Learning Journey: Skeletons

Age: 7-8
Learning activities: Gathering evidence, making connections
Creative dispositions: Motivation and curiosity
Synergies: Motivation and affect, reflection and reasoning, assessment for learning
Contextual factors*:* Group work

Background information

School setting: Inner city school, diverse intake including children from professional families.
School policy for science: Curriculum in the process of being updated to give more priority to science.
Curriculum links:

- Identify that humans and some animals have skeletons and muscles for support, protection and movement.
- asking relevant questions and using different types of scientific enquiries to answer them.
- gathering, recording, classifying and presenting data in a variety of ways to help in answering questions.

Setting the Scene

Focus

The focus of this project was on developing children's *motivation and curiosity* and providing them with *opportunities to make decisions in planning investigations.* I wanted to stand back, observe and encourage children's *reflection and reasoning*.

Rationale

The children were already strong at collaborating and independent learning, personally motivated & generally on task.
I wanted to build on this in fostering children's *motivation* in terms of *being a scientist* and using scientific skills, to get them *actively curious* about scientific investigations, both their construction and execution.
I was concerned to allow opportunity for *children's agency*. I wanted the children to steer the direction of the learning and to feel they were part of the decision making process.

Implications for my planning and teaching

To foster *motivation and affect* by building on children's ideas and questions (both about being a scientist and skeletons) and to promote *problem solving and agency* by offering a range of opportunities for children t o develop their questions and ideas through active investigation, and for recording and reflecting on their learning in a variety of ways.

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Group work was also an important feature in my planning. I aimed to build on children's collaborative skills to foster sharing of ideas - identifying and solving problems and reflecting on their developing knowledge and understanding

Overview of the sequence of activities

Starting points - The first two activities were designed to elicit children's ideas

- **What is a scientist?** Children shared views about what scientists do and how they work. It acted as reference point during our investigations into skeletons.
- **What do we already know about the skeleton?** Activities involved drawing bones on a diagram of the body and making a skeleton with split pins and cardboard. The activity helped identify questions and areas for further research.

Learning journey – Children collaborated in different types of investigations to find out more about the skeleton, using both first and second hand sources.

Initial investigations: **Can children record and collect data for our skeleton investigations?** Children observed each others' bodies to see what they could find out at first hand. They kept records of their developing ideas including what they wanted to find out further.

Circus of activities: Children worked in groups, taking turns to carry out these different activities.

1. **Observing bones**. Children were given examples of bones related to different parts of the body. They examined their features closely and identified evidence of how they might fit together.
2. **Ipad research.** Children researched questions they could not answer at first hand .
3. **Constructing a 2D model of the skeleton**- children collaborated to put together a 2D model of the skeleton checking with their partner's bodies to position parts correctly and labelling as many bones as possible with post it notes.
4. **Labelling joints on their own bodies**. In pairs children stuck post it notes on each others' bodies with as many names of joints as they could remember, referring to class charts for support.
5. **Making a giraffe out of Play Doh.** In pairs children made a giraffe out of Play Doh or pipe cleaners. They were given three minutes for the task. They compared and contrasted their outcome and decided what was more effective and why.
6. **What happens to our bodies when we fall**? Encouraging reflection on the role of the skeleton in providing protection.

Reviewing learning across the project. Children reviewed their learning across the project through making a poster of a skeleton, creating a glossary of terminology and recording reflections in their books.

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Developing the learning journey

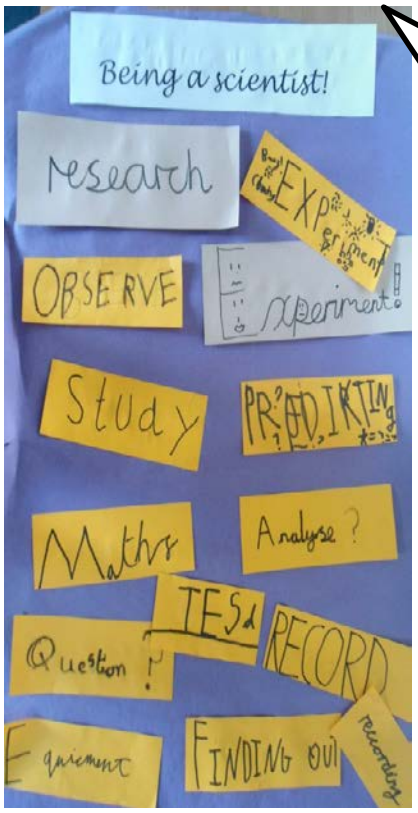
Starting points 1

Activity: What is a scientist?

