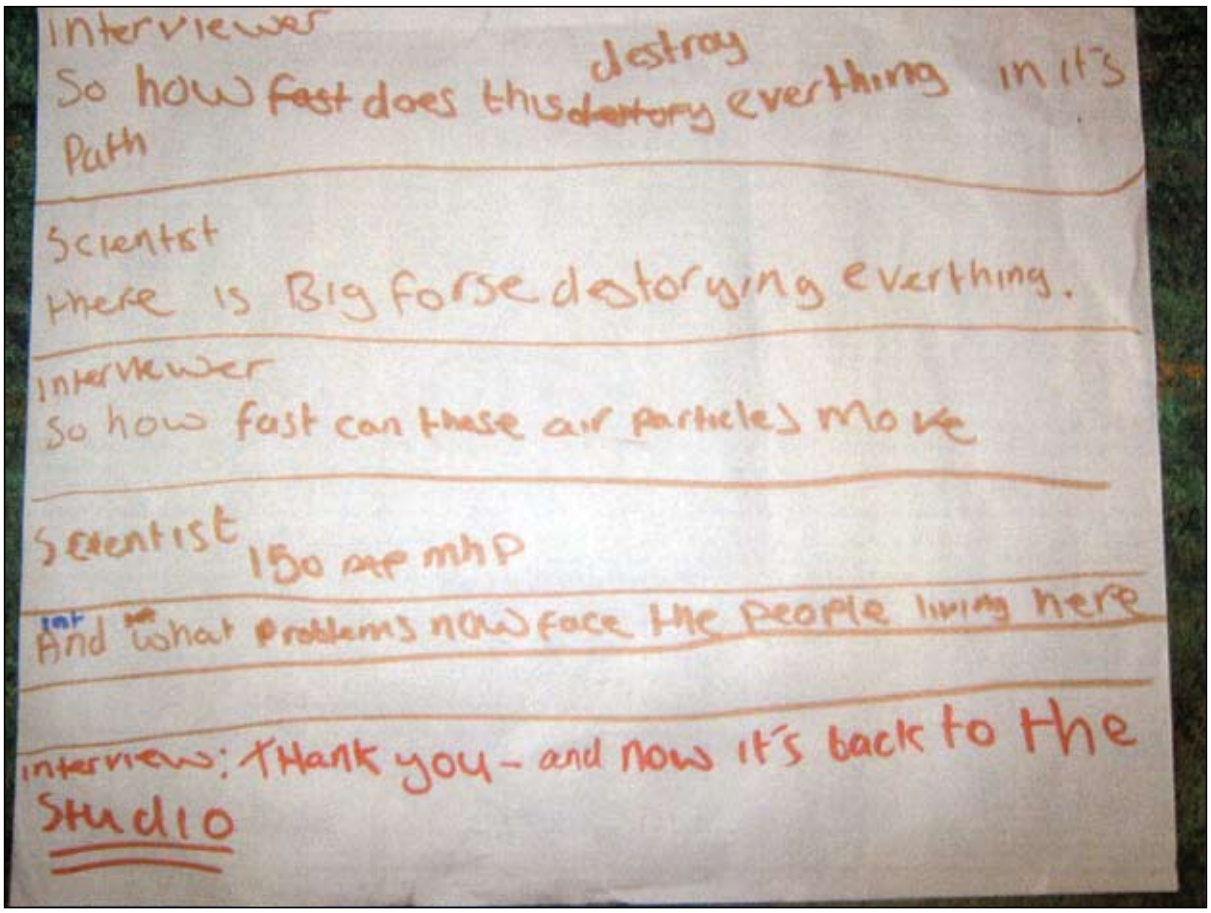
A ~~other~~ outher word of hurrkane

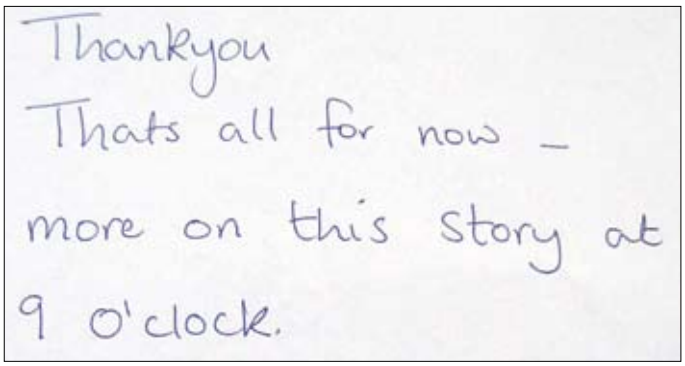
Internewer.

