Practice guide for primary and secondary schools

Develop techniques and practices

Australian Education Research Organisation

Extend and challenge

Provide appropriately challenging opportunities for students to apply, extend and demonstrate mastery of their learning

November 2024

All students need opportunities to successfully extend and demonstrate their learning beyond what they've been explicitly taught. This can be through a variety of structured, guided and open tasks that build in detail, complexity and abstraction as students develop mastery.

This practice guide will help you understand how to:

- provide opportunities for all students to extend their knowledge and demonstrate mastery of learning objectives at various stages in the learning process
- guide and monitor students during independent practice using scaffolds and constructive, explanatory feedback as they extend and apply their learning
- provide appropriately challenging tasks that require students to retrieve and apply knowledge in more complex and integrated ways.

Provide appropriately challenging opportunities for students to apply, extend and demonstrate mastery of their learning (*Extend and challenge*) is one of 18 interconnected practices in our Teaching for How Students Learn model of learning and teaching. This practice sits in the **Gradual release** phase, which focuses on maximising students' opportunities to retain, consolidate and apply their learning. It is the fourth of 4 practice guides focusing on the gradual release phase, supporting students in developing and demonstrating mastery of their learning. Mastery is the accumulation of knowledge, conceptual understanding and skills. Students have achieved mastery when they retain their learning and understand how and when to use it. This practice is interconnected with:

- **Enabling**, which focuses on responsive, respectful relationships in a culturally safe, learning-focused environment
- **Planning**, which focuses on developing and using a sequenced and structured plan for the knowledge and skills students will acquire
- **Instruction**, which focuses on managing students' cognitive load as they process and acquire new learning.

Enabling	Planning	Instruction	**Gradual release**

Understanding this practice

These examples demonstrate what extending and challenging students' learning might look like in the classroom, and potential misapplications in practice.

What it is

- Designing learning activities following explicit teaching and practice that enable all students to transfer what they now know and can do to new or unfamiliar problems, situations or contexts.
- Students using their knowledge and skills in increasingly complex situations, deepening their understanding and strengthening their skills.
- Providing opportunities for all students to demonstrate mastery of the knowledge and skills they've learned via problem-solving and real-world tasks.

What it isn't

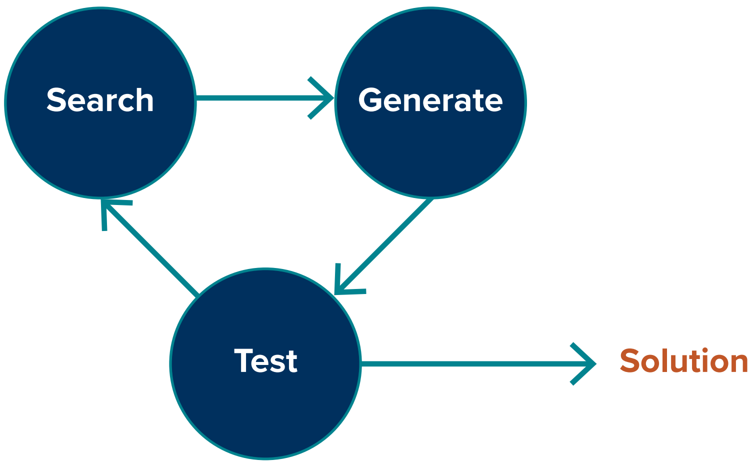
- Providing more of the same kind of work for fast finishers or more capable students.
- Only providing challenging application of learning tasks for students who demonstrate early mastery of foundational knowledge and skills.
- Students working independently without scaffolds, guidance or feedback.
- Teaching generalised, decontextualised problem-solving and thinking skills.
- The provision of additional extension activities for gifted and high-ability learners.

