Practice guide for primary and secondary schools

Develop techniques and practices

Australian Education Research Organisation

Organise knowledge

Teach the connections between ideas using models and tasks that build in complexity, detail and abstraction

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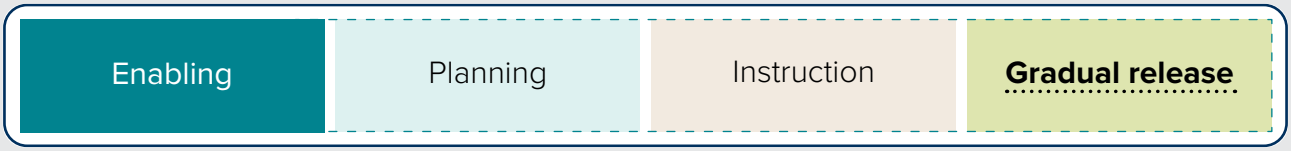
All students develop knowledge throughout their lives, drawing from their life experiences, family and community connections, and what they learn at school. Showing students how new knowledge relates to what they already know helps organise knowledge in long-term memory.

This practice guide will help you understand how to:

- use strategies and techniques to connect knowledge within a lesson, across a sequence of lessons, across areas of learning or with prior knowledge already retained in students' memory
- support students to develop deeper understandings, with greater meaning, relevance and a growing ability to apply their learning.

Teach the connections between ideas using models and tasks that build in complexity, detail and abstraction (*Organise knowledge*) 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 third 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.



Understanding this practice

These examples demonstrate what organising knowledge might look like in the classroom, and potential misapplications in practice.

What it is

- Applying a sequenced teaching and learning plan, building from concrete to abstract ideas and applications.
- Making meaningful connections between the intended learning objectives and students' prior knowledge, skills and experiences.
- Providing an overview of the topic or content and explicitly teaching the components of the topic to then relate back to the overview.
- Creating safe environments and opportunities for students to ask questions, share and test their knowledge, adjust their ideas and integrate new knowledge with their previous understandings.

What it isn't

- Providing students with loosely structured, open-ended problem-solving tasks to allow them to explore the connections between ideas without guidance.
- Expecting students to create concept maps to connect ideas within and across learning areas before they've learned about and understood the components.
- Checking for understanding without first considering how students can connect their prior knowledge, skills and experiences to their learning.

Key points from the research

- Starting with the main topic and breaking it down into smaller parts helps students build knowledge step-by-step, moving from simple to more complex ideas. Explicitly teaching and integrating knowledge, skills and understanding using real-world tasks and examples prevents fragmented learning and supports students in applying knowledge effectively in complex situations.[1, 2]
- Deep understanding comes from learning how facts, concepts and procedures are connected, with the help of teacher guidance and tools such as advance organisers, concept maps and scaffolds that link to and reinforce the value of students' prior knowledge.[3, 4, 5, 6]
- Learning materials that combine images and text or verbal or aural information with visuals can help organise knowledge – provided extraneous information is excluded. Helping students develop connected and related verbal and pictorial models in long-term memory supports better understanding, retention and recall.[7, 8]
- Learning – and student's capacity to apply and transfer what they learn – is dependent on the context the learning content relates to. Authentic tasks that demonstrate the contexts learning can be applied to, supported by explicit teaching of the relevant knowledge, processes and procedures relating to the task, can help students transfer and apply their learning in less familiar but relevant ways.[9, 10]
- Metacognitive knowledge involves how students monitor and purposefully direct their own learning. When students reflect on how they approach tasks and think about relevant learning strategies they've used before, they can better organise information in a meaningful way. This helps them make connections between new and existing knowledge, which supports deeper understanding and retention.[11]
- First Nations knowledge systems can influence and support students to organise knowledge and make connections, though teachers should recognise that Indigenous knowledge is protected and can only be used with permission from the community.[12]

Key strategies and techniques

This section describes key strategies and techniques (see summary in Figure 1) that can support you in helping students organise their knowledge.