In pairs on whiteboards the children brainstormed their ideas and definitions. We shared these and then in their pairs the children chose their own words to write out for the learning wall. We shared and discussed them as a class.

Rationale

The purpose of this activity was to see what their ideas were about being a scientist and part of a scientific community.



Teacher Questions: What does a scientist do? What things would we do if we were working like a scientist? What are the key words?

Children's responses

The list included many skills but not *why* you might investigate – questions as starting points. Many of the children already had an awareness of scientists in the world. However the children did not see themselves as scientists. They saw scientists more like adult professionals.

Reflections and implications

I realized it is important to provide opportunities for children to come up with *their own* questions and to make enquiry processes explicit.

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Starting points 2

Activities: What do you already know about the skeleton?

Can children draw bones onto a diagram of the body?
Can children make a skeleton with split pins and cardboard?
Can they write some sentences discussing the 'job' of a skeleton and how it moves?
What further questions do you have?

Rationale

These activities provided an opportunity for us to share what we knew, spot knowledge gaps and *raise questions*. It gave us a starting point for *planning investigations* to find out more.

Children's responses

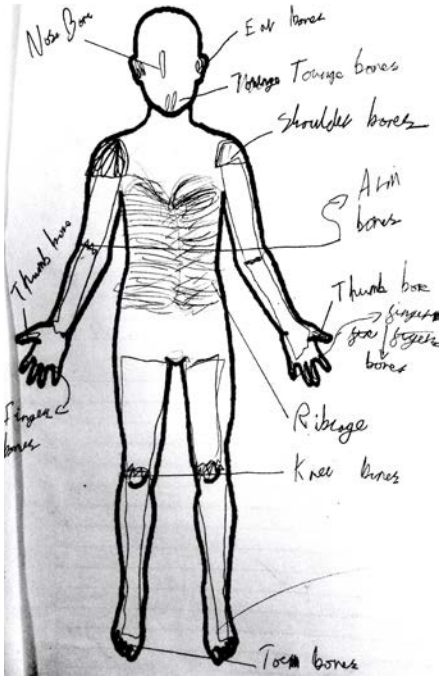

Photo 1: Example of a children's drawing
Diagrams generally did not show the skeleton as a comprehensive structure linked to the spine, mostly isolated known bones.

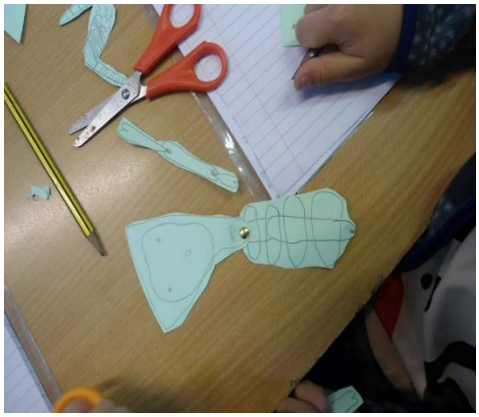

Photo 2: Example of a skeleton the children made

Children had very limited awareness of joints and over-representation of organs.

Children showed limited attention to the skull, jawbone, attachment to the spine.

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Reflections

Children found these activities challenging. The activities were open so they were not sure what was expected. However they could see gaps in their knowledge.
The children did not refer back to their own bodies when doing these activities – as if referring to a cartoon picture – remembering rather than checking.

Implications

The children needed to go back *to their own bodies* as a starting point for inquiry.

Developing the learning journey

Initial investigations: Can children collect and record data for our skeleton investigations?

We acknowledged that there were gaps in our skeletons and talked with the class about how we could research like scientists. In pairs the children observed and examined each other's bodies to see what they could find out about skeletons to fill in the gaps. They were asked to record their findings on a whiteboard.