The importance of extending and challenging students

Key points from the research

- Students need sufficient surface knowledge to achieve deep learning. Learning surface knowledge starts with remembering and recalling information. Deep learning happens when students understand and apply what they've learned, can choose effective strategies relevant to the problem or task and know what to do if they get stuck.[1]
- Following the provision of explicit teaching and practice to build and consolidate knowledge and skills, well-structured and scaffolded problem-solving and real-world tasks help students apply their learning more effectively than continued explicit teaching.[2, 3] Students develop more complex mental models as they connect information, solve new problems, expand their understanding and generate new ideas.[4]
- Guided structured inquiry, following explicit teaching and practice to consolidate learning, offers opportunities to introduce additional complexity, new challenges and independence. For this to be effective, students need clear instructions, sufficient prior knowledge and ongoing guidance, feedback, modelling and recommendations, including methods, processes and metacognitive strategies.[5]
- Knowledge provides the basis for critical and creative thinking. When students tackle unfamiliar problems, they search their memory to generate and test new ideas (Figure 1). This process combines existing knowledge into new strategies leading to new learning.[6, 7]

Figure 1: Process for using knowledge in memory to generate ideas



- Students reorganise their existing mental models and build meaningful new connections through the process of searching, organising and integrating what they already know and connecting this with new learning. This process is known as 'generative learning', named for the fact that students can – once they have the necessary depth of knowledge and understanding – generate new learning beyond what they've been explicitly taught.[8, 9]
- Positioning open tasks in a real-world context offers an opportunity for students to use their knowledge and skills to think critically and creatively about topics that have personal meaning and significance. Tasks that draw on students' contexts, cultures and prior knowledge can reduce cultural and linguistic barriers, helping to manage cognitive load and support learning.[10, 11]

- A group of students with similar levels of proficiency can collaborate and use their combined individual working memories to optimise cognitive load when solving complex problems. Working collaboratively can also help students deepen their learning by drawing from multiple perspectives, helping to clarify their understanding.[12]
- Self-efficacy – the belief in one's ability to complete a task – comes from successful experiences of developing and demonstrating mastery in specific areas and growing greater awareness of strengths and limitations.[13]

Key strategies and techniques

This section describes key strategies and techniques (see summary in Figure 2) when designing a sequence of lessons to build in opportunities for students to demonstrate, extend and apply their learning.

Figure 2: Key strategies and techniques for extending and challenging students' learning

Key strategies	Key techniques
Provide tasks that allow students to develop and demonstrate mastery in unique ways	Use generative learning activities Provide open tasks relevant to students' prior knowledge and lives
Guide students to apply their learning with greater independence	Provide exemplars and frameworks for independent practice Model approaches to problem-solving Establish protocols for collaborative problem-solving Prompt and scaffold self-regulation and evaluation

Provide tasks that allow students to develop and demonstrate mastery in unique ways