Figure 1: Key strategy and techniques to organise knowledge

Key strategy	Key techniques
Connect and organise learning content during instruction	Encourage the use of advance organisers Integrate visual and textual or visual and verbal representations Demonstrate, narrate and think aloud Include examples and non-examples Connect familiar with unfamiliar content Build metacognitive knowledge

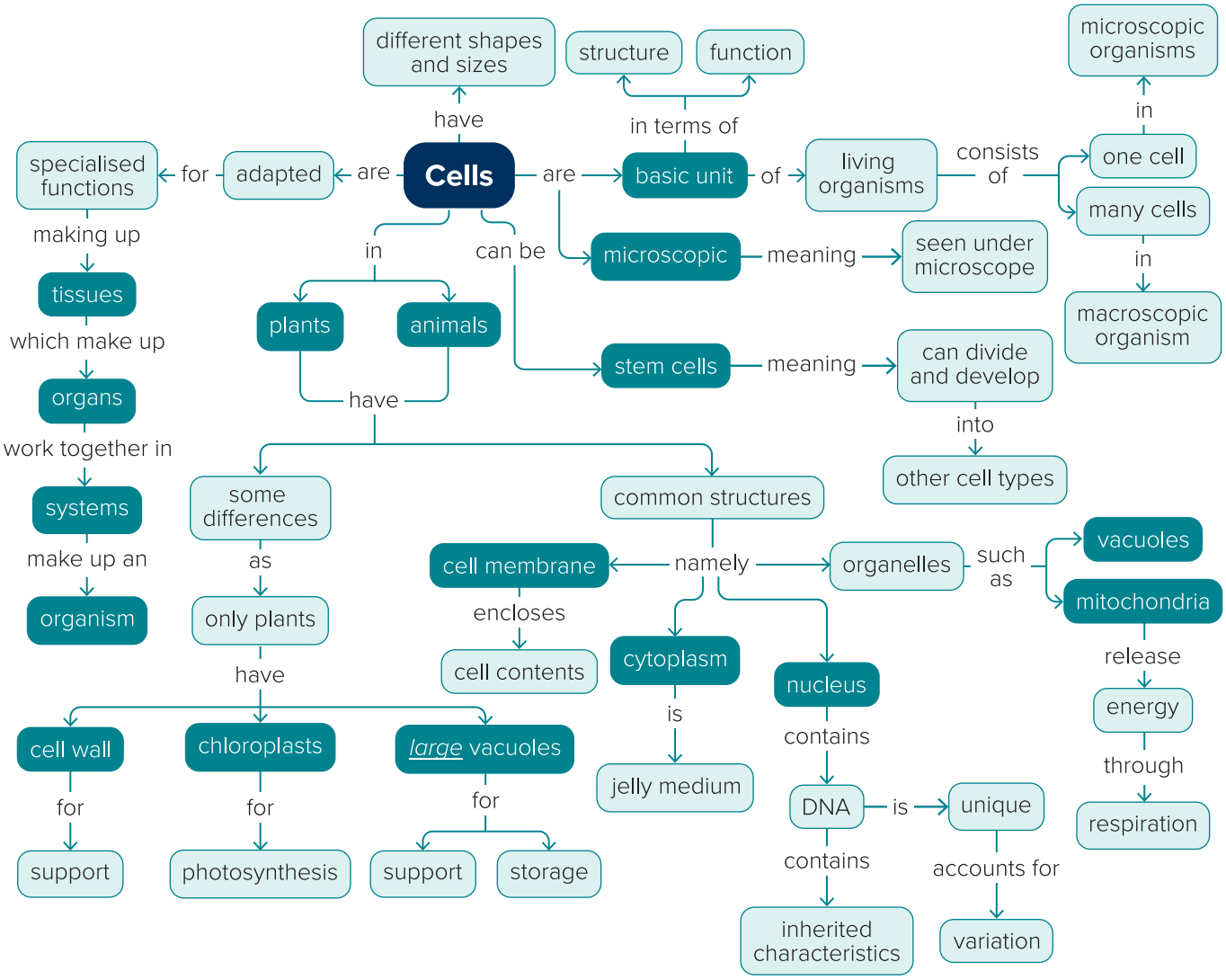
Connect and organise learning content during instruction

Encourage the use of advance organisers

Advance organisers provide an overview of relevant information before it has been explicitly introduced in detail. Organisers help students recall what they already know and prepare them to learn more detailed information as they progress through upcoming, related lessons. For example, the concept map in Figure 2 is an organiser for the content in a sequence of learning about cells.

