

# Mix It Up: Testing Students on Unrelated Concepts Can Help Jump-Start Learning

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Testing students on one subject at a time may seem like common sense, but [research published in \*Psychological Science\*](#) lends further support to an alternative strategy: interleaving retrieval practice. Unlike traditional “blocked” testing, which requires students to retrieve information about a single topic, interleaved testing presents a mix of topics from various lessons in order to encourage deeper conceptual learning, according to Faria Sana (Athabasca University) and Veronica X. Yan (The University of Texas at Austin).

“One of the leading explanations for the interleaving benefit is that when problems of different concepts are juxtaposed, as is the case with interleaved sequences, learners’ attention is drawn to the features that help discriminate between the concepts,” Sana and Yan wrote. “In contrast, when problems are blocked by concept, there are fewer opportunities to notice the critical features that differ between concepts.”

Most of the evidence supporting interleaved retrieval has come from laboratory trials. Within actual classroom settings, it’s been shown to boost students’ retention of math concepts, but this study is among the first to put interleaving to the test when it comes to science curricula, the researchers explained.

The study involved 155 Canadian high school students. Over a period of 4 weeks, students completed four end-of-week quizzes in which they were tested on half of the concepts they had just learned. The quiz style alternated each week so that by the end of the 4-week trial, each student had completed two blocked and two interleaved quizzes.

One month after the last quiz, students were tested on a random selection of all the concepts they had been introduced to in class, including those on which they had not been tested, those tested in blocks, and those that were interleaved.

In the end-of-the-week quizzes, students performed slightly worse when quizzed on interleaved content than when quizzed on blocked content, averaging 55% versus 59% correct responses. This finding wasn't unexpected. Interleaved learning often feels more difficult, Sana and Yan explained—but that doesn't mean it isn't working.

In fact, this trend reversed on the final test. Students correctly answered an average of just 47% of the questions on which they had not previously been quizzed. This jumped to an average of 54% for questions from blocked-concept quizzes and 63% for questions from interleaved-concept quizzes.

“These quizzes added only 10 to 12 min of class time each week and yet led to sizable and sustained learning benefits a month later,” Sana and Yan wrote. “A small addition to classroom practice—one that does not require additional teacher training, is cost-effective, and is not time intensive—can yield powerful, long-lasting effects on student learning.”

Introducing interleaving in the classroom may require relatively little additional time investment from teachers, the researchers noted, because these quizzes can be created using questions from existing blocked quizzes, test banks, and end-of-chapter practice problems.

Combining interleaved and blocked practice may be particularly beneficial because it could help educators address different students' needs, Sana and Yan added. Research is mixed on whether interleaved or blocked practice is most beneficial for students who are less familiar with a subject, for example, but including both could help address this variance while the topic is further investigated.

“Conceptual learning is the backbone of education. Yet one of the challenges that science teachers face is promoting long-lasting conceptual understanding (being able to understand underlying principles and apply them to new situations) rather than simple memorization,” Sana and Yan wrote. “Clearly, interleaved retrieval practice is a promising strategy to promote learning.”

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## Reference

Sana, F., & Yan, V. X. (2022). Interleaving retrieval practice promotes science learning. *Psychological Science*, 33(5), 782–788. <https://doi.org/10.1177/09567976211057507>

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