Rationale

This was an opportunity to observe children' *motivation and curiosity*, their scientific skills in particular their *questioning* and *recording of data*

Teacher questions:
What's missing in our skeletons?
What do we know?
Our class as a scientific community now needs to come up with some areas of research.
If you were going to think and behave like a scientist what would you do next?

Photo 3: A child getting first-hand experience of the skeleton by examining another pupil

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Children's responses

- Children had to cooperate and feed back observations to each other.
- Most children initially suggested books and ipads
- The children were able to come up with subheadings and ideas for further investigation.
- It was a great revelation to children that they could use their hands to investigate – appropriately!

Reflections

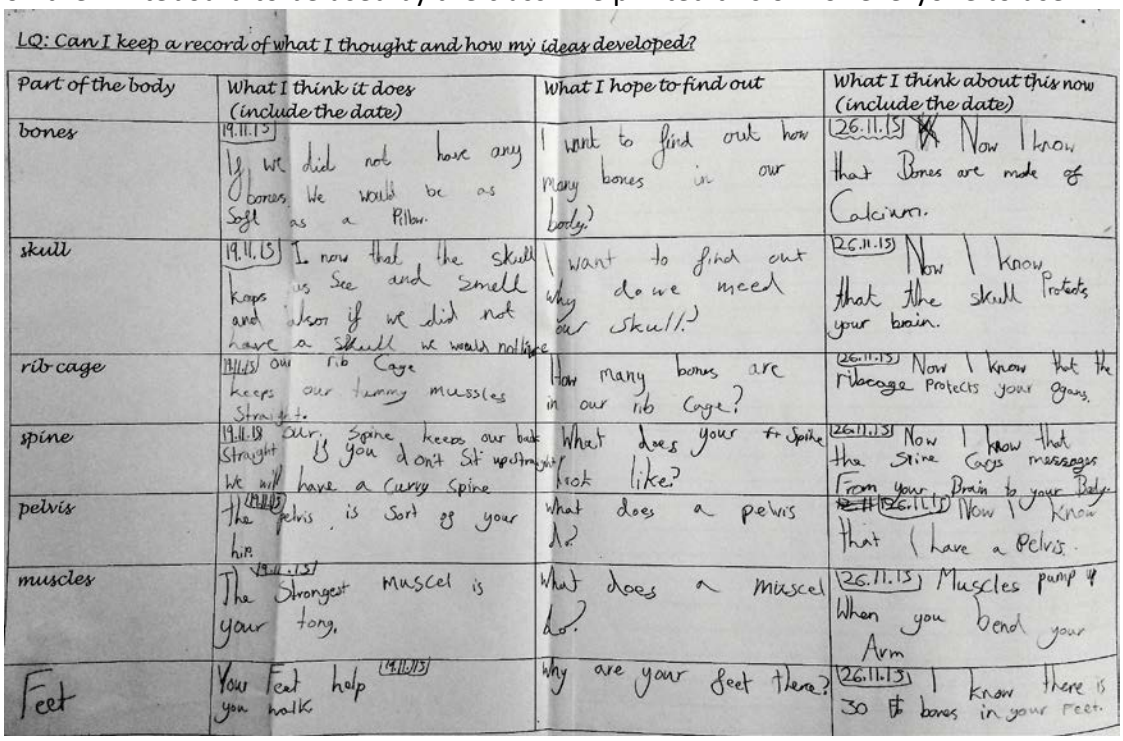
I noticed that children started to formulate *questions during the activity.*
No advice was given as how to record findings. Children were left to their own devices. This produced a variety of responses – ranging from ad hoc to highly systematic.

Implications

This led to a discussion about the processes of recording data – why record, role of planning, ways of recording.

Recording bone activities

Children shared what they had recorded on their whiteboards. Some had recorded in great detail – and others not at all. This opened up a discussion as to the purpose of the whole activity and what a scientific approach would have been.
Some children had used a table and a tally chart – we adjusted this to build a table on the whiteboard to be used by the class. We printed this off for everyone to use.



LQ: Can I keep a record of what I thought and how my ideas developed?

