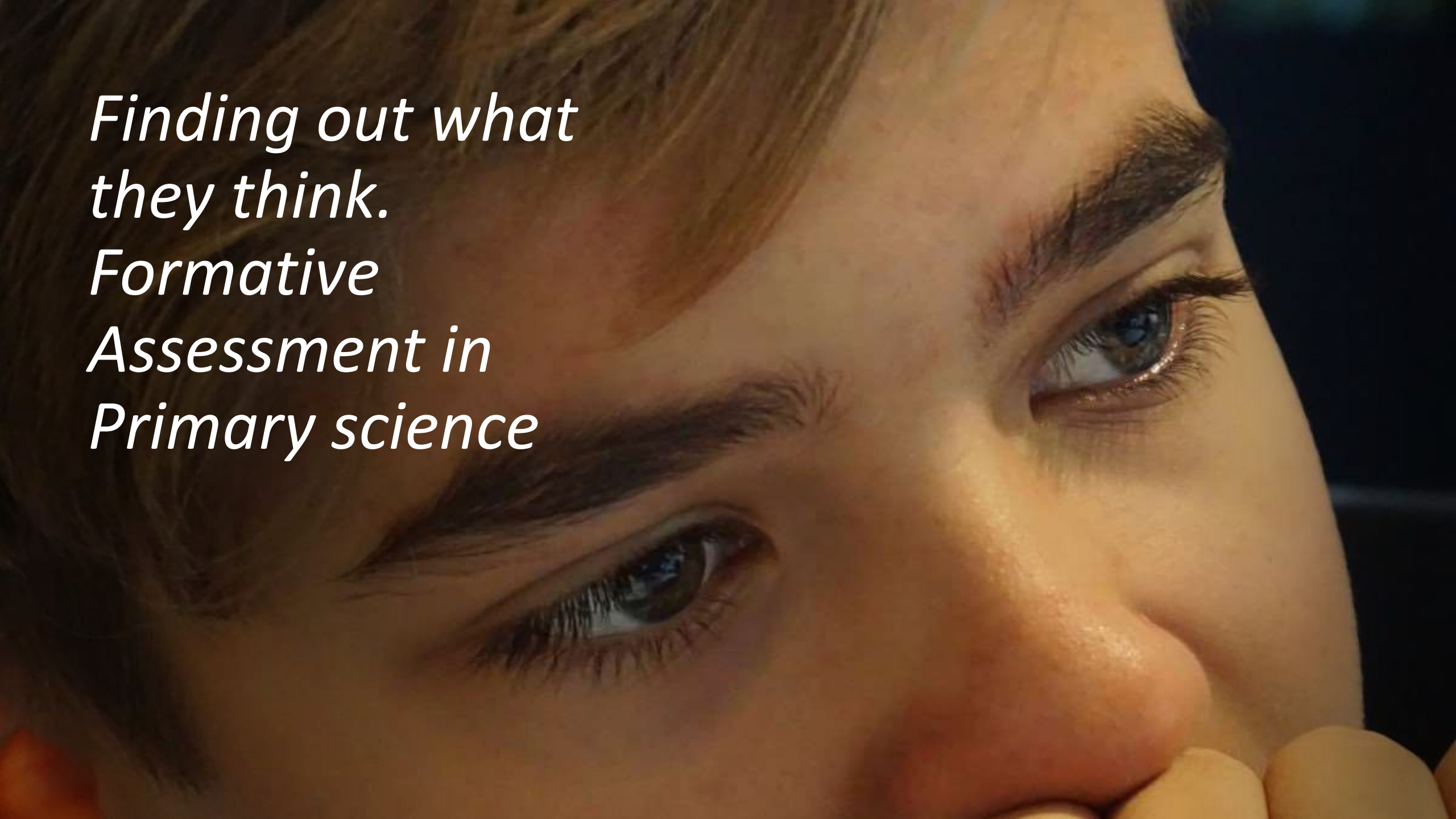
1b
Sample 2
AfL in primary science

This powerpoint forms part of the teaching sequence illustrated in 1b.

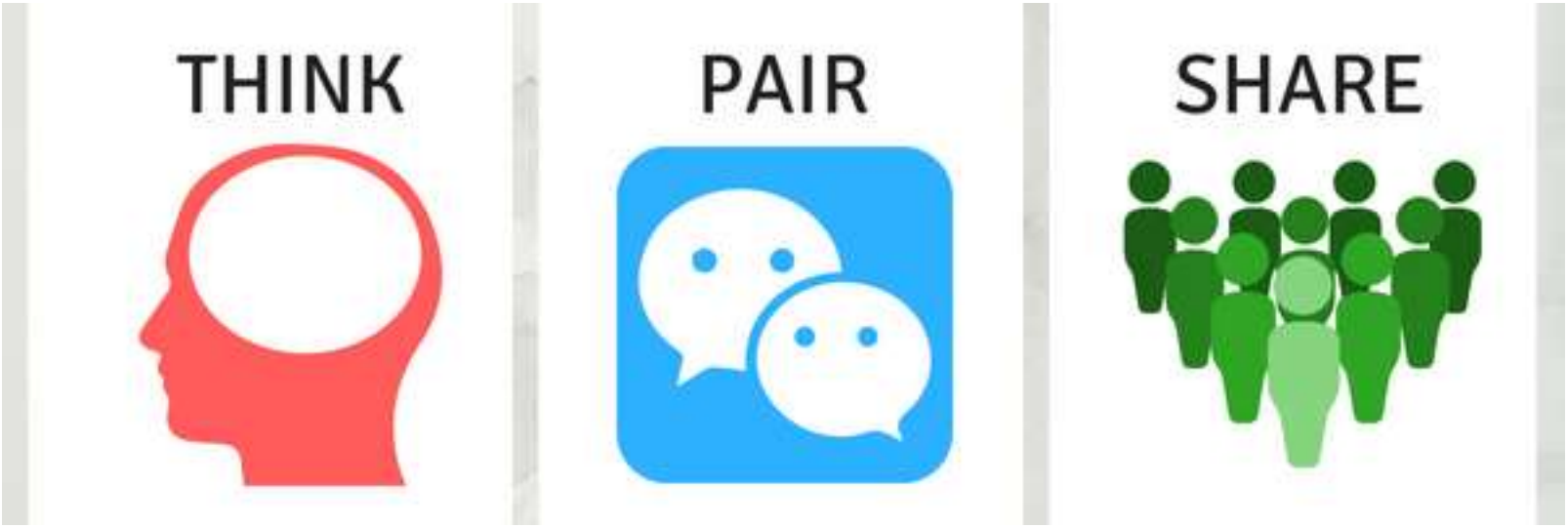
It is situated in Phase 2, Embedding Knowledge and Skills and builds upon the generic, introductory input on formative assessment. This moment shows subject specific techniques to inform teaching in primary science.

After this input, trainees practice using these techniques during planned science lessons



Finding out what they think. Formative Assessment in Primary science

What do we already know about assessment?



2 minutes…..

Core Content Framework

- 6:1 Effective assessment is critical to teaching because it provides teachers with information about pupils' understanding and needs.
- 6:2 Good assessment helps teachers avoid being over influenced by potentially misleading factors, such as how busy pupils appear.
- 6:3 Before using any assessment, teachers should be clear about the decision it will be used to support and be able to justify its use.