~~And how does this destroy everthing in its path~~

What happens to the particles in a cyclone

it is going faster ~~about~~ 150mp





Teacher's notes

AF1

Pupil M referred to the movement of air particles in a cyclone and how it can cause damage due to its speed and force. He began to identify changes related to simple scientific ideas.

AF2

Pupil M understood that clean water and food would be in short supply and that consequently disease could spread. He stated that scientists could help with this problem, such as by the use of medicines. He recognised that aid workers ('nurses and doctors') would hand out these medicines to the refugees, and that other people could help to provide clean water.

AF3

He used some straightforward scientific language such as 'particles', 'force', 'medicine' and 'diseases'. The tone and style of the reporting is an accurate reflection of television news.

Next steps

- Discussing models of surface collisions by very large numbers of particles, including a 'human' model in which the pupils played the part of the particles.
- Exploring related scientific ideas such as energy, forces and pressure.

Assessment commentary

Pupil M makes links between a world event affecting many millions of people, with some of the abstract scientific ideas that can produce such disastrous consequences. He also identifies aspects of the work that various people do to provide support in such situations. Such an activity allows Pupil M to see the relevance of science on a global scale.

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5. Constructing spaghetti bridges

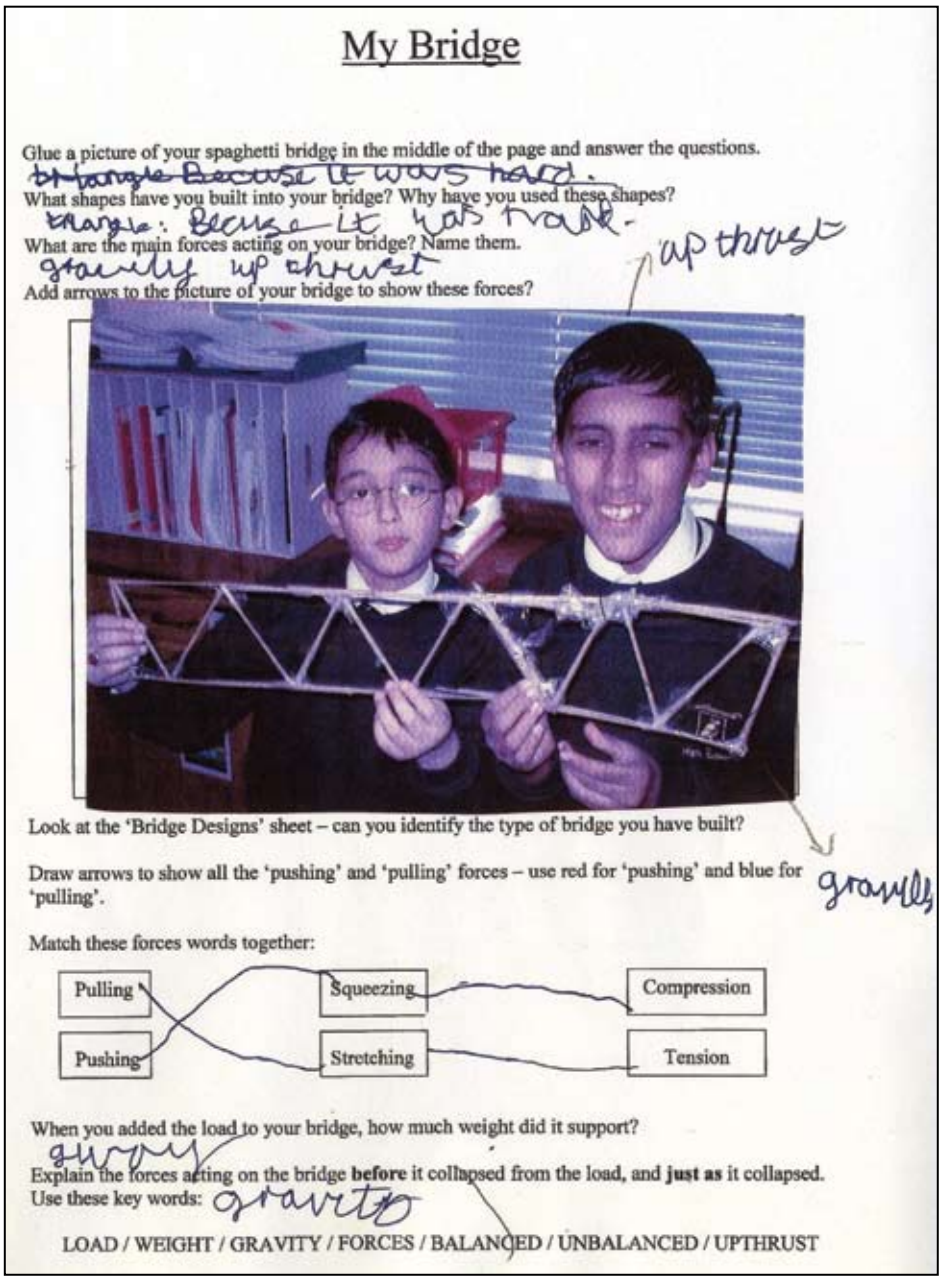
Assessment focuses

AF1, AF2, AF3, AF4, AF5

Context

Near the end of a topic on forces, pupils built a bridge from spaghetti and sticky tape, to span a given gap. The bridges were then tested to destruction. Pupils had previously studied a range of forces and their understanding was applied to the problem. The activity was photographed and pupils used the images in their final piece of written work.

Pupil M's work



My Bridge

Glue a picture of your spaghetti bridge in the middle of the page and answer the questions.

~~triangle Because it was hard.~~

What shapes have you built into your bridge? Why have you used these shapes?

triangle. Because it was hard.