Part of the body	What I think it does (include the date)	What I hope to find out	What I think about this now (include the date)
bones	19.11.13 If we did not have any bones We would be as Sofl as a Pillow.	I want to find out how many bones in our body.	26.11.13 Now I know that Bones are made of Calcium.
skull	19.11.13 I now that the skull keeps us See and Smell and also if we did not have a Skull we would notice	I want to find out why do we need our skull?	26.11.13 Now I know that the skull Protects your brain.
rib cage	19.11.13 our rib Cage keeps our tummy muscles Straight.	How many bones are in our rib Cage?	26.11.13 Now I know that the ribcage Protects your Organs.
spine	19.11.13 our Spine keeps our back Straight If you don't Sit upstraight We will have a Curvy Spine	What does your Spine look like?	26.11.13 Now I know that the Spine Cords messages From your Brain to your Body
pelvis	19.11.13 The pelvis is Sort of your hip	What does a pelvis do?	26.11.13 Now I know that I have a Pelvis.
muscles	19.11.13 The Strongest muscel is your tong.	What does a muscel do?	26.11.13 Muscles pump it When you bend your Arm
Feet	Your Feet help you walk 19.11.13	Why are your feet there?	26.11.13 I know there is 30 bones in your Feet.

Photo 4: A child's completed recording sheet

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Rationale:
This part of the activity aimed to support children in recognising the role and importance of recording in answering *their own questions.*

Children's responses
The children were able to come up with sub-headings and ideas for further investigation.

Reflections
This made me aware of the spread of experience and approach across the class and the need to share this.

Implications and next steps
It highlighted my role in supporting children's independent enquiry processes and refocusing on the purposes of investigations and what they are learning from them.

Circus of activities
Children worked in groups, taking turns to carry out these different activities.

Rationale
These activities were designed to explore further the connected structure of the skeleton and ways in which bones are fit for purpose. The ipad activities gave opportunities to watch videos and bodies in motion – to research properties of bones and begin to explore muscles.

1: Observing bones
In pairs the children examined bones using a prompts to direct them.
Choose a bone. Draw and label it.
List as many jobs of the bone as possible.

Photo 5: Children observing and drawing bones

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Children's responses

The children really explored the bones and there was lots of conversation – in particular the articulated jaw on the life-sized skull. However there was little recording.

Reflections and implications

Children really enjoyed playing with the bones but found it *challenging to ask scientific questions, to hypothesise* and to continually ask why.
They needed adult support and questioning to encourage discussion about structure and why bones in different parts of the body are different shapes.

2: IPAD research

Children independently answered questions. The focus was on information which is not readily available at first hand in the class room or from books.

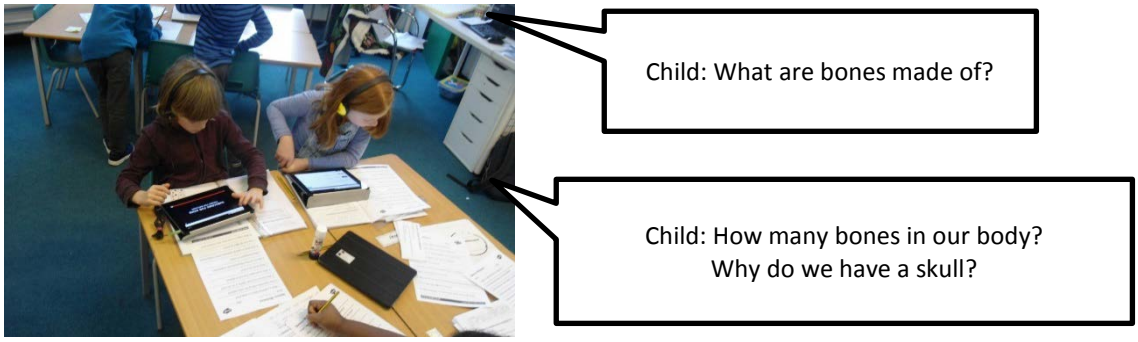

Photo 6: Children carry out their research using IPADS

Reflections

The children were motivated by having a *focused question*.
The activities gave children experience of *different kinds of inquiry*, using different resources.

