Develop techniques and practices

# Vary practice

Space and vary tasks for guided and independent student practise

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**Varying the ways students practise consolidates learning better than repeatedly practising in the same ways. Spacing out practice over time supports long-term retention and fluent recall by helping to manage cognitive load.**

This practice guide will help you understand how to:

- space and vary the opportunities you provide for students to practise
- support students to develop and retain knowledge and skills that are adaptable across different contexts and applications
- model effective retrieval practices so students can adopt these as they gradually take more responsibility for their revision and study routines over time
- use practice opportunities to monitor progress and inform teaching decisions.

**Space and vary tasks for guided and independent student practise** (*Vary practice*) 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 second 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.[1] 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 varying and spacing opportunities for practice might look like in the classroom, and potential misapplications.

## What it is

- Providing multiple opportunities for students to consolidate their learning by engaging and re-engaging with their learning at spaced intervals.

- Using learning and assessment tasks that vary how students interact with and apply what they're learning, while still aligning with the learning objectives and success criteria.

- Explaining and modelling to students how spaced and varied practice supports their learning. Explicit explanation and modelling can guide students' own development of effective approaches to learning.
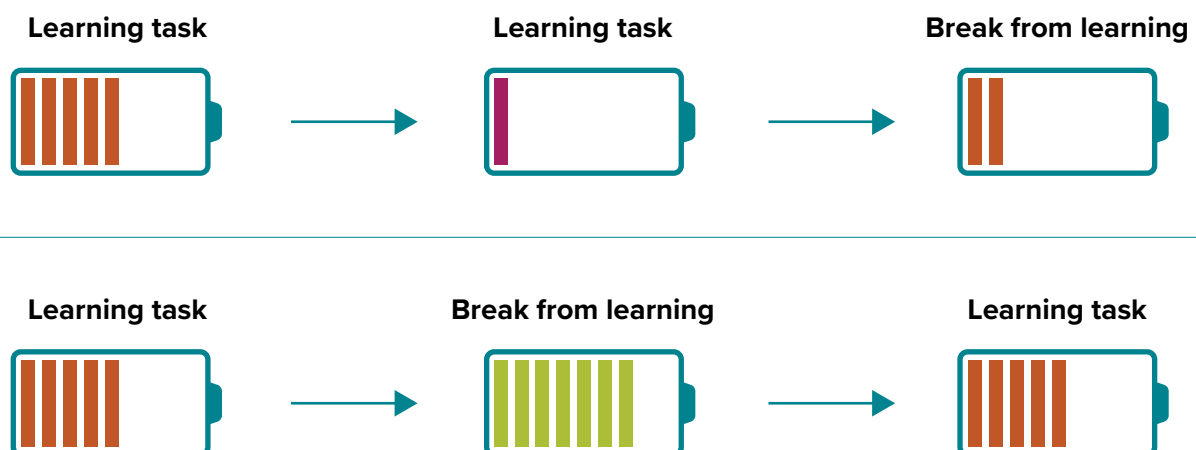
## What it isn't

- Cramming a lot of information into single lessons and providing limited opportunity for students to space out their learning and practice over time.

- Repeating the same activity or same type of activity many times with no variation in approach or content.

- Varying opportunities for practice without providing timely feedback and checks for understanding.

- Allowing students to repeat mistakes, and possibly reinforcing misconceptions.

# The importance of providing students with varied and spaced opportunities to practise

## Key points from the research

- Practising in varied ways can support students' abilities to apply their knowledge to different tasks and types of problems, and to connect their learning to different contexts.[2] This, in turn, enables learning to be increasingly transferred and applied to new and more complex contexts over time.[3]

- Learning information within defined lessons or units and then moving on without revisiting or practising it in varied ways can make it difficult for students to remember. This has been demonstrated in the Forgetting Curve, which shows how each recall of learning makes it more likely for learning to be retained and not forgotten.[4, 5] The more times we're reminded about what we've learnt and encouraged to practise it, the longer the interval until we need to be reminded about it again (see AERO's Revisit and Review practice guide for more on the Forgetting Curve).