Dylan Wiliam – building on what we know

Wiliam is an important person in the field of assessment but,
Assessment for Learning did not start with him.

There is a long history of research into learning before 'Inside the Black Box' was published.

Today we'll look at some historic examples, and some current examples of how we apply AfL in **science** and build on what we already know.

Black, P., & Wiliam, D. (1998). *Inside the Black Box: Raising Standards through Classroom Assessment*. Phi Delta Kappan, 80, pp.139-148.

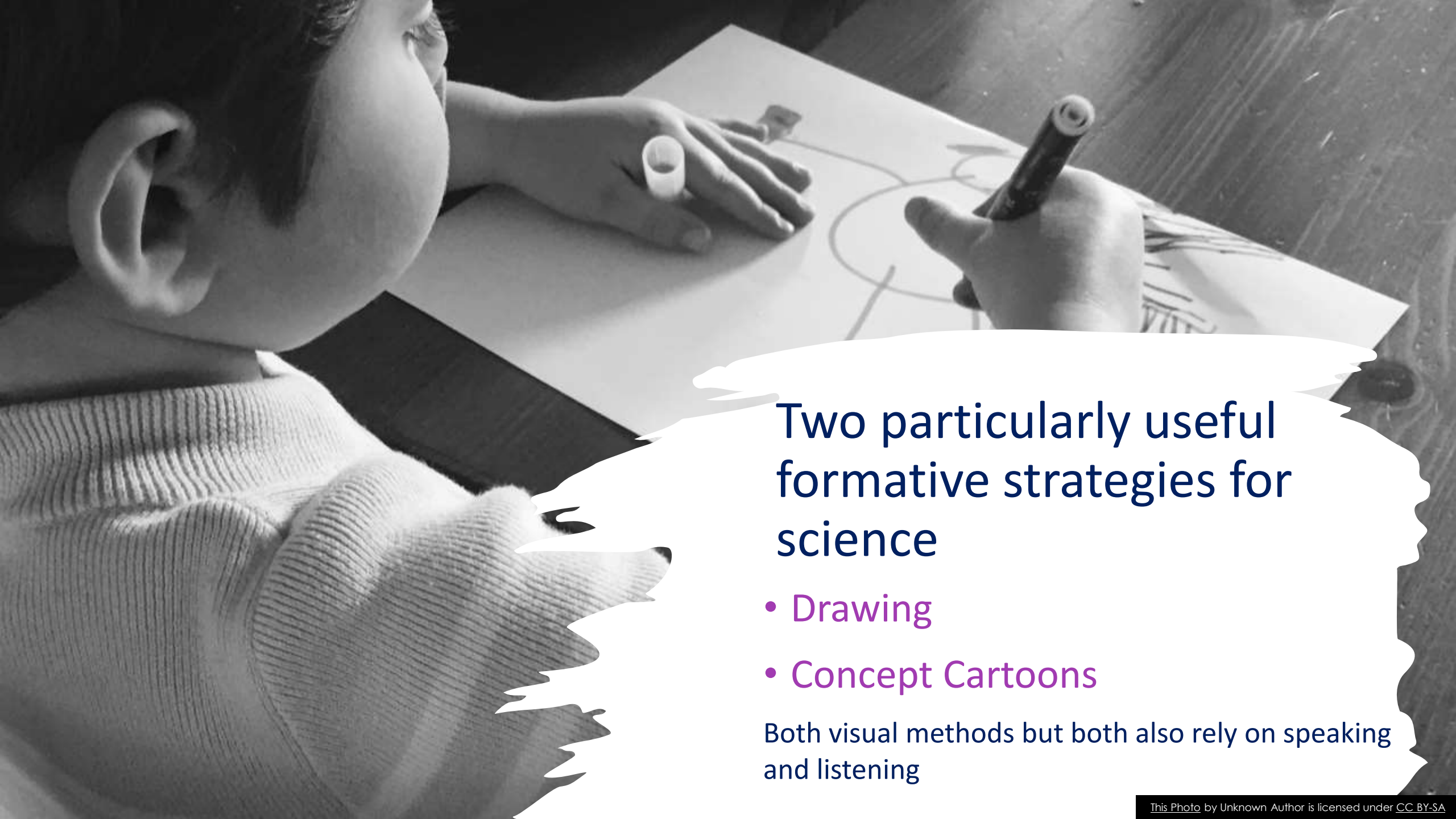
“The most important single factor influencing learning is what the learner knows. Ascertain this and teach accordingly.” (1968, p.vi)

David Ausubel

Ausubel, D.P. (1968) *Educational Psychology : A Cognitive View*, New York: Holt, Reinhart and Wilson

Purposes of assessment in science

Type of classroom assessment	purpose	Link to stage in instructional sequence
Formative (pre-instruction)	Diagnostic – to find out children's existing ideas	Elicitation stage – Used prior to developing instruction or during the instructional sequence when new ideas are encountered
Formative	To monitor children's learning and / or to provide feedback to children on their learning	Exploration and concept development stage – used continuously throughout the instructional sequence
Summative	To measure the extent to which children have achieved a learning goal or objective	Application stage – used primarily at the end of an instructional sequence



Two particularly useful formative strategies for science

- Drawing
- Concept Cartoons

Both visual methods but both also rely on speaking and listening

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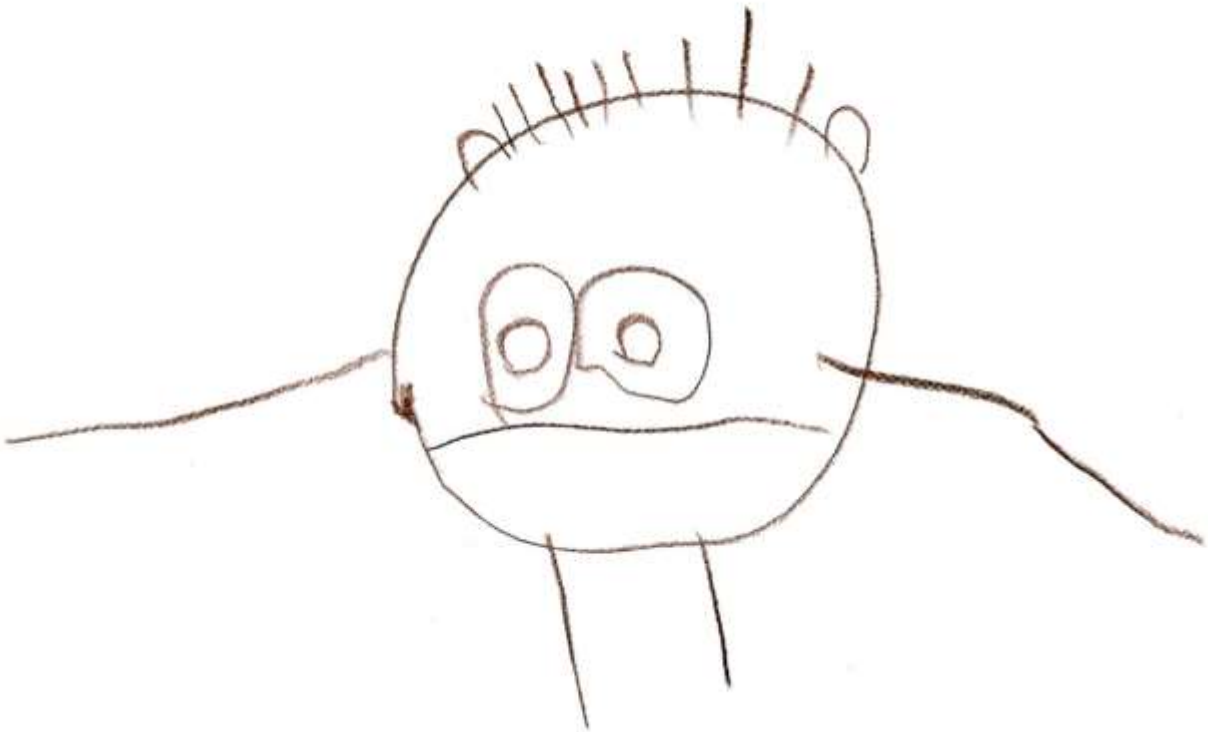
Children’s drawings as an AfL strategy