Implications

This highlighted the importance of questions (from adults and children) in focusing inquiry.

3: Constructing a 2D model of the skeleton

Children positioned skeleton parts on a table.
They had to check with their partners' body and the skeleton model when stuck.
They labelled as many bones as possible with 'post it' notes.

Rationale

Activities 3 and 4 were designed to join experiences together in seeing the skeleton as a connected structure and to provide opportunities for rehearsing scientific terminology.

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Photo 7: Children arrange the bones of the skeleton and add labels

Children's responses and reflections

Some children positioned the bones incorrectly so hinge joints became ball and socket joints – even though they had explored this.
The children still made limited connections with the model skeleton and their own bodies in completing this.

4: Labelling joints on their own bodies

In pairs the children stuck post it notes on each other's bodies with as many names of joints and muscles as they could remember. They could refer to class made charts when stuck.

Photo 8: Children labelling the bones of the body to show their positions in real life

Reflections

Children really enjoyed this activity – much more fun than labelling a diagram and maintained the contact with their own bodies.
Children still needed to be prompted *to go back to first hand sources and evidence* rather than relying on prior knowledge/memory.

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Implications

Children need support in linking their ideas to practical experience

5. Make a giraffe out of Play Doh.

In pairs make a Giraffe out of Play Doh or pipe cleaners in three minutes. Compare and contrast your outcomes. What was more effective and why?

Rationale

Activities 5 and 6 were designed focus the children on the wider role of skeleton for support, protection and movement.

Photo 9: Children make a model giraffe to show its skeleton

Reflection

This activity itself was fun but it needed adult support and questioning to focus children on issues of support.

6: Investigate what happens to our bodies when we fall.

Which parts hit the ground first and the order in which this happens. How does the skeleton protect us?

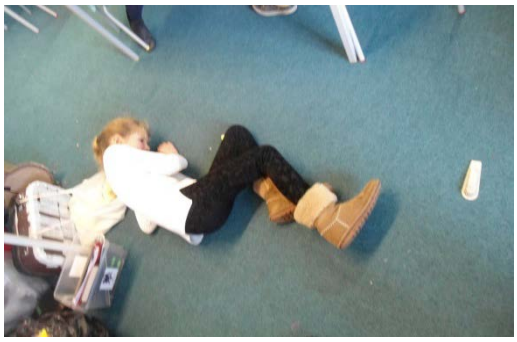

Photo 10: The children experiment with falling

Children's responses

The children noticed that the central part of the body was often protected.

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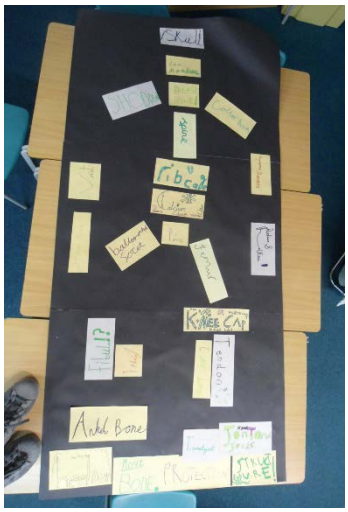
Reflection and implications

These activities provided starting points for further class discussions. They would have been better as a separate phase of follow up activities with greater teacher modelling. On reflection there were too many activities for one session.

Reviewing learning across the project

There were opportunities to review learning across the project as outlined below.

Developing vocabulary



In pairs the children came up with all the bone names and other vocabulary that they felt relevant to our learning wall.
Next step would be to title this as a glossary and give more of a focus to why this is important and necessary.

Photo 11: Glossary of bone names and vocabulary for learning wall

Developing inquiry skills and creative dispositions

The aim of the project was to promote curiosity and motivation and provide increased opportunities for children to make decisions in gathering evidence and to draw their own conclusions.

Evidence of this was gained through ongoing opportunities for children to reflect on their learning through class discussion and sharing of ideas for example:

- Initial activities to share thoughts about the skeleton and scientific inquiry
- Sharing of recording from their investigations (feeling their body)
- Their different perceptions of activities (falling activity).
- What they had learnt from the circus of activities
- What it had felt like learning in this way.