- Providing opportunities for students to practise in ways that draw on their cultural knowledge can reduce cultural and linguistic barriers to learning. It can prevent cognitive overload, maximise retention in meaningful mental models, and support students In applying their learning.[6]

- Spacing practice out over time also allows rest. This means that students are less likely to be mentally exhausted and are more likely to consolidate their learning into long-term memory efficiently and effectively (see Figure 1).[7, 8, 9]

- Spaced practice has a positive effect on student learning across education stages and subjects.[10, 11] When students work on a learning activity for a while, it usually becomes easier. Re-engaging with learning content later or in a different way requires students to actively retrieve information from long-term memory. This requires more effort. That cognitive effort – sometimes known as 'desirable difficulty' – embeds learning more deeply into memory, making it easier to recall and use over time.[12] Searching and retrieving past learning from memory may activate related ideas and create new, stronger connections. These new and stronger connections create faster ways to retrieve and apply knowledge in the future.[13, 14]
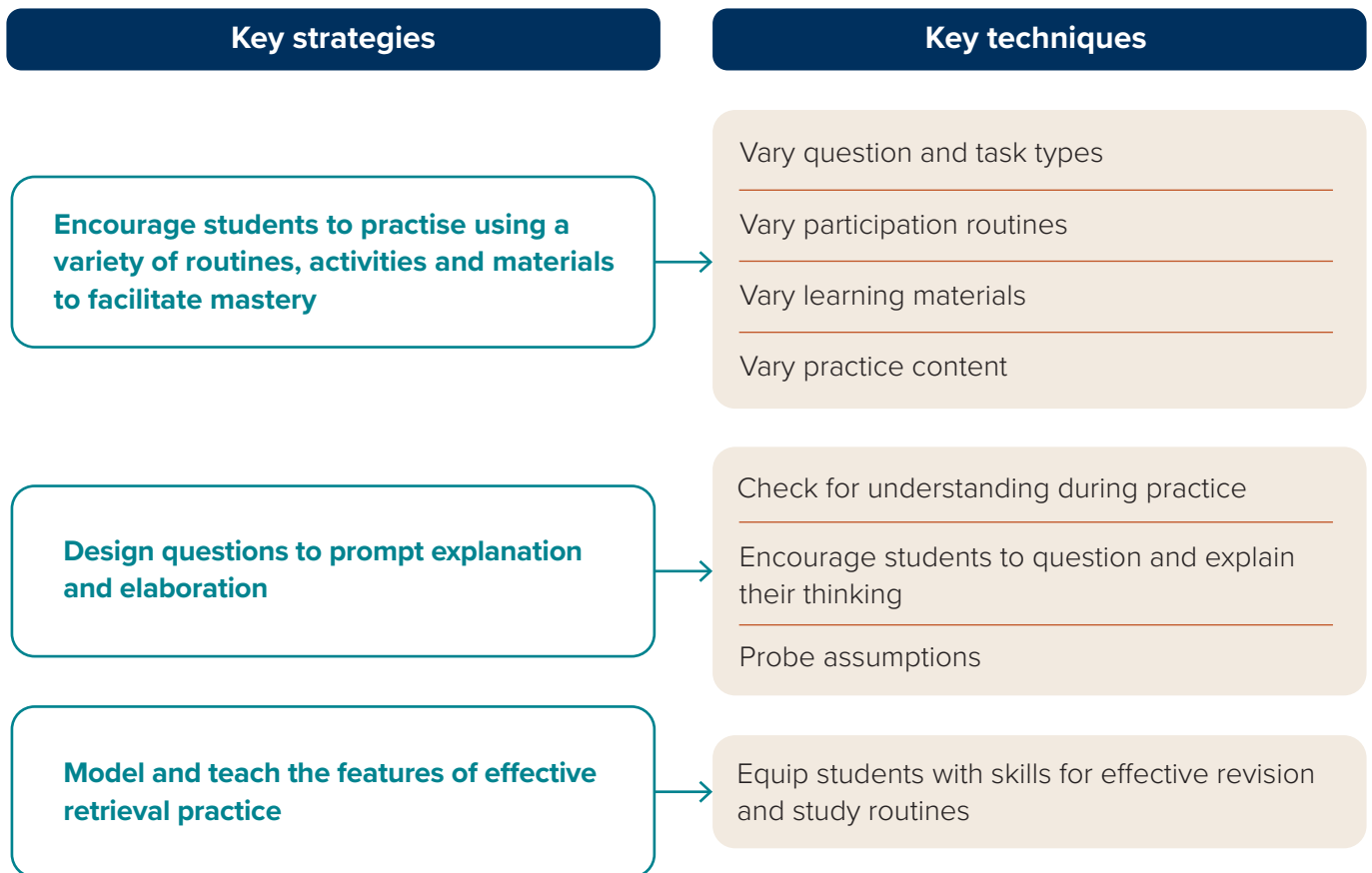
**Figure 1:** Impact of rest on mental resources[15]