Piaget

- Young children's drawings are realistic in intent
- Attempt to imitate what s/he sees or thinks s/he knows about the world
- Children's drawings and interpretations of the world and natural phenomena can help us, as teachers of science, understand their thinking
- The narrative is equally important, providing insights into children's ideas

Driver

- Driver argued that the ideas children already held about science (alternative conceptions) were the key to how children created meanings about science for themselves – not just through first-hand sensory experiences

- Driver believed children used their ‘alternative conceptions’ to help them understand their everyday experience of science. However, they could hinder students' acceptance of more advanced scientifically accurate concepts.

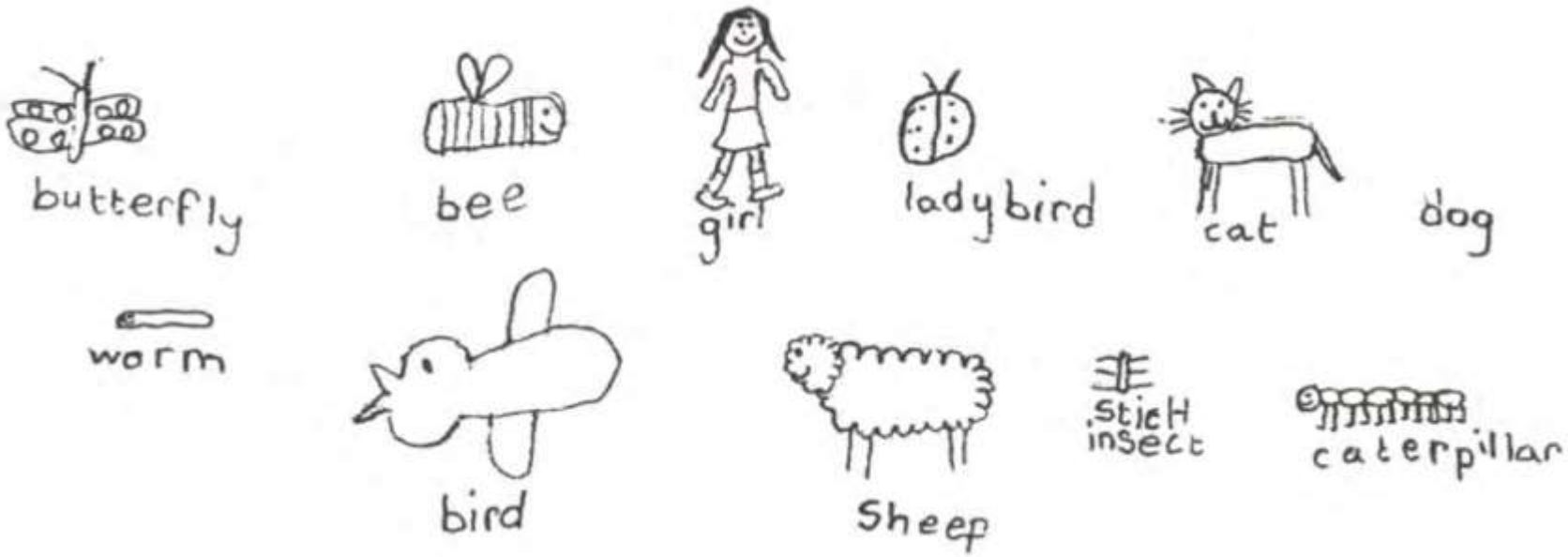
Driver, R. (1983) *The pupil as scientist?* Milton Keynes: Open University Press.

Nuffield SPACE research (science processes and concept exploration) 1990-98

- Very large research project
- One of the first to look in detail at how children explained their ideas about science through drawing
- All reports available through the National STEM Centre and many contain examples of children's drawings.

https://www.stem.org.uk/resources/collection/3324/space-research-reports

Alive?

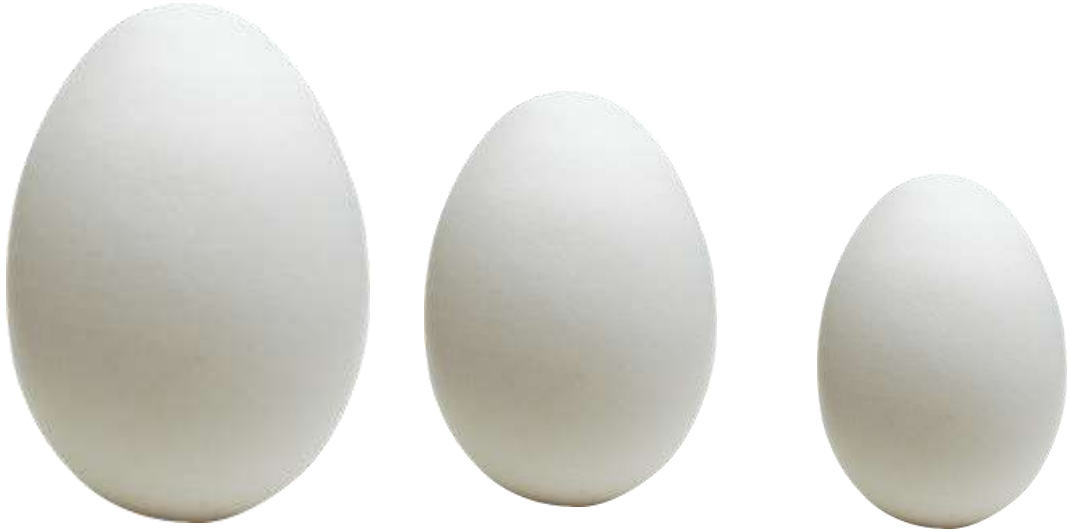


Teacher	*Some children put a tree on their pictures of things that are alive, and they said the tree is alive. What do you think of that?*
Child	(laughs) *Well, a tree isn't alive, is it?*
Teacher	*You don't think a tree is alive?*
Child	*No, it's just a plant that grows up … and we've got a little tree in our garden … growing next to its mother.*

Nuffield Primary Science SPACE, (1995) *The Variety of Life Teachers' Guide Age 7-12* London: Harper Collins (p. 43)

Recent research example

What’s Inside an egg?

