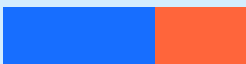
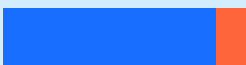
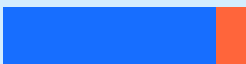


The seven-step model: working scientifically

Improving primary science

The seven-step model provides a useful framework to support teachers to build students' independence when working scientifically, by deliberately shifting responsibility for learning from the teacher to the student. This example demonstrates how teachers could integrate the seven-step model into a series of lessons. The arrows in the model highlight that the seven steps are to be used flexibly and in response to feedback from learners.

Find out more in E4L's
'Improving primary science'
Guidance Report
[E4L.org.au/science-primary](https://e4l.org.au/science-primary).

Step		Summary Key ideas from the Guidance Report	Example from the classroom
Student	Teacher		
1. Activating prior knowledge 		Identify what students already know, what you have taught previously, and what students need to know to access the lesson. This can inform the pace and content of the lesson.	<i>Ms Hayes activates prior knowledge of light and shadows by showing students a short video on shadow puppets. She asks students to discuss in groups of three: 'What can you see?', 'What do you notice?' Ms Hayes listens carefully as students reveal their understanding, keeping an ear out for misconceptions, such as 'shadows are solid objects' or that shadows are reflections'. This informs targeted questioning and future learning.</i>
2. Explicit strategy instruction 		Teach the knowledge, skills, and processes required to work scientifically. Be clear what the learning intentions are. Address common preconceptions before they become embedded.	<i>Ms Hayes provides instruction about predictions: 'Today, we are going to learn and define how shadows are formed. We are going to work scientifically by making predictions and observations. A prediction is when you explain what you think will happen—using what you already know and any evidence available to you—to explain why you expect that to happen. When we make predictions, it is important we use what we already know to help us. We can use a sentence frame like this: 'I predict that ... because ...'</i>
3. Modelling of learned strategy 		Build understanding through demonstrations, modelling expected behaviour or thinking, providing examples, partially worked examples, or non-examples.	<i>Ms Hayes models predictions with a scientific explanation: 'For example, if I see a lot of dark clouds in the sky, I might predict that it will rain soon because the last time I saw the dark clouds in the sky it rained.' 'In the last topic, we focused on forces and magnets. Based on what I have learned, I would predict that if I held this magnet close to a paperclip, the paperclip would be attracted to the magnet. I know this because the paperclip is made from steel, which is a magnetic material.'</i>
4. Building memory 		Check to see if students have understood. For example, low stakes quizzes (ensuring you see or hear a range of answers to inform next steps) can help check students' understanding.	<i>Ms Hayes uses the topic of shadows to build memory of what makes a good prediction. Each trio is given a concept cartoon. Each character on the concept cartoon has made a prediction of how they think a shadow is formed. Ms Hayes instructs students to 'Read and discuss the predictions. Do you think all the statements are good examples of predictions? Why/why not?' Students might suggest that one of the predictions is not a good example because scientific vocabulary is not used.</i>
5. Guided practice 		Introduce practical work to reinforce learning, encourage recall, or deepen understanding while developing skills to work scientifically.	<i>Ms Hayes asks students to work together to form their own predictions of how a shadow is formed. She uses a sentence frame to scaffold their prior knowledge and to select appropriate scientific vocabulary. Each group is given a torch, a white card on a stand, and a range of transparent and opaque objects. Ms Hayes guides students to set-up the equipment, explore what happens when different objects are used, and to use scientific words such as 'transparent' and 'opaque'. Ms Hayes guides students to reflect, draws together student reflections and clarifies how a shadow is formed.</i>
6. Independent practice 		As students build their knowledge and expertise, the type of support you provide should be gradually reduced so that students can work more independently.	<i>Ms Hayes uses the relationship between shadows and distance from a light source as an opportunity for students to make predictions independently. Students are presented with a new investigation: 'How can you change the size of a shadow?' Students are asked to make predictions (with reduced scaffolding or no scaffolding at all). Once they have made their predictions, students complete an investigation, making observations and recording their measurements. Ms Hayes reflects on the findings with the students. Prompting them to consider: Were their predictions correct? Why/why not?</i>
7. Structured reflection 		Provide opportunities for students to summarise what they've learned and receive feedback. 'Does the conclusion make sense? Why? How could it be improved?'	<i>Ms Hayes provides a structured reflection activity for students to reflect on the sequence of activities on the topic of light and shadows and making predictions. The students summarise their learning to another triad verbally. They can use torches, objects, and white card to aid their summaries. Ms Hayes asks students to use their knowledge of how shadows are formed to support detailed explanations.</i>