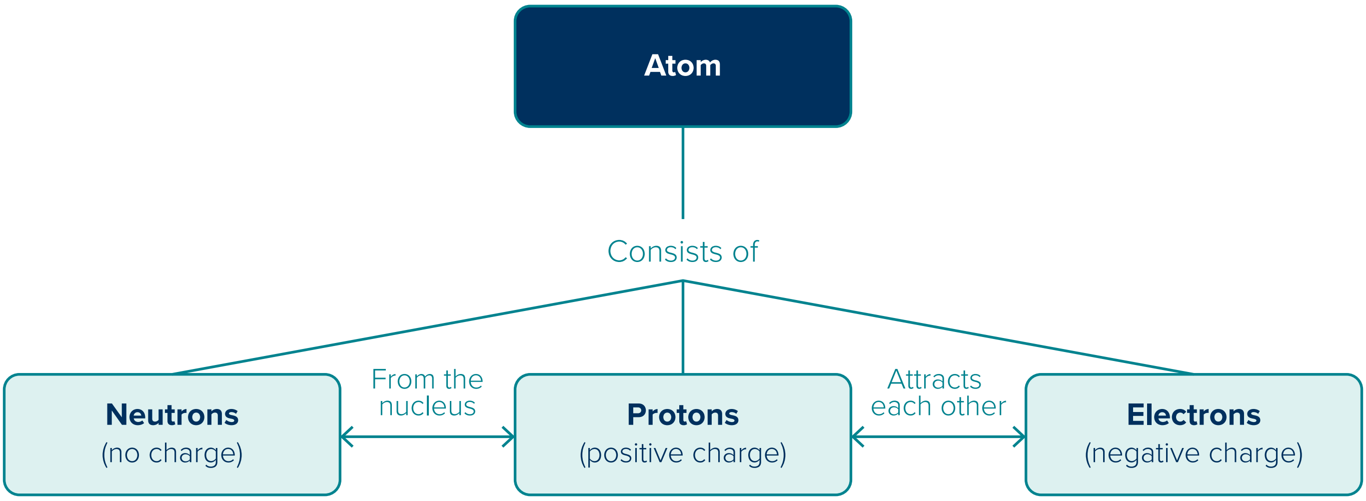
Use generative learning activities

Generative learning activities encourage students to actively integrate new information with their prior knowledge, and to organise and elaborate on content during the learning process.

Generative learning activities include the following:

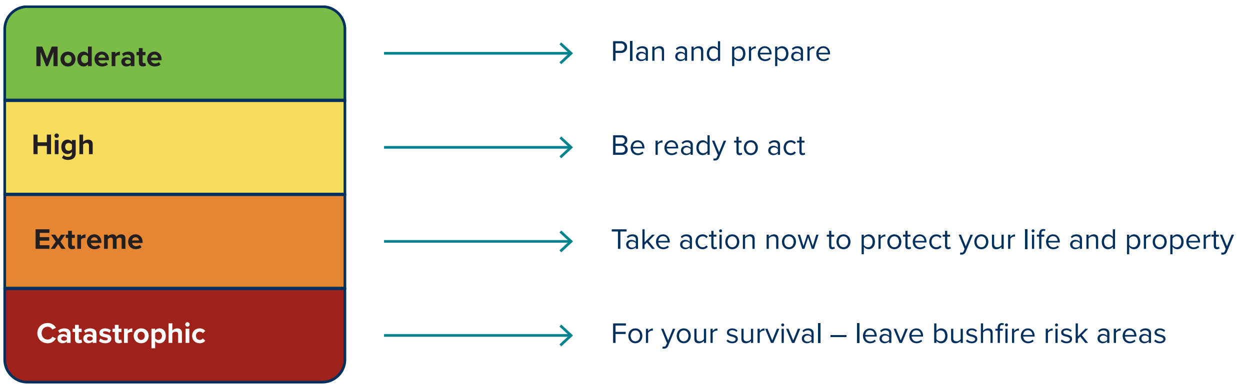
- **Summarising:** Generative summarising is when students select key ideas and organise and integrate them with what they already know.[14] For summarising to be generative, it must involve more than students reproducing what they've read or heard. Students must draw on their prior knowledge to add their own interpretation and understanding of key ideas. The explicit teaching and modelling of vocabulary, sentence structure, inferencing and background knowledge are essential foundations for students to summarise effectively and avoid a cut-and-paste approach.
- **Mapping:** Mapping is a way of representing what students have learned that shows how ideas are related and organised. Examples of mapping include concept maps, knowledge maps and graphic organisers.
  - *Concept maps* depict the main idea as a box or circle connected by lines or arrows to related ideas, describing the relationship between each. In the example in Figure 3 the components of an atom are displayed in a simple concept map.