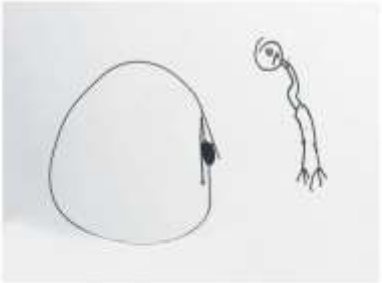


Recommended to read: “Is There a chick in there? Kindergartners’ Changing Thoughts on Life in an Egg.
Young Children, March 2018, Vol 73 #1

https://www.naeyc.org/resources/pubs/yc/mar2018/kindergartners-changing-thoughts-life-egg

Adam: The farmer puts the chick in the egg, then he runs to the mom to give her the egg before it hatches.

John: The chick rolls up in a ball and the mother puts them in [the egg].

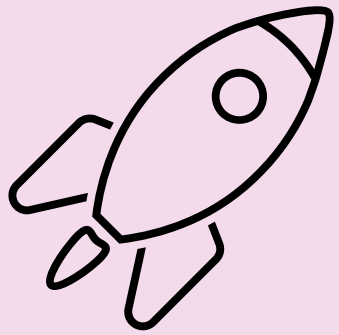


Calvin: Open the egg. Put the chick inside. The chick closes the egg from inside.

Let’s try it:

Task:

Draw the Earth, Sun and Moon as seen from a spaceship window.



Ideas change – children asked to draw the Earth, Sun and Moon as seen from the window of a spaceship

Age 6

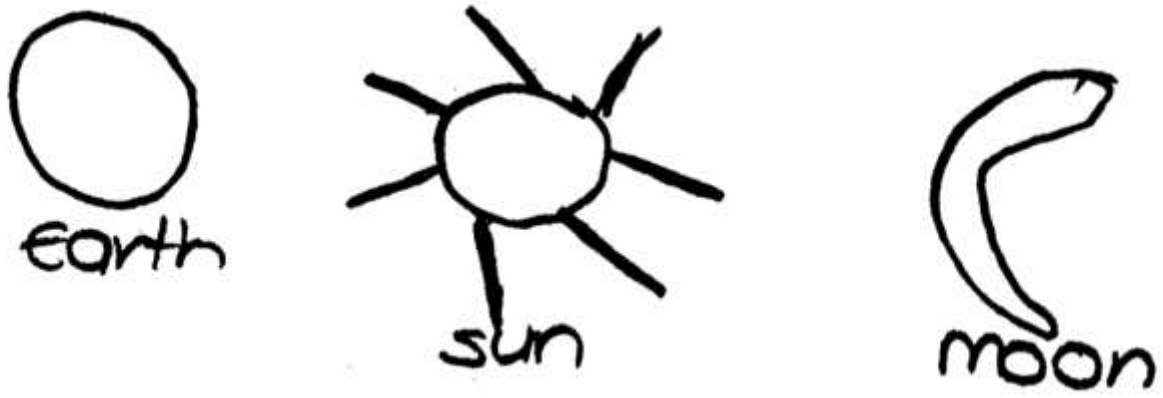


Fig 3.22: Child's (age 6) response to question asking for a drawing of the Sun, Moon and Earth as seen from a spaceship window.

Age 9

Fig 3.23: Child's drawing (age 9) showing Earth, Sun and Moon as seen from window of a spaceship with the Earth largest.

Age 10

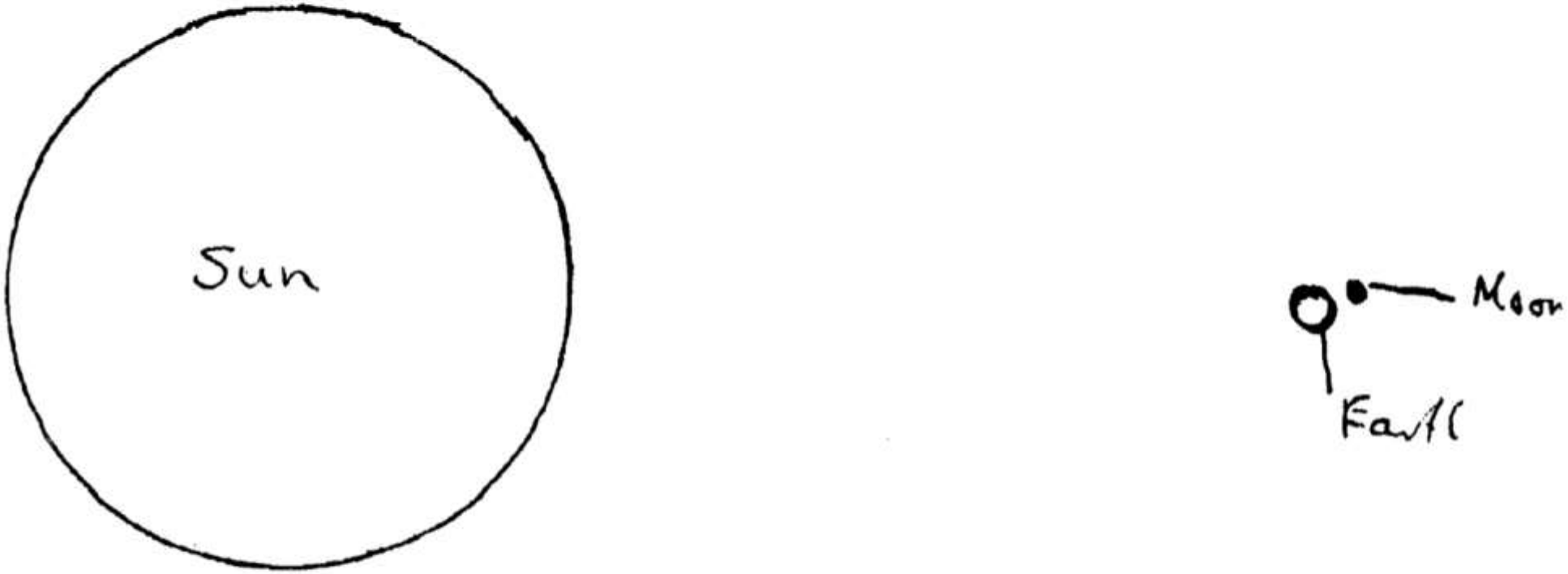


Fig 3.24: Child's (age 10) response to question asking for a drawing of the Sun, Moon and Earth as seen from a spaceship window.

Patrick Age 6. The Earth in Space.

Patrick is 6 and drew this earlier this month. The red lines are ‘what holds the Earth up in the air’.