**Learning task**    **Learning task**    **Break from learning**

**Learning task**    **Break from learning**    **Learning task**

# Key strategies and techniques

The techniques described in this section will assist you in providing varied and well-spaced opportunities for students to practise what they're learning (see summary in Figure 2). This helps to build secure, adaptable knowledge that can be applied across diverse contexts.

**Figure 2:** Key strategies and techniques for spacing and varying practice

| Key strategies | Key techniques |
|---|---|
| **Encourage students to practise using a variety of routines, activities and materials to facilitate mastery** | Vary question and task types<br>Vary participation routines<br>Vary learning materials<br>Vary practice content |
| **Design questions to prompt explanation and elaboration** | Check for understanding during practice<br>Encourage students to question and explain their thinking<br>Probe assumptions |
| **Model and teach the features of effective retrieval practice** | Equip students with skills for effective revision and study routines |

## Encourage students to practise using a variety of routines, activities and materials to facilitate mastery

When learning occurs in the same ways all the time, the material learned tends to become closely connected to the context in which it was learned. Students may perform well in the specific context or environment where they studied but their ability to recall or apply their learning in different contexts can be compromised. Instead, provide a variety of activities by using the following techniques.

## Vary question and task types

Offer multiple types of tasks, examples, questions and models for students to practise, demonstrate their understanding and try out new ways of applying their learning. Introduce variation across spaced practice sessions using a mixture of question and task types, such as worded problems, number problems, fill-in-the-blanks, quizzes and multiple-choice questions. You can also introduce variation in question and task types by:

- **Pairing simple and applied questions:** Pair questions that require simple factual recall with ones that require broader application of knowledge. When using paired questions, it's helpful to sequence them so students are required to retrieve their factual knowledge before applying it.

  Pairing and sequencing in this way can support student practice by priming the knowledge that students need to engage with more complex tasks. For example, worded maths problems require higher cognitive demand to interpret and apply knowledge (and for some students to translate) than number problems.

  > **Examples of sequencing questions**
  >
  > **Mathematics:** Sequence numerical multiplication and division before a worded problem – for example:
  >
  > a) Calculate: 10 ÷ 2 =
  >
  > b) If Sally has 10 muffins and she wants to share these equally between 2 people, how many muffins should she give each person?
  >
  > **English:** Once students have demonstrated their ability to recall what happened in the previous chapter of their novel, ask them about the characteristics and motivations of a character reacting to an event. Students will need to use recalled facts to make inferences about the character.
  >
  > **Science:** After asking students to recall the meaning of the atomic number for elements on a periodic table, you could give students a series of questions that require them to consult a periodic table to identify and interpret the atomic number of each element.

- **Shuffling practice questions:** Shuffling involves mixing up the order and type of practice questions, so no 2 consecutive questions require the same strategy to answer them. It can also involve grouping questions that jump between topics. Shuffle practice questions and topics that students are practising so they need to think more deeply about what knowledge and strategy to apply for each question, strengthening the connections forming in memory. Delivering practice sessions in a 'blocked' fashion, where students are asked to answer a series of questions using the same strategy or on the same topic, can unintentionally see students 'going through the motions' when practising without much active thinking.