Figure 3: Concept map of atomic particles



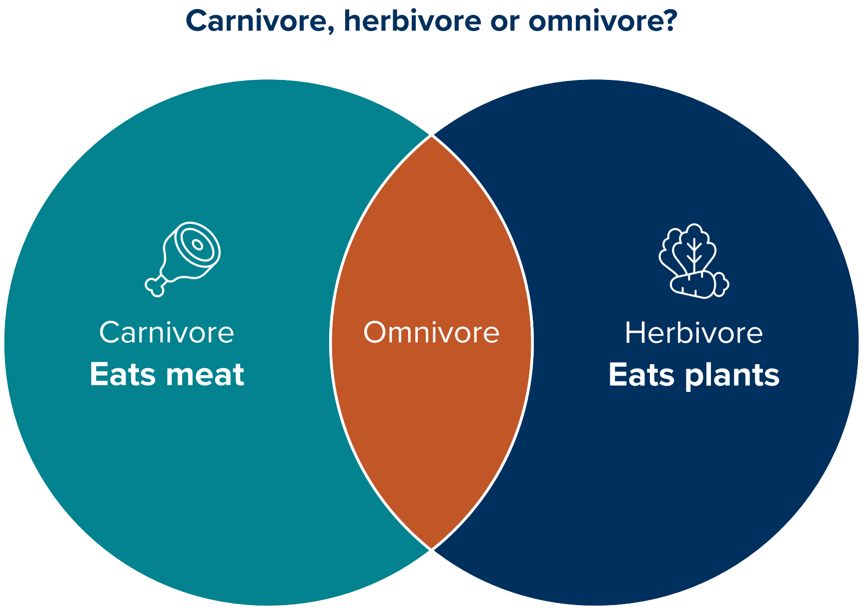
  - *Knowledge maps* predefine connections and relationships between ideas as characteristics such as types, functions or processes. For example, the map of the fire danger rating system in Figure 4 shows the meanings of each colour and the recommended response.

Figure 4: Knowledge map of fire danger rating system



– *Graphic organisers* may include a matrix, flow chart, hierarchy or diagram to represent relationships. Organisers can be used by students to compare and contrast and show cause and effect or classifications. For example, the Venn diagram in Figure 5 could be used in an activity to compare and sort animals that can be classified as carnivores, omnivores or herbivores.

Figure 5: Venn diagram comparing foods eaten by carnivores, omnivores and herbivores



- **Drawing:** When drawing, students select from tools such as paper, pens, concrete objects or technology to visually represent their learning. This helps them connect prior knowledge, select key ideas and clarify understanding through spatial organisation, fostering creativity and insight. Drawing that includes text – such as labelled diagrams – can enhance memory by engaging both visual and verbal systems.[15]
- **Imagining:** Imagining key ideas when reading or listening helps students form mental images and representations. Prompting students to imagine or mentally rehearse a concept or procedure can improve future performance of related tasks by aiding the transfer of information to long-term memory.
- **Self-testing:** Self-testing is a form of retrieval practice that involves students selecting key ideas and creating questions, tests or challenges for themselves to respond to. Students select key ideas and create self-tests to recall prior learning. It can include open questions, prompts or creative tasks for students to generate and share the outcomes of their learning. For example, students who have learned about acid and base reactions could then create and respond to questions about the impact of acid rain on the corrosion of different materials in the built environment.
- **Self-explaining:** Self-explaining is when students use diagrams, images, text or words to explain learning to themselves, their teachers or their peers. Students use what they know and explain the steps they took to find a solution or create a response. You can prompt and scaffold self-explaining. For example, providing sentence starters can help students respond to 'how' or 'why' questions in discussions, while frameworks can guide them in creating extended written or verbal opinion pieces.

- **Peer teaching:** Once students have achieved mastery, they can reinforce both their own and their peers' understanding by explaining their learning to each other. This process is similar to self-explaining, but here, the student explains learning to a peer with the goal of helping them each describe and compare their understanding of what they've been taught. You should monitor closely for misconceptions, provide feedback and offer additional support as needed to help students clarify their thoughts and deepen their understanding.
- **Enacting:** Enacting is when students use objects, movements or gestures to explain what they're learning. These physical actions serve as scaffolds to organise and integrate learning. This process also supports the creation of episodic memories linked to specific experiences (the classmates present, time of day, emotions felt and related contexts during the event). For example:

> Enacting in science might include students choreographing and performing a physical dance, model or demonstration to explain what they've learned about how an increase in temperature changes the state of matter. You can guide students to include and represent component ideas such as:
>
> - Particles gain energy and vibrate more vigorously when a solid is heated.
> - At a specific temperature called the 'melting point', the particles have enough energy to break free from their fixed positions.
> - The solid becomes a liquid as the particles can now move past each other, though they remain in close contact.
>
> Prompt students to make connections in their enactment to the big idea that changes in the states of matter due to temperature increases involve the transition between solid, liquid and gas states.

Provide open tasks relevant to students' prior knowledge and lives

Open tasks can be used to encourage creativity, critical thinking and application of learning following consolidation of relevant knowledge and skills. By providing open tasks, you can support students to go beyond what they may have seen before and to combine information in new ways. Open tasks should only draw on content that's familiar to students and require them to recall and apply a wide range of prior knowledge in new and varied ways. Open tasks can be simple or complex depending on the level of challenge and variety of possible solutions. Open tasks may:

- have multiple solutions
- have multiple ways to arrive at a solution
- enable students to apply their knowledge and skills to new situations and contexts.

Provide initial guidance and prompt students with ongoing feedback throughout the task but stay open to the end result of what students might create, as what they're capable of and where they take their learning may surprise you.

It can be helpful to consider open tasks in terms of what's known (information given), what's unknown (what needs to be found out) and how restrictions in the task can be made more flexible to open space for thinking. You can change the knowns, unknowns or restrictions in a task to increase its complexity and openness. For example:

Open task: How many people are needed to form a human chain around the world?

	Knowledge	Details
Known	The distance around the equator	40,075 km
Assumptions	Average arm span	150 cm
Unknown	The number of people	?
Restriction	People must be linked hand to hand	-

- Change the known/unknown: What if a different part of the world was used and how would that impact the distance?
- Change or remove the restriction 'We've assumed people are holding hands and used an average arm span of 150 cm. What if they're linked another way, such as by touching from head to toe?'

Open tasks that include real-world problems involve applying known concepts and techniques to work on a task that's relevant to students' lives. A real-world problem bridges the gap between abstract ideas and practical application, helping students transfer learning to contexts they may encounter in the future. For example, you could ask students to design a school food garden that grows a variety of fruits, vegetables and herbs while considering factors such as space, plant needs and sustainability. This open task involves several interconnected variables that students need to consider, such as space, sunlight, water usage and sustainability.

For another example, you could involve students in catering for a school celebration. Familiar recipes that have been taught may have quantities and methods for a small number of people. Students will need to convert a chosen recipe to cater for a large group, considering quantities of ingredients, cooking time and equipment to use in preparation and serving. This real-world task also provides opportunities to take known skills and integrate them with knowledge of the local context in creating a celebration that will be appreciated by the school community.

Guide students to apply their learning with greater independence

Provide exemplars and frameworks for independent practice

To support independent practice, provide short periods of further explicit teaching as needed. For example, partially worked examples can show students how to approach an independent practice task, such as a scientific investigation. Additionally, providing students with high-quality exemplars, like an annotated work sample, can model a successful approach to completing an independent practice task. Scaffold Practice provides further information on how to scaffold and guide students in their learning.

Model approaches to problem-solving

Modelling where to start with a problem and guiding students through the solution steps are effective scaffolds when students have a strong understanding of the content. You can continue to check for understanding throughout the process to spot misconceptions and reteach where necessary, modelling how to correct mistakes. For example, the Understand, Plan, Solve, Check scaffold (Figure 6) guides students to draw on what they've already learned to define the problem, plan, solve and check their solutions and strategies.

Figure 6: Understand, Plan, Solve, Check scaffold for application of learning

Understand	Plan
Think about what the problem is asking. Restate the problem.	Consider how will you solve the problem. Decide on the best strategy.
Solve	**Check**
Follow your chosen plan to solve the problem.	Look back to check if the answer makes sense. Could you have used another strategy?