Children’s developing ideas about electrical circuits – paired task

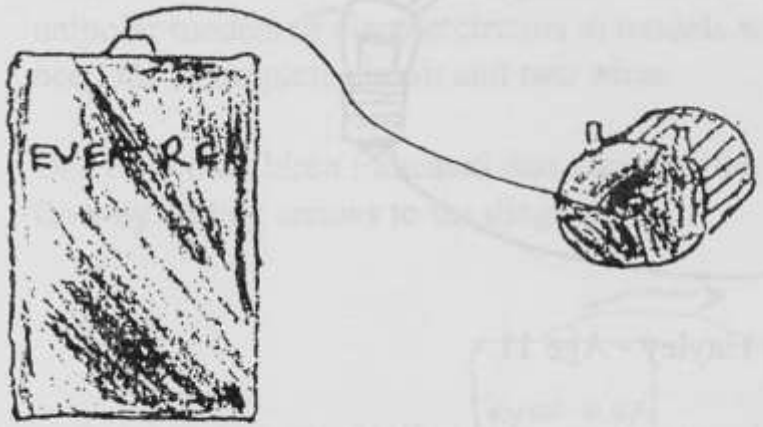


Fig 1: Tom - Age 7

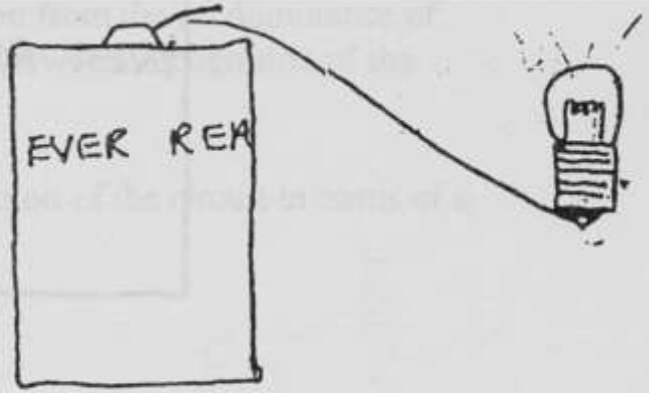


Fig 2: Dano - Age 9

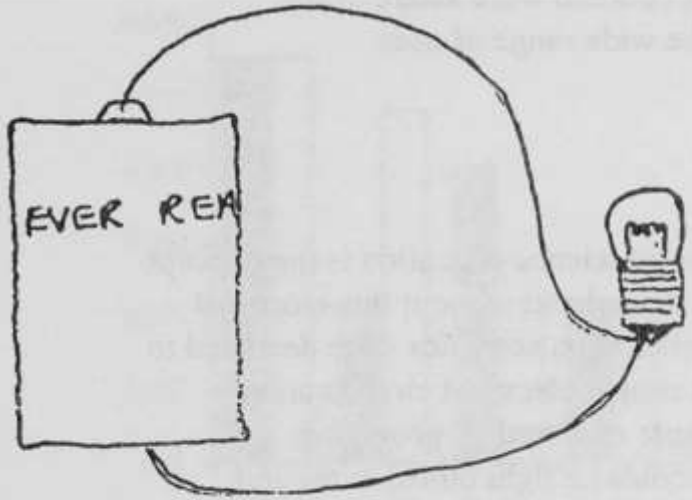


Fig 3: Julie Age 6.

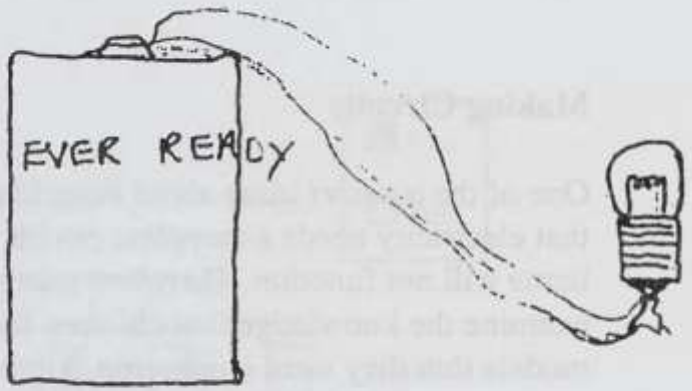


Fig 4: Makeda - Age 10

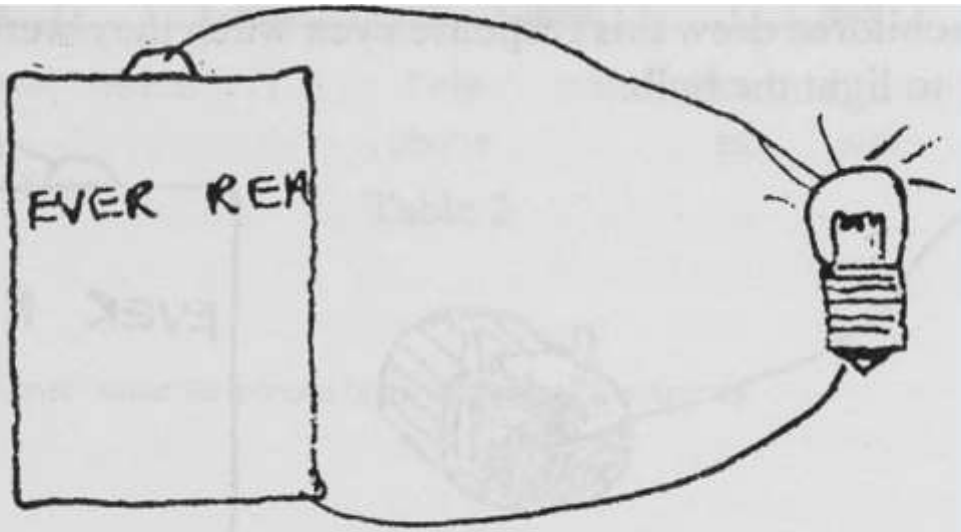


Fig 5: Hayley - Age 11.