- **Combining familiar and unfamiliar problems:** Use familiar problems to help manage cognitive load while students are consolidating new learning, building fluency and confidence. For example, provide sets of familiar problems or questions as a starter activity routine (see AERO's Revisit and Review and Rules and Routines practice guides). Introduce unfamiliarity by increasing the degree of difficulty or by varying the contexts students need to apply their knowledge to. Gradually increasing unfamiliarity will allows students to experience success and grow more confident in their ability to apply their learning.

- **Retrieval grids:** Retrieval grids are tables that include questions about previously covered information and skills to prompt retrieval practice. Students can move around the grid at their own pace and answer questions in any order. The content may include a mix of topics and may also vary in complexity and degree of difficulty so students can strive for challenge when they're ready.

- **Low-stakes quizzes:** Low-stakes quizzes are a type of formative assessment that provide valuable information to inform your teaching, such as whether you need to provide additional instruction while students practise, make mistakes and get feedback on their learning. Build and reinforce a safe learning culture in your class that ensures students experience minimal consequence or risk during questioning and quizzing. The safer students feel about taking risks and making mistakes, the better they can learn from low-stakes practice.

- **No-stakes quizzes:** Students complete no-stakes quizzes anonymously, eliminating identifying information and scores. This reduces pressure on students while providing a snapshot of class progress to inform teaching decisions. It's important to note that a no-stakes approach can make it difficult for you to directly address misconceptions or correct errors with students. Therefore, you should use it to help evaluate the effectiveness of your teaching of that content and to monitor the progress of the whole class rather than an individual student.

- **Oral narratives and pictorial mapping:** While written responses are common, students are likely to retain more from practice tasks that vary the way they respond. For example, asking students to speak about what they're learning and show their learning in graphical forms. Further guidance is provided in AERO's practice guide on scaffolding practice.

## Vary participation routines

Use a variety of participation routines to mix up the ways students practise their learning. As students become familiar with each participation routine, mix them up and combine these routines over time and possibly on different days to balance variety with predictability and clear expectations. If you're still supporting students to develop familiarity with a limited set of routines – such as whiteboard responses, quizzes and retrieval grids – you might still introduce variety by changing the format of the activity or by providing a partial retrieval grid students can add to and share with a peer before completing.

## Vary learning materials

Provide opportunities to work with a variety of learning materials and sources, rather than, for example, only drawing from a textbook or worksheets or always using slides. Real-world materials may also be offered – such as gumnuts for counters in maths rather than only plastic counters. Exposure to a broad range of materials and sources promotes adaptable learning, preventing learning from becoming attached too closely to one context, learning material or application.

## Vary practice content

Interleaving is a form of variation that is most effective in maths and science. With interleaving, the content students focus on is mixed up – such as drawing content from across learning areas and topics.[16] As with other forms of varied practice, interleaving prompts students to engage with differing information regularly and benefits them by helping to:

- refresh working memory

- differentiate between concepts

- apply knowledge in flexible ways

- strengthen connections in memory.[17, 18, 19]

A daily review session that incorporates knowledge and vocabulary recall from across multiple learning areas is an example of interleaving. Cross-curricular teaching can also provide opportunities for interleaving as students retrieve and apply concepts from many learning areas as they study a topic.

# Design questions to prompt explanation and elaboration

## Check for understanding during practice

Checking for understanding during practice sessions is covered in detail in AERO's practice guide on monitoring progress. It includes asking open and specific questions and avoiding closed questions such as 'Does everyone understand that?' Examples of checking for understanding during practice include:

- asking students to simultaneously show their answers on mini whiteboards or using digital platforms

- asking all students to 'turn and talk', explaining their answers with a peer before asking a random, small number of students to share back to the whole class

- circulating the room while students complete practice tasks, checking for error rates and common misconceptions to inform next steps in teaching.