What are the main forces acting on your bridge? Name them.

gravity up thrust

Add arrows to the picture of your bridge to show these forces?

up thrust

Look at the 'Bridge Designs' sheet – can you identify the type of bridge you have built?

Draw arrows to show all the 'pushing' and 'pulling' forces – use red for 'pushing' and blue for 'pulling'.

gravity

Match these forces words together:

Pulling	Squeezing	Compression
Pushing	Stretching	Tension

When you added the load to your bridge, how much weight did it support?

slurpy

Explain the forces acting on the bridge **before** it collapsed from the load, and **just as** it collapsed.
Use these key words: gravity

LOAD / WEIGHT / GRAVITY / FORCES / BALANCED / UNBALANCED / UPTHRUST

Teacher's notes

AF1

Pupil M, with a partner, constructed a simple model to their own design, with Pupil M suggesting that triangles would be a strong shape to use. In addition, he was able to name the main forces and recognise the importance of compression and tension forces (although he used the terms 'stretching' and 'squeezing' forces).

He was able to explain that when the weight was greater than the upthrust, the bridge collapsed when tested, applying ideas of balanced and unbalanced forces.

AF2

Pupil M recognised that in building bridges, designers would have to take forces into account, to make the bridge strong enough to support the weight of cars and other vehicles.

AF3

Pupil M identified some simple advantages of working with his partner, explaining that they shared ideas, and helped each other with the construction of the bridge.

AF4

Pupil M made relevant measurements of the mass added to the bridge when testing it to destruction. He followed instructions about using the masses to avoid injury.

AF5

He was able to state that the bridge collapsed when the weight was greater than the upthrust, successfully linking cause and effect.

Next steps

- More opportunities to use arrows to represent forces.
- Relating their models to real bridges and the history of bridge design.

Assessment commentary

Pupil M and his partner produced a physical model based on scientific ideas that they had recently worked on. His completed worksheet and verbal comments show use of scientific language and ideas, with a graphic representation of forces at a simple level.