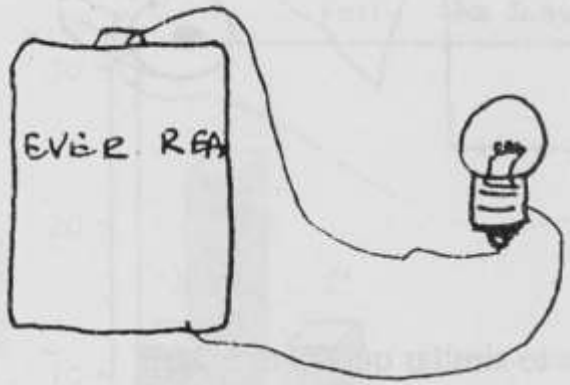


Fig 7: David - Age 5

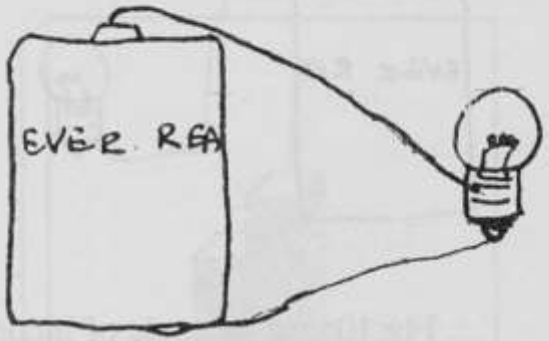


Fig 8: Alexander - Age 6

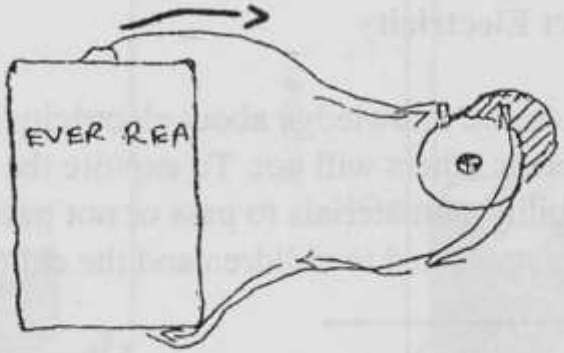


Fig 9: Harry - Age 10