You can support students in creating their own organisers, including concept maps, tree diagrams, Venn diagrams, flow charts, cycles and fishbone diagrams. Demonstrate and explain how to choose an organiser that will best represent the content of learning within or across a series of lessons. Help students draw connections between the various aspects of a topic, and bring together new and prior knowledge. As students work on their own organisers, you can monitor their understanding and address any misconceptions.

Figure 2: Advance organiser example

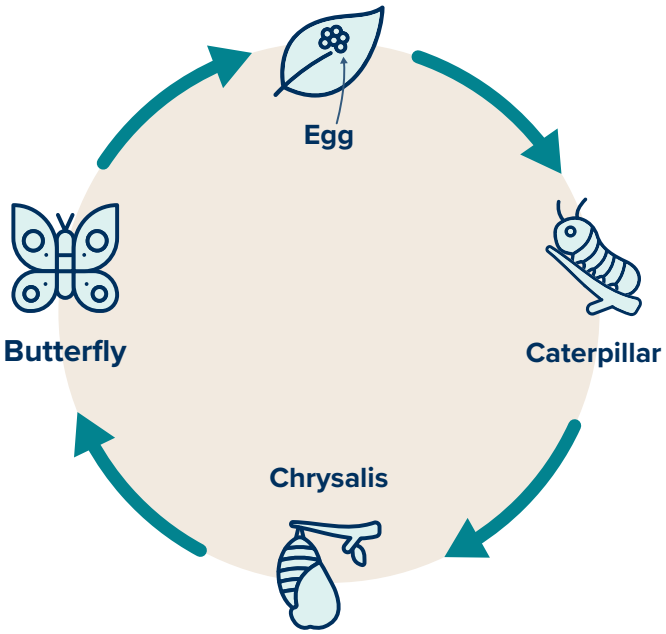


Source: Adapted from 'Gr 9 - Ch 1 - Cells' by Siyavula Education, used under a CC BY 2.0 licence.

Integrate visual and textual or visual and verbal representations

Provide learning materials that integrate text clearly within visuals to help students retain and understand what they're learning. A clearly and simply labelled diagram can integrate text and visuals better than an image that represents information from a separate passage of text. For example, Figure 3 integrates information about the life cycle of a butterfly within the diagram.

Figure 3: Integrated visual and textual representation of a life cycle



Source: Adapted from 'Butterfly life cycle diagram in English' by Cyanocorax, used under a CC0 1.0 licence.

Providing verbal explanations of visual learning materials can also help students process and integrate new information alongside their prior knowledge. To manage students' cognitive load while they make sense of learning content, leave out unnecessary words, images and audio from learning materials. Avoid talking and explaining while students are reading text to prevent cognitive overload. Competent readers will process and acquire new learning from written text more effectively when they're not also hearing it read aloud by someone else. Rather than reading a passage of text in a slide presentation aloud, pause and allow students to read and then provide any further explanations needed.

Demonstrate, narrate and think aloud

Demonstrating, narrating and thinking aloud makes the processes you use to solve or generate a problem explicit to students. This is helpful in modelling the short cuts that are often used in real-world contexts.

For example, once students have mastered simple addition, you could use money to demonstrate a real-world application. You could couple it with a think-aloud to explain the process, pitched with the right amount of explanation to manage students' cognitive load.

> I have 3 coins that make a total of $1.20. What coins could I have?
>
> I could have $1 and two 10c coins because I know that 10 + 10 = 20. I can write this as $1 + 10c + 10c = $1.20
>
> What else could I have?
>
> I could have two 50c coins and a 20c coin. I know that 50 + 50 = 100 and 100c is $1. $1 + 20c = $1.20. I could write this as 50c + 50c + 20c = $1.20.

Include examples and non-examples

Examples lead learners directly to a single interpretation of a concept. Non-examples are used to show what doesn't fit a concept, helping students understand its boundaries. For example, when teaching about nutrition, you could discuss and provide examples of foods high in calories and low in nutrients, as well as foods high in nutrients and low in calories. This could be the basis for a discussion about food choices and what foods best nourish our bodies. This approach addresses misconceptions and helps students form accurate understandings, such as why some foods might be considered healthier than others. When using examples and non-examples, by incorporating the languages, cultures, experiences and values of students with diverse backgrounds, you can guide learning from familiar to new concepts to help students make meaningful connections. The process of comparing and contrasting examples draws on long-term memory to strengthen memory retention. It helps students reorganise their knowledge in ways that reflect their deeper understanding.