Establish protocols for collaborative problem-solving

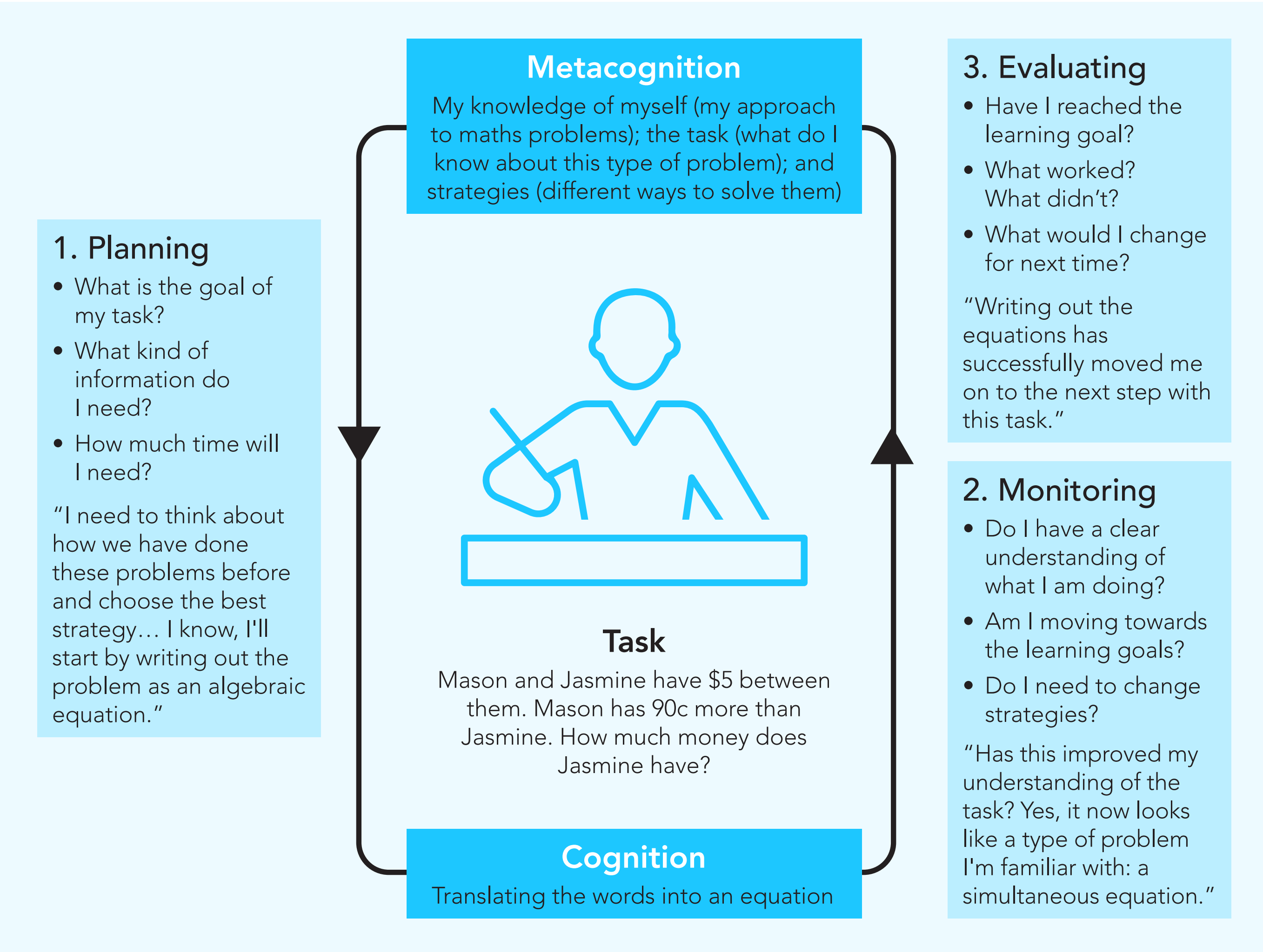
Collaborative problem-solving involves a small group working together to solve an unfamiliar problem that, by design, could not be solved by any individual member of the group. Each group member is allocated a specific role to solve a different aspect of the problem. All roles within the group are interdependent. Each member brings a different contribution to the problem-solving process.