Ideas about digestion

Age 5

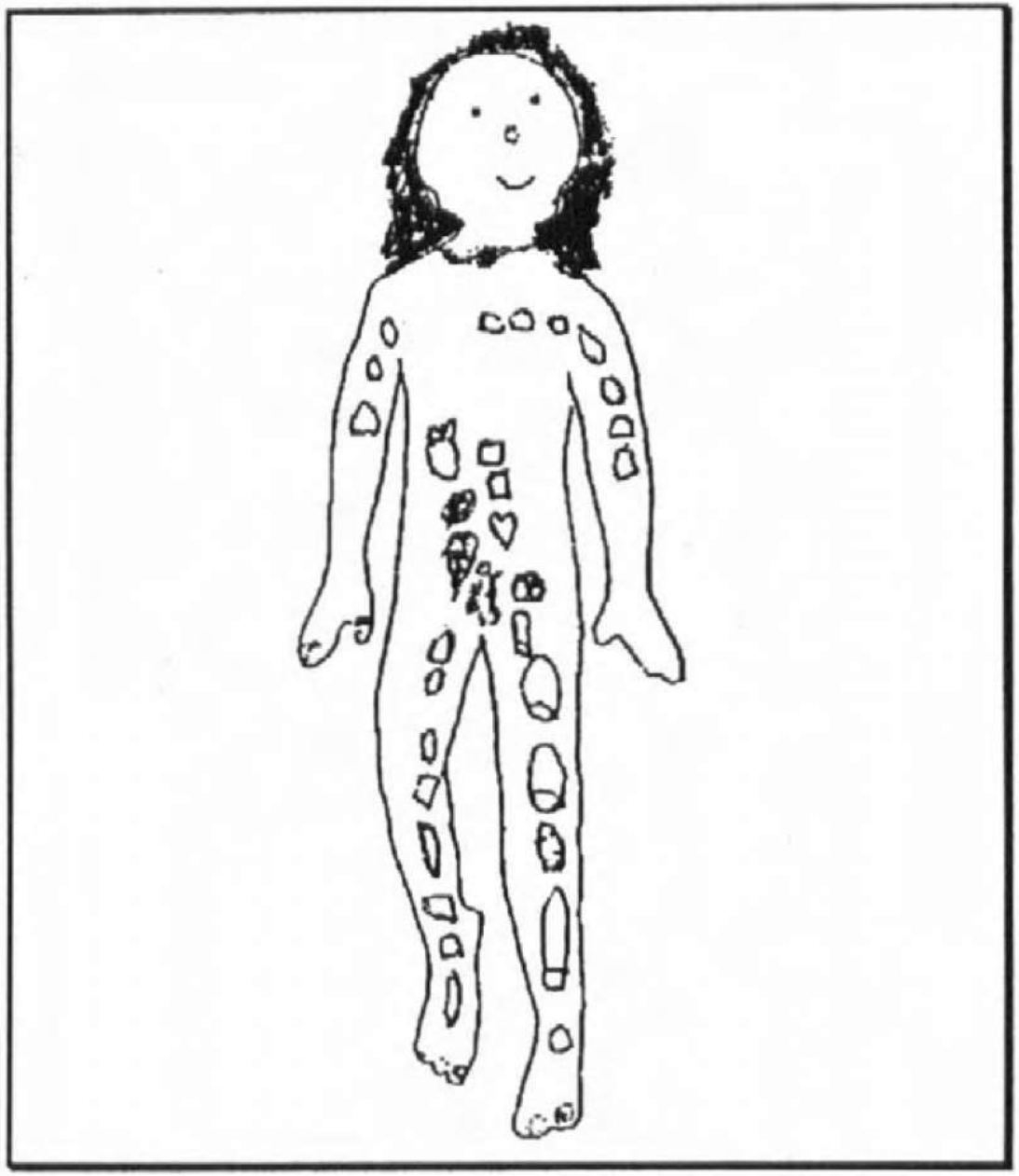


Fig 3.15 Tumseela-Age 5

Age 6

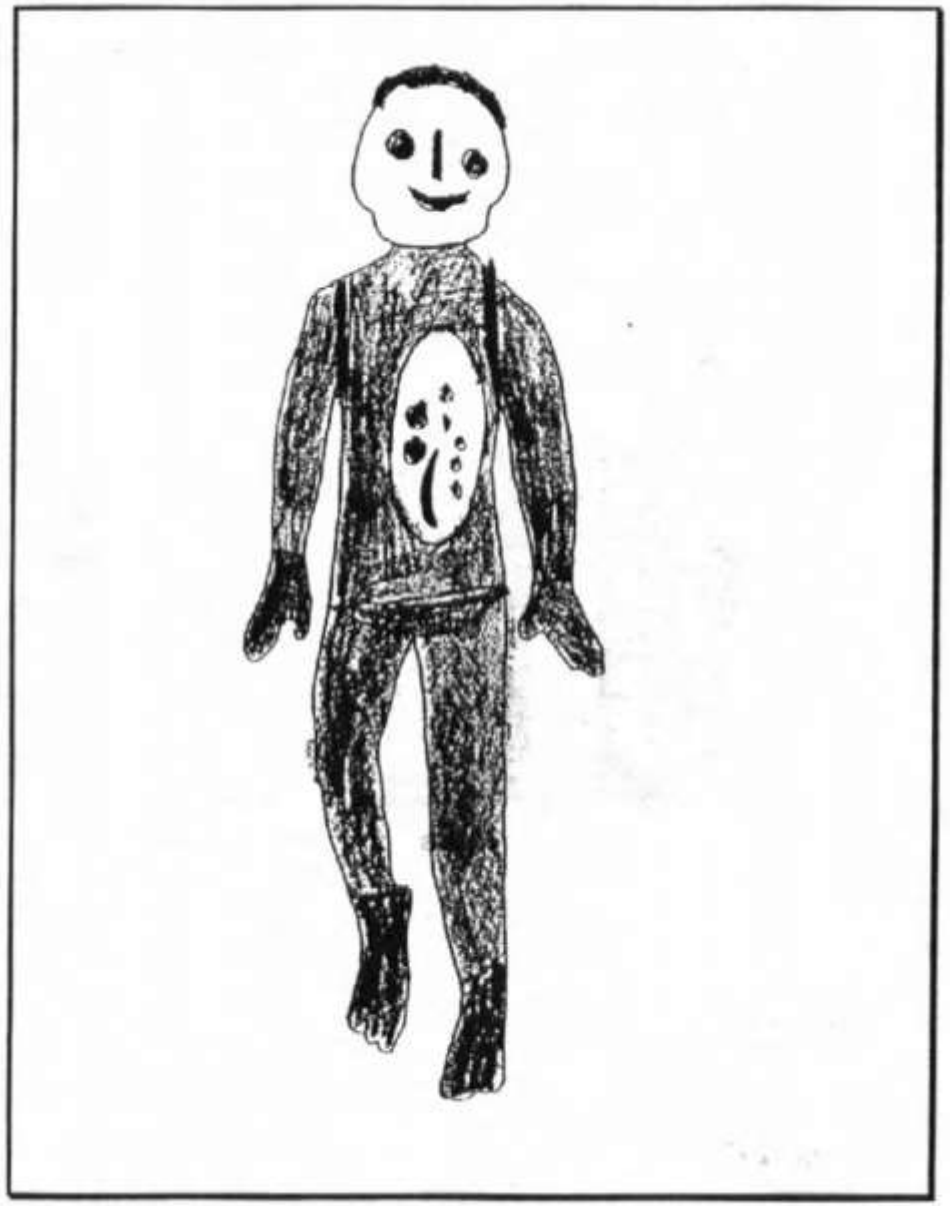
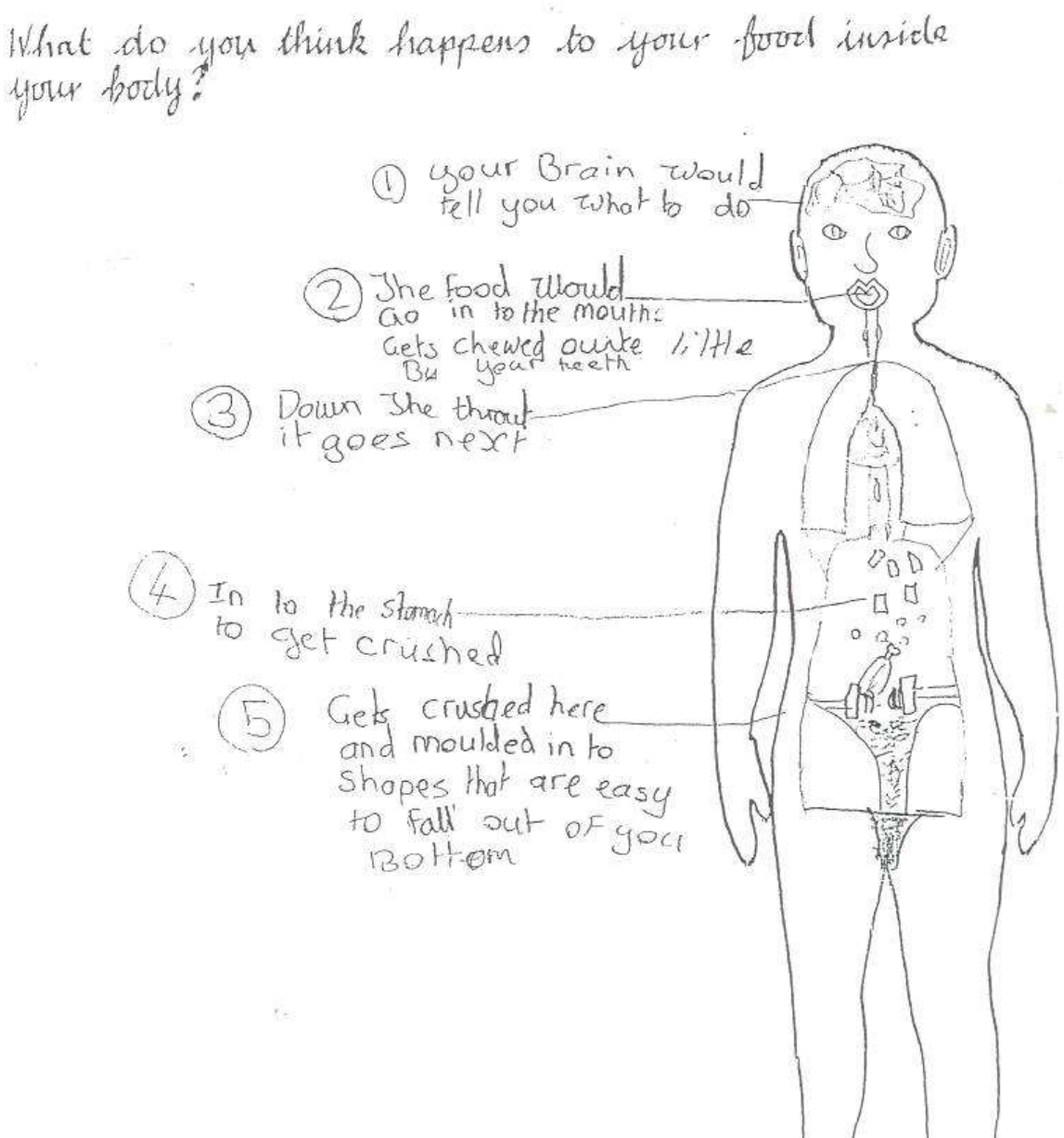