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6. Reproduction

Assessment focuses

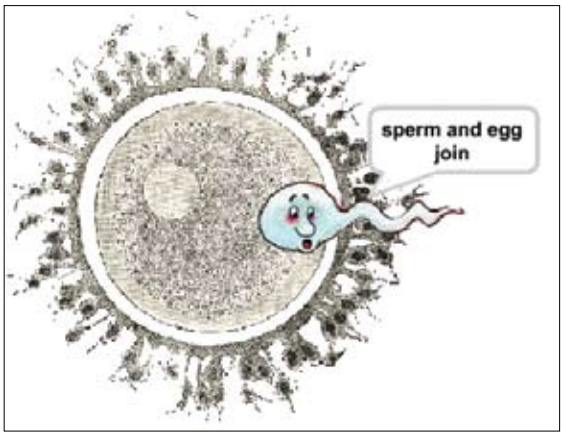
AF1, AF3, AF4

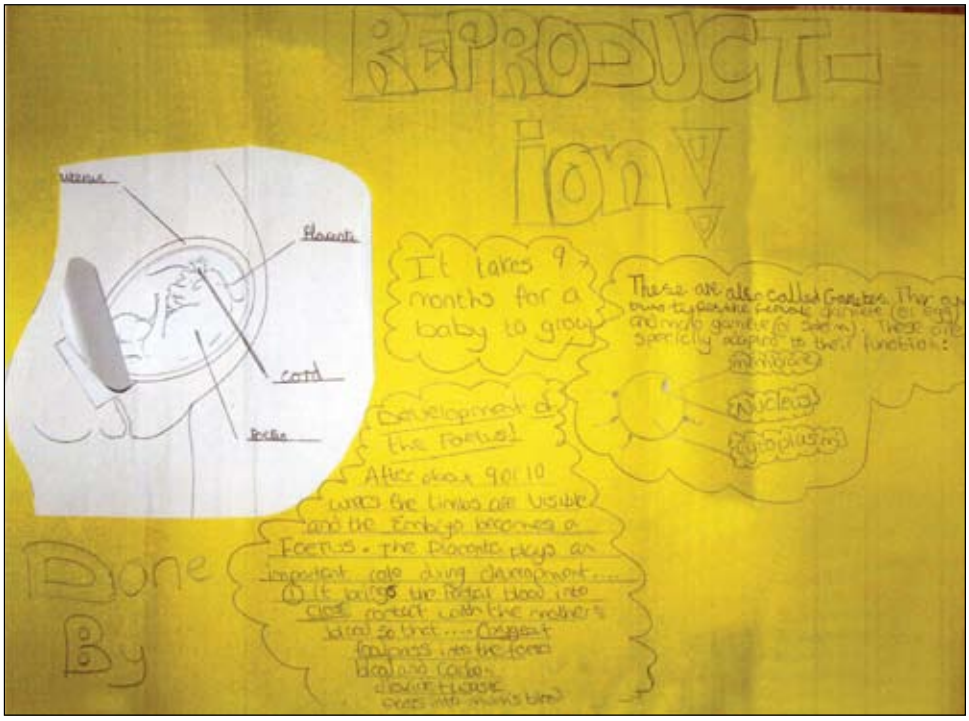
Context

Pupils studied a unit on reproduction. Within this the teacher asked them to produce a simple animation to display their understanding of reproduction using a freely available software download. Pupils developed the animation themselves and added appropriate text and sound effects.

Pupils were also asked to produce a leaflet on pregnancy, to describe the development of the foetus in the uterus. They had two different textbooks and a medical leaflet, and they selected information to include in their leaflet.

Pupil M's work





Teacher's notes

AF1

The animation acts as a simple model. Pupil M was clear about fertilisation as the joining of sperm and egg and recognised that this was needed for a baby to develop, as was indicated by the sound of a baby crying that he added to the animation.

Within the leaflet, some text is taken directly from another source, for example the reference to gas exchange, but is relevant and appropriate to the context.

AF3

The animation communicates a key idea of movement of sperm to a less mobile egg. The leaflet describes straightforward scientific information using a simple form of scientific language.

AF4

Pupil M selected information from a range that was provided, to address a particular idea.

Next steps

- Work on birth and the newborn baby, including exploration of the work of a special care baby unit (at which one of the pupils' mothers is a nurse).

Assessment commentary

Pupil M successfully provides a meaningful animation showing the movement of sperm to egg and representing the process of fertilisation. The leaflet is informative and required some active selection of material, although the text is not original and some of it is not focussed on the set topic of pregnancy.

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Assessment summary

AF1 Thinking scientifically

Pupil M achieves at a higher level in this AF, moving into level 4 when supported in communicating ideas, and uses scientific ideas and simple models to describe processes and phenomena.