Connect familiar with unfamiliar content

Explaining content using examples drawn from something familiar, relevant and valued by students helps them link new knowledge with what they already know. For example, when teaching rhythm or meter in poetry, you could compare the rhythm of a poem to that of a popular song to make the new concept easier to understand. This approach provides a memory aid to help with recall and application of this concept again when needed.

Build metacognitive knowledge

Metacognitive knowledge is about how students think about their own learning and how they choose strategies to help them succeed with different tasks. Students' ability to apply metacognitive knowledge is strongest when they already understand the content well. To support this, you can provide step-by-step instructions, examples and break tasks down into smaller parts. You can help manage cognitive load by separating learning new content from reflecting on it, so students aren't overloaded. For example, you can use a scaffold to prompt students' metacognitive thinking.

> ### Four types of metacognitive questions[13]
>
> - **Comprehension questions:** What's the problem all about?
> - **Connection questions:** How is the problem at hand similar to or different from problems you've already solved? Please explain your reasoning.
> - **Strategic questions:** What kinds of strategies are appropriate for solving the problem? Why? Please explain your reasoning.
> - **Reflection questions:** Does the solution make sense? Can the problem be solved in a different way? Are you stuck? Why?

Developing your practice*

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

- How could you sequence the teaching of concepts starting with concrete examples and moving to abstraction?
- How could you use an advance organiser to teach the connection between ideas? How could you model the development of an advance organiser for students?
- How can you build on students' prior knowledge to connect what they already know, value and have experienced in their lives to what they're learning at school?
- How can you invite and use feedback to strengthen your approach?

*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.[14]

Further reading

Australian Institute for Teaching and School Leadership. (n.d.). *Linking scientific concepts*. https://www.aitsl.edu.au/tools-resources/resource/linking-scientific-concepts-illustration-of-practice

In this video, students use a practical activity with carts and ramps to investigate constant acceleration formula and Newton's laws. The teacher supports the students in forming theories, making connections, self-correcting and reflecting on learning.

Australian Institute for Teaching and School Leadership. (n.d.). *Linking theory and practice*. https://www.aitsl.edu.au/tools-resources/resource/linking-theory-and-practice-illustration-of-practice

In this video of a Year 8 chemistry class, the teacher reviews prior learning on molecular structure, using questioning, physical enactment and experimentation to help students connect new concepts with existing knowledge.

Hirsch, E. D. (2016). *Why knowledge matters: Rescuing our children from failed educational theories*. Harvard Education Press.

This book focuses on the effective use of knowledge and strategies stored in long-term memory to apply domain-specific knowledge and strategies for solving problems.

National Academies of Sciences, Engineering, and Medicine. (2018). *How people learn II: Learners, contexts, and cultures.* The National Academies Press. https://doi.org/10.17226/24783

This report updates and expands on How People Learn I, incorporating recent research and exploring learning across different contexts and throughout life. It emphasises that learning is a complex, interactive process, influenced by emotions, goals, social relationships and individual experiences, rather than a simple accumulation of information. It asserts that learning is shaped by the changing demands of various learning situations.

Shay, M., & Oliver, R. (Eds.). (2023). *Indigenous education in Australia: Learning and teaching for deadly futures.* Routledge. https://doi.org/10.4324/9780429263453

This book focuses on improving the schooling experiences of Aboriginal and Torres Strait Islander students. This text is an edited collection from Indigenous and non-Indigenous authors. It provides specific skill sets in relation to pedagogy and curriculum development for embedding Indigenous knowledges and perspectives.

Endnotes

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12 Janke, T. (2021). *True tracks: Respecting Indigenous knowledge and culture.* UNSW Press.

13 Adapted from Mevarech, Z. R., & Kramarski, B. (2014). *Critical maths for innovative societies: The role of metacognitive pedagogies.* OECD Publishing. https://doi.org/10.1787/9789264223561-en

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