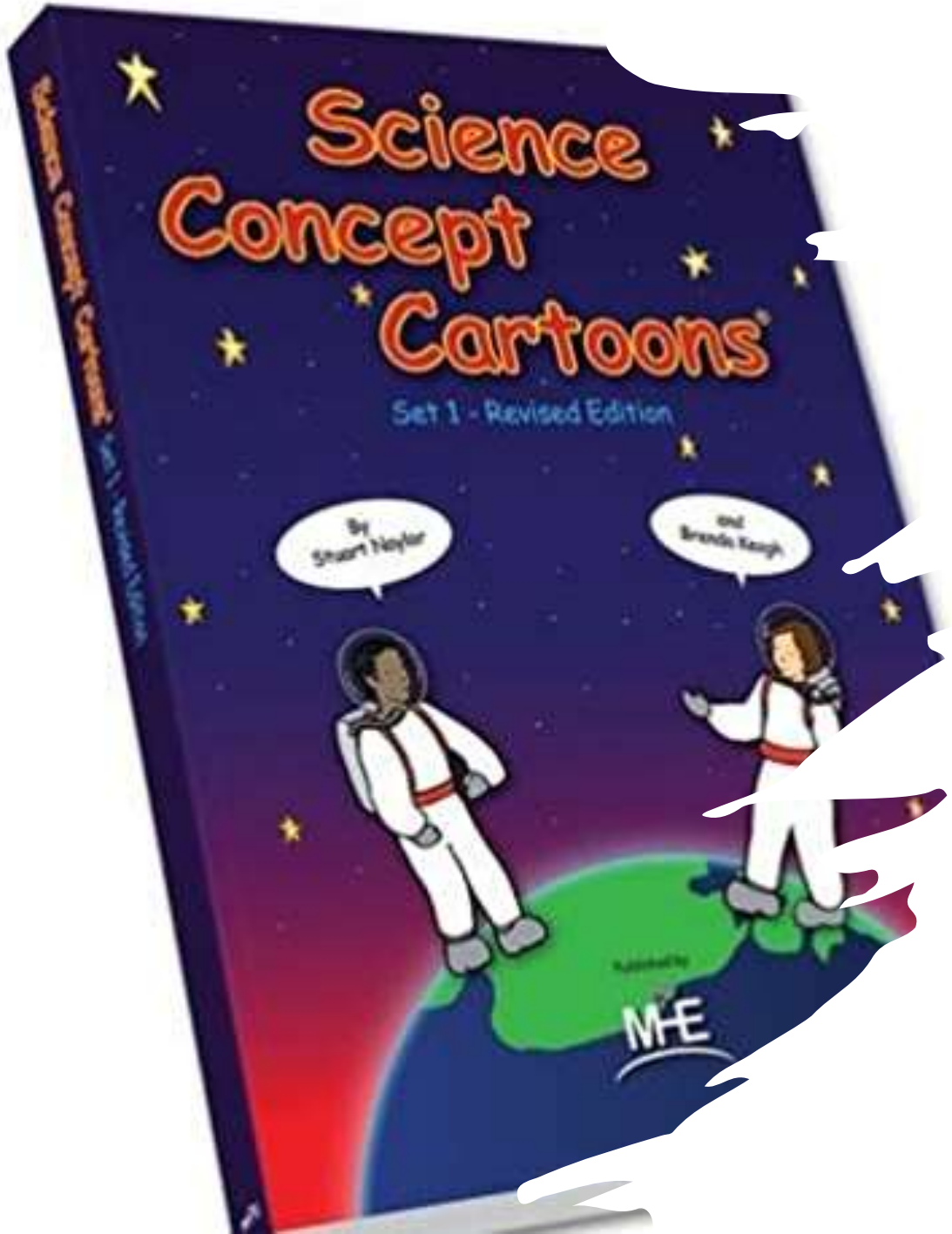
Fig 3.14: Sashidaren - age 6

Age 9


What do you think happens to your food inside your body?
1 your Brain would tell you what to do
2 The food would go in to the mouth: Gets chewed quite little By your teeth
3 Down the throat it goes next
4 In to the stomach to get crushed
5 Gets crushed here and moulded in to shapes that are easy to fall out of your Bottom

What can we learn from drawings?

- How the child visualizes what they believe
- Particularly good for ideas that involve a ‘process’ e.g. growth, body systems, how we see and so on
- Better with a narrative
- Gives us an insight into any misconceptions or incomplete understanding a child may have
- Develop over time

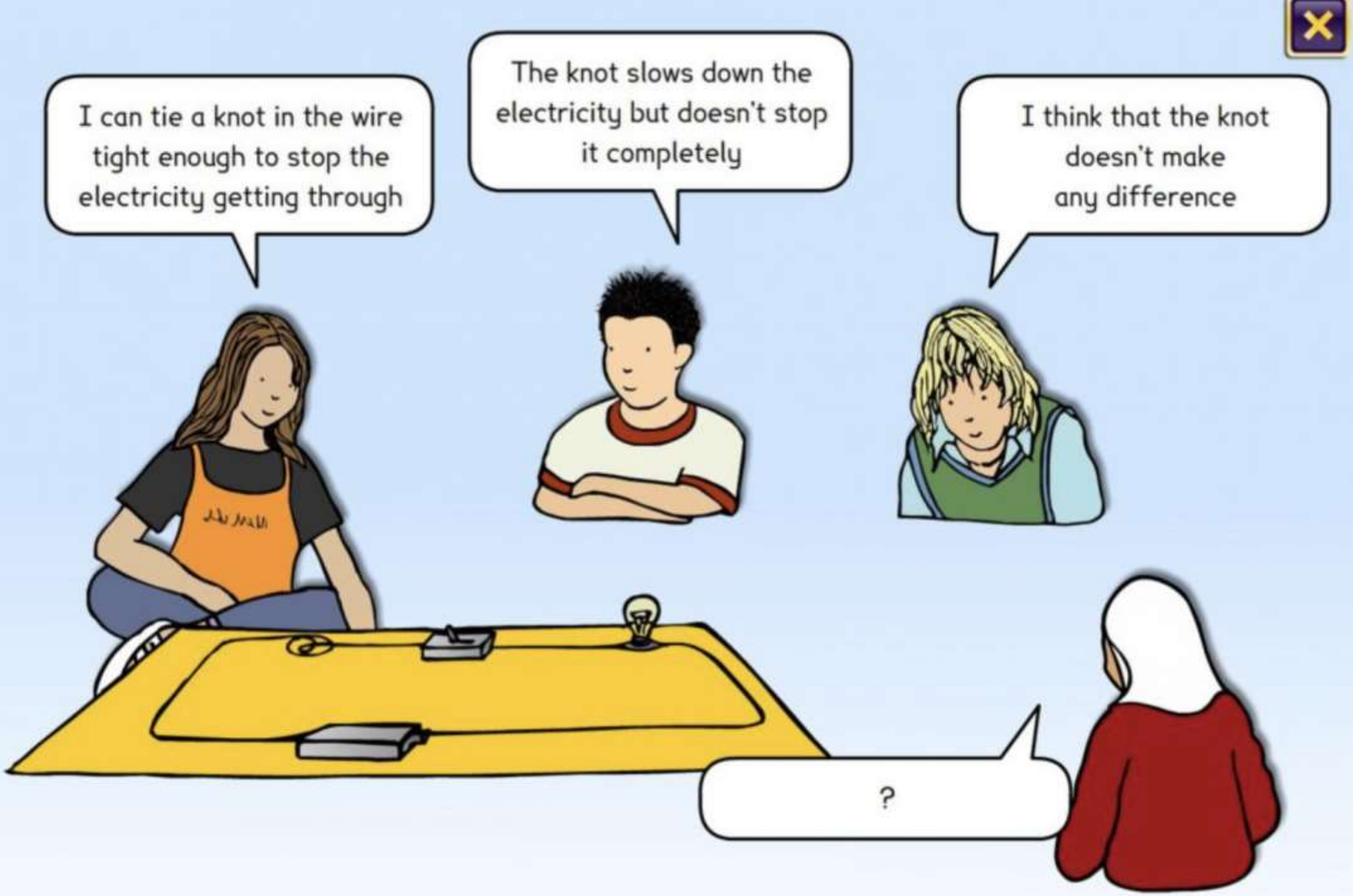


Concept Cartoons

- Another visual method
- Devised initially especially for science
- *Scenario based*
- *Everyday situations*
- *Deliberately simple illustrations*
- *Two (or more) common misconceptions*
- *One correct scientific idea*
- *Viewpoints have equal status*
- *Invitation to discuss*
- *'What do you think?*
- *'How can we find out?'*

Don't put the coat on the snowman. It will melt him
I don't think the coat will make any difference
It will keep him cold and stop him melting

?
They go round to the other side of the Earth
The stars disappear in the daytime because they only reflect moonlight
They go down when the Sun comes up
The Sun shines so brightly that we can't see the stars


I can tie a knot in the wire tight enough to stop the electricity getting through
The knot slows down the electricity but doesn't stop it completely
I think that the knot doesn't make any difference
?

What can we learn by using Concept Cartoons?

- Good for generating whole class or group discussions
- Supports a dialogic teaching style
- Based around cognitive conflict so challenge children to metacognitively examine their ideas
- Invite children to express ideas
- Precursor to enquiry

Now,

-Using the ITP guidance, consider you will practise these techniques in AfL Intensive Teaching and Practice

-Consider how you will sustain these techniques when teaching a series of science lessons

Further reading and supporting resources are in the module area.

Thank you for listening

End of presentation.