AF2 Understanding the applications and implications of science

Pupil M explains some technology and its scientific basis, in the application of ideas about forces to the strength of bridges. He identifies medical support as an aspect of life that is based on scientific ideas. The assessments show him to be working at a secure level 3 for AF2.

AF3 Communicating and collaborating in science

Straightforward scientific language and formats of data presentation are used, and Pupil M works collaboratively. His work for AF3 is at secure level 3.

AF4 Using investigative approaches

With significant help, Pupil M can make and record simple measurements. He recognises obvious risks when prompted. For AF4 he is working at low level 3.

AF5 Working critically with evidence

Pupil M can identify straightforward patterns and use them to reach a conclusion, stating what he has found out and providing a link between cause and effect. This is indicative of performance at level 3.

Overall assessment judgement

Pupil M is able to show some progress to level 4 for AF1, when supported by the resources available. For other AFs he just moves into level 3, for example in requiring guidance in making and recording stopclock measurements. Overall, however, based on his profile, he is judged to be working at a secure level 3.

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APP science assessment guidelines: levels 3 and 4

Name…M……

	AF1 – Thinking scientifically	AF2 – Understanding the applications and implications of science	AF3 – Communicating and collaborating in science	AF4 – Using investigative approaches	AF5 – Working critically with evidence
Level 4	**Across a range of contexts and practical situations pupils:** ● Use scientific ideas when describing simple processes or phenomena ● Use simple models to describe scientific ideas ● Identify scientific evidence that is being used to support or refute ideas or arguments ☑	**Across a range of contexts and practical situations pupils:** ● Describe some simple positive and negative consequences of scientific and technological developments ● Recognise applications of specific scientific ideas ● Identify aspects of science used within particular jobs or roles ☐	**Across a range of contexts and practical situations pupils:** ● Select appropriate ways of presenting scientific data ● Use appropriate scientific forms of language to communicate scientific ideas, processes or phenomena ● Use scientific and mathematical conventions when communicating information or ideas ☐	**Across a range of contexts and practical situations pupils:** ● Decide when it is appropriate to carry out fair tests in investigations ● Select appropriate equipment or information sources to address specific questions or ideas under investigation ● Make sets of observations or measurements, identifying the ranges and intervals used ● Identify possible risks to themselves and others ☐	**Across a range of contexts and practical situations pupils:** ● Identify patterns in data presented in various formats, including line graphs ● Draw straightforward conclusions from data presented in various formats ● Identify scientific evidence they have used in drawing conclusions ● Suggest improvements to their working methods, giving reasons ☐
Level 3	**Across a range of contexts and practical situations pupils:** ● Identify differences, similarities or changes related to simple scientific ideas, processes or phenomena ● Respond to ideas given to them to answer questions or suggest solutions to problems ● Represent things in the real world using simple physical models ● Use straightforward scientific evidence to answer questions, or to support their findings ☐	**Across a range of contexts and practical situations pupils:** ● Explain the purposes of a variety of scientific or technological developments ● Link applications to specific characteristics or properties ● Identify aspects of our lives, or of the work that people do, which are based on scientific ideas ☑	**Across a range of contexts and practical situations pupils:** ● Present simple scientific data in more than one way, including tables and bar charts ● Use scientific forms of language when communicating simple scientific ideas, processes or phenomena ● Identify simple advantages of working together on experiments or investigations ☑	**Across a range of contexts and practical situations pupils:** ● Identify one or more control variables in investigations from those provided ● Select equipment or information sources from those provided to address a question or idea under investigation ● Make some accurate observations or whole number measurements relevant to questions or ideas under investigation ● Recognise obvious risks when prompted ☑	**Across a range of contexts and practical situations pupils:** ● Identify straightforward patterns in observations or in data presented in various formats, including tables, pie and bar charts ● Describe what they have found out in experiments or investigations, linking cause and effect ● Suggest improvements to their working methods ☑
BL	☐	☐	☐	☐	☐
IE	☐	☐	☐	☐	☐

Key: BL-Below Level IE-Insufficient Evidence

Overall assessment (tick one box only) Low 3 ☐ Secure 3 ☑ High 3 ☐ Low 4 ☐ Secure 4 ☐ High 4 ☐

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