Collaborative problem-solving is only effective when group goals and individual accountability are established.

Prompt and scaffold self-regulation and evaluation

As students master new skills and receive recognition for their progress and other achievements, they build self-efficacy through their experiences of success. By supporting students with keeping their own records, monitoring their progress and celebrating their achievements (as appropriate to their age and developmental stage), you can contribute to the development of positive learning behaviours. Prompts to scaffold students' self-regulation and evaluation can be used to help with planning, monitoring and evaluation of learning (Figure 7).

Figure 7: The metacognitive regulation cycle[16]



Source: 'Figure 2: The metacognitive regulation cycle for a learner' in Metacognition and Self-Regulated Learning: Guidance Report by Evidence for Learning, used under a CC BY-NC-ND 4.0 licence with permission.

Developing your practice*

Consider what's informing your current practices, expectations and beliefs. Use these questions to reflect, make a plan to develop your practice and seek feedback to monitor the impact for your students:

- How does your teaching take account of the different levels of knowledge and skills of individual students?
  - How do you recognise, acknowledge and share students' progress towards achieving their learning goals and aspirations? How do you make sure that the opportunities for students to demonstrate their progress are relevant and meaningful?
- How does your teaching support students to use and apply what they know from their wider lives and experiences to solve unfamiliar problem situations?
  - How do you draw on the students' culture, contexts and real-life experiences?

*Reflexive practice (reflexivity) is a process that critically examines personal attitudes, values and biases, with a view to becoming a more self-aware and effective teacher. Through reflexive practice, teachers, educators and school leaders can appraise and evaluate how their behaviours and ideas influence their teaching and learning.[17]

Further reading

Australian Institute for Teaching and School Leadership. (n.d.). *Around the world with maths: Illustration of practice*. https://www.aitsl.edu.au/tools-resources/resource/around-the-world-with-maths-illustration-of-practice

This resource provides an example of a Year 5/6 extension maths class using previously learnt mathematical methods and strategies to solve real-world problems. The students work in collaborative groups with each member assigned a role. The teacher concludes the class with reflection to reinforce what the students have achieved.

Australian Education Research Organisation. (n.d.). *Mastery learning in maths [Video]*. https://www.edresearch.edu.au/guides-resources/videos/mastery-learning-maths-video

This video shows a maths lesson on place value using a mastery learning approach. It shows how the teacher checks for understanding and how students make connections between what they know and what they're learning.

Smith Ferguson, J. (2020). *Metacognition: A key to unlocking learning*. NSW Department of Education. https://education.nsw.gov.au/teaching-and-learning/education-for-a-changing-world/thinking-skills/metacognition---a-key-to-unlocking-learning

Metacognition involves thinking about one's own thinking processes, which can help students develop strategies for planning, monitoring and evaluating their learning. This review paper assesses the evidence base for teaching metacognition to support cognitive self-regulation.

Endnotes

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7 Willingham, D. T. (2021). *Why don't students like school?: A cognitive scientist answers questions about how the mind works and what it means for the classroom* (2nd ed.). Jossey-Bass.

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9 Fiorella, L., & Mayer, R. E. (2016). Eight ways to promote generative learning. *Educational Psychology Review, 28*(4), 717–741. https://doi.org/10.1007/s10648-015-9348-9

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17 Australian Education Research Organisation. (2024). *Cultural responsiveness in education.* https://www.edresearch.edu.au/summaries-explainers/research-summaries/cultural-responsiveness-education