To facilitate effective practice and feedback, plan for and ask questions that prompt and scaffold memory recall rather than simply reteaching or recapping information. If your checks for understanding and other forms of formative assessment indicate that further reteaching is needed, move back to instruction before continuing with guided and independent practice.

## Encourage students to question and explain their thinking

Pre-plan and use questions that prompt explanation and elaboration to probe student understanding, promote retrieval and encourage students to explain and actively use their learning. Elaborative interrogation is a specific technique guided by teachers that helps students explain and justify their thinking once they have sufficient prior knowledge. Prompt students to ask their own questions about the content, particularly 'how' and 'why' questions, to answer in their own words and connect it with prior knowledge to make meaning (see AERO's Organise Knowledge practice guide). Prompt students to check their answers are correct with you, and allow time for students to rephrase, summarise and elaborate on new information to help them consolidate and extend what they're learning and make meaningful connections.[20]

## Probe assumptions

To move beyond vague responses, probe students' understanding. Probing highlights the impact of any assumptions a student might be making and prompts them to think more deeply. Examples of prompts include:

> 'Your answer assumes x. What would happen if … ?
>
> 'Your answer assumes x. How do you know that?'
>
> 'What makes you say that?'
>
> 'What was your method? How did you arrive at that answer?'
>
> 'Is that always true?'

Use probing questions for students to explain what the next step will be when solving a complex problem and why they think that's the best way to proceed.

Model this technique by asking students to spot and share assumptions you make as you demonstrate and think aloud. For example, when demonstrating how to analyse the results of a science experiment, pose a possible conclusion not supported by evidence, ask students how the data might or might not support this and then talk through the alternatives. Students could repeat this with a peer, using data from an experiment they've conducted, before they move on to writing conclusions. You could also use a collaborative discussion activity to prompt students to think about and check for assumptions, articulate what they've found and then share their ideas.

## Model and teach the features of effective retrieval practice

### Equip students with skills for effective revision and study routines

As students progress through their education, they will benefit from understanding that varied strategies to revise and practise can support them in remembering what they learn. Explicitly teaching and modelling how to undertake effective retrieval practice and review of learning, using a variety of strategies, can develop students' practice skills.

Model and explain the benefits of interleaving and retrieval practice once students reach a stage of learning where they undertake independent study and revision. For example, guide students to develop a study timetable that includes short study sessions from multiple learning areas before end-of-year exams. For younger students, modelling varied approaches to practise can help them experience the benefits to their learning and guides them in making effective choices later in their schooling.

See AERO's practice guide on underlined self-regulated learning to help you equip students with effective learning techniques.

**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.

- To what extent does your practice include spaced and varied opportunities for students to practise what they're learning? How could your practice be strengthened further?

- How often do you give students opportunities to practise what they've previously learnt? How can knowledge of the Forgetting Curve improve your practice?

- What would others (peers, students, leaders) observe about your approach to supporting students with spaced and varied opportunities to practise? How could you invite and use their 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.[21]

# Further reading

Barton, C. (2018). *How I wish I'd taught maths: Lessons learned from research, conversations with experts, and 12 years of mistakes*. John Catt Educational.

This book combines research insights and personal observations. It provides clear explanations of how varying practice can support students to practise what they're learning.

Churchie Research Centre. (2022). *The 6 strategies*. A learner's toolkit. https://alearnerstoolkit.com.au/for-students/the-6-strategies/

This toolkit can help you support students to learn about and make choices between different study strategies and routines that support learning in a secondary context.

Rohrer, D., & Pashler, H. (2007). Increasing retention without increasing study time. *Current Directions in Psychological Science, 16*(4), 183–186. https://doi.org/10.1111/j.1467-8721.2007.00500.x

Rohrer and Pashler's research explains methods such as spaced repetition and varied practice, which can be applied across different teaching practices to enhance long-term retention of material. This article outlines strategies to improve retention of learning.

# Endnotes

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