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Spacing and retrieval practice
Improve students' long-term retention of learning

Australian Professional Standards for Teachers | Focus Area 1.2 Understand how students learn

This guide is one in the Australian Education Research Organisation (AERO)'s Tried and Tested series on evidence-informed teaching practices that make a difference. Teachers can use these guides to reflect on their classroom practice and inform their planning for future instruction.

For this guide, AERO has synthesised the most rigorous and relevant evidence-based practices from meta-analyses, systematic reviews and literature reviews. AERO has rated these sources of information against its Standards of Evidence, focusing on evidence generated in an Australian context where possible.

Spacing and retrieval practice can improve students' long-term retention of their learning. **Spacing** is the practice of sequencing learning so that information is delivered across two or more lessons rather than just one. **Retrieval practice** is the strategy of getting students to actively recall their learning. When students are asked to bring information that they have previously learnt to the front of their mind to answer a question, rather than looking up the information in a textbook or having the teacher explain it again, it makes the information more retrievable or accessible in the future. Similarly, if a student cannot recall the information, it helps both teacher and student understand where there are learning gaps that can be addressed. **Spaced retrieval** is the active practice of recalling previous learning at a point in time after the initial lesson. Spaced retrieval practice uses the principles of cognitive science to help students consolidate their learning in long-term memory so they retain the information for longer and are better able to apply their learning in the future.

This guide lists evidence-based practices for applying spacing and retrieval practice in the classroom. Note that some of the examples offered may not apply in all contexts, may be more suitable for primary students than secondary students (and vice versa), and/or may look different in different content areas. Reasonable adjustments must be made where necessary to ensure full access and participation for students with disability.

Key practices

1. **Make sure learning retention is maximised by spacing learning across lessons.** Spacing learning allows students to remember more in the long term than if they learnt everything at once.

    *   Space the learning of a particular concept or skill across 2 or more lessons rather than concentrating all learning into one lesson.[1] For instance, in a language class, you may space the learning of new vocabulary over a series of lessons so that students learn the basics one lesson, modifiers the next and then in a subsequent lesson they engage in conversation practice where they apply their previous learning.

    *   The specific length of the time between the initial lesson and asking your students to retrieve information (for instance, one day or one week) is not as important as ensuring that you use spacing in the first place.[2]

2. **Prompt your students to recall information in different ways to enhance long-term retention.** Retrieval practice is more than rote learning – it is about students accessing their learning and transferring it to new tasks and contexts.

    *   Ask your students to recall information from memory rather than recapping, revising or restudying the information in the same format that it was delivered. Ask conceptual and higher-order thinking questions, alongside fact-based questions, to ensure students access their knowledge and apply it in different ways.[3] For example, instead of asking students what happened in the previous chapter of their reading, you might ask them why they think a character reacted a certain way to an event. In a chemistry lesson, rather than asking students to recall the position of an element on a periodic table, you could give students a series of 'true or false' statements about an element, asking them to elaborate on why each statement is true or false.

    *   Make sure every student in the class (not just vocal students) are given an opportunity to retrieve knowledge. Do this through structured activities involving all students, such as 'think, pair, share' or students writing answers on a mini whiteboard.[4]

    *   Retrieval practice is most effective when students are not being assessed on their recollection and instead are given the opportunity to recall their learning in a high challenge but low risk way.[5] To maximise effectiveness, ensure the level of challenge of retrieval is appropriate (see Mastery Learning). If it is too easy and students can correctly retrieve all information quickly, then students may mistake ease of retrieval for mastery of learning. If it is too hard, it is unlikely that students will be able to recall and apply information from long-term memory.[6]

    *   Correct misconceptions or wrong answers in a timely manner (see Formative Assessment). Misconceptions could be reinforced if errors are not corrected quickly.[7]

3. **Plan your lessons around routines.** Be deliberate about how you embed spacing and retrieval practice in your learning programs to boost student learning.

    *   Plan and sequence your lessons to incorporate spacing and retrieval practice into your teaching time. Aim to embed these practices into your existing approach, rather than add yet another element to your lesson plans. This may mean that you replace some of your existing lesson activities with spacing and retrieval techniques inserted at appropriate points.[8]

    *   Create routines that embed retrieval practice as part of lessons so that learning time is maximised. For example, you could use bell ringers, exit tickets or question prompts that all students answer before getting into the day's lesson.[9]

    *   Allow students multiple opportunities across a unit of work to practise spaced retrieval to consolidate their learning. Activities such as self-generated summary tasks or mapping links between the skills or content of the day and of the past lessons can allow students to retrieve their past learning and consolidate it in long-term memory.[10]

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To provide feedback on this guide or view further information, including full references and additional resources, visit AERO's website.

1   Cepeda et al., 2006
2   Cepeda et al., 2008
3   Agarwal, 2019
4   Adesope et al., 2017
5   Adesope et al., 2017
6   Roediger & Butler, 2011
7   Roediger & Butler, 2011
8   Carpenter et al., 2012
9   Adesope et al., 2017
10 Carpenter et al., 2012