In terms of ideas about scientific inquiry they moved away from parroting fair test - to recognising the need for making, recording and discussing observations in a variety of situations and in a variety of ways and the importance of evaluating ideas and processes

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Examples of children's progress

	**Lakaysha** was *very motivated and curious*. She really enjoyed the practical activities and the idea that you can find out. She gained confidence recording herself as, 'happy' and 'have a go' in her final self assessment. She began to *make connections* between her practical experiences and developing ideas 'when you watch your partner running in the corridor you can see which bones they yost'. She had limited initial ideas and experience 'I think a skeleton is there because it mite help the souell and plants grow'. 'Bones are the most important things'. Her final ideas showed developing understanding of the skeleton and its functions including: 'The skull protects the brain'. 'Your spine has lots of bones.' 'Pelvis helps you stand up straight'.
	**Rafa's** initial ideas included 'I think the skeleton is mainly to help you think and to digest food and water and for strength to move and talk'. His drawing showed organs rather than bones. His model had no joints. He suggested *questions to investigate* for example 'Is your tongue a joint, is your mouth, is your nose a joint? Initially he found it difficult to *take risks, reflect on learning,* and *make connections* to experience of handling bones in his models and drawings. His final comments *connected* to his practical experiences for example: 'I know that you could nearly move a 12al land socket joint 360 degrees.'I know that your ribs protect your organs' (distinguishing skeleton and organs).
	**Sophia's** initial ideas included: The spine makes our back straight. If we did not have any bones we would probably be as soft as a pillow. I know that the skull helps us see and smell and if we did not have a skull we would not live. She was *curious* to know 'what your spine looks like'. Her *reflections on learning made connections* to her practical experiences 'I think the skull protects your brain because the skull is extremely hard and I looked inside a skull and there was a brain inside.' 'I think you need bones because when I made my giraffe out of play doh it did not stand up because it did not have any bones.' Now I know that the skull protects your brain. Now I know that the rib cage protects your organs'

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Overall Reflections

Children's progress

- The children were *very motivated*. They felt this was a *team effort as a scientific community* – sharing our strengths and knowledge. They saw ways in which *their ideas were incorporated* across the lessons.
- The practical nature of the activities helped children to *make connections* between prior isolated elements of factual knowledge and *their own inquiries* of various kinds. But this still needed prompting.
- They started to see that the point of investigations is to *answer questions*, that making observations is scientific.
- The experience highlighted the need for children to understand *ways of recording* in science and their purposes. They are often given frameworks to use without a clear idea of how this might support their inquiry processes and learning.
- The children really enjoyed the practical elements and the fact that they could *make choices and decisions* about resources, roles and approaches.
- I had not anticipated that higher attainers would struggle with not having a closed expectation, and with *connecting* direct practical experience with knowledge gained from second hand sources. For example they knew about ball and socket and hinge joints in theory, but could not relate this to joints in their own bodies. But this will improve in time.

Implications for future learning

The children further experience of building investigations from their own ideas and questions, including the roles of recording and using evidence in reflection and reasoning.

Reflections: My role

- This experience was also much more open-ended for me (not just the children). I needed to be creative in thinking about the flow, the structure and activities in response to the children.
- I have become more thoughtful about my role as a facilitator – not just pouring information onto them and allowing the children to make choices.
- I became much more focused on *informal observation* of the children's learning behaviours rather than formal assessment.
- The recording processes introduced provided useful vehicles for the children to *reflect on their learning* and gave insights for me into their progress. It will be important to build on this.
- Although the children were diligent, enthusiastic and focused, I still needed to return to the purposes of activities, *using questioning* to emphasise the skills involved in scientific inquiry and what we were trying to investigate.

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Classroom environment*:*

Building group work skills was an essential pre-requisite for the success of these activities. Although greater attention was need to scientific inquiry the class were used to working independently in groups and they knew what was expected of them in the classroom.

Implications

I need to encourage children to reflect not just *what* they learnt but *how* they learnt it – linked to their ideas of being a scientist.

Reflection questions for the reader

- In what ways do you find out about children's ideas and questions?
- What opportunities do you provide for different kinds of inquiry?
- How do you help children make connections between different experiences?

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