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## The R.I.S.E. Guide to Interleaved Practice

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### Introduction

One of the ways that we can enhance rigor in our courses and improve student learning is by implementing interleaved practice. Interleaved practice is a form of retrieval practice that helps students to incorporate existing knowledge and skills with new ones. This strategy is especially helpful when presenting new content and material to your students.

Think to yourself for just a second: When you are introducing a new concept to your class, how do you present this new material? Do you introduce it in relation to previous course material? For example, if the class reviewed Concept A in week 3 and Concept B in week 5, do you review and practice both of these skills when introducing Concept C during week 7 of the course? Is this combining of previous material with new material an effective approach? What would such an approach look like in a classroom, whether that classroom is on-ground or online?

For a quick overview of this approach, take two minutes to watch the following video: [Interleaved Learning](#). As you are watching the video, try to list 3 ideas/concepts that you learned about Interleaved Practice.

## Explanation

### Blocking



### Interleaving



Research tells us that interleaving, the practice of reviewing previous and new concepts or skills concurrently is more beneficial than blocking. With blocked practice, you focus on one concept at a time before moving on to the next concept. For example, you would review Topic

1 in its entirety before moving on to Topic 2, and you would follow this same blocked pattern for Topics 3 and 4. This differs from interleaved practice where you would introduce Topic 4 while simultaneously reviewing Topics 1, 2 and 3. (Image: <https://blog.innerdrive.co.uk/blocking-or-interleaving-for-revision>)

One must note that interleaving is not a one-time occurrence. That is to say, ideally interleaving should happen as spaced review. Throughout each course/semester and across courses/semesters, we should **“build in activities and assignments that have students review and practice retrieving content at spaced intervals,”** (Nilson & Goodson, 2018, p. 91) preferably every few weeks. Since interleaving involves retrieval and practice with previous content, students generally find interleaved practice to be somewhat challenging, especially if it is happening across different courses. However, research indicates that such a challenge results in students’ long-term retention of the material.



In fact, “Cognitive psychologists believe that interleaving [as opposed to blocking] improves the brain’s ability to differentiate, or discriminate, between concepts and strengthens memory associations.” (The University of Arizona Academic Affairs, 2019). Research has shown that interleaved practice improves long-term retention, problem solving, and the ability to transfer learned knowledge. In simple terms, interleaved practice results in better learning!

<https://elearningindustry.com/6-scientifically-proven-brain-facts-that-elearning-professionals-should-know>

To hear professors discuss their research and the benefits of interleaved practice across various disciplines, watch some of the following videos:

- [How to study to maximize performance](#) by Drs. Elizabeth Bjork & Robert Bjork (University of California, Los Angeles)
- [The benefits of interleaving practice](#) by Dr. Robert Bjork (University of California, Los Angeles)
- [Benefits of Interleaved Practice](#) by Dr. Noa Kageyama (The Juilliard School)
- [The Benefits of Interleaved Practice](#) by Dr. Doug Rohrer (University of South Florida)

To review some additional information and research on interleaved practice before completing some practice activities, look over some of the resources listed below. Additional research, including discipline-specific research for foreign languages, STEM and music, can be found in the references section located at the end of this guide.

- Firth, J., Rivers, I., & Boyle, J. (2021). A systematic review of interleaving as a concept learning strategy. *Review of Education*, 9(2), 642–684.
- Pan, S. C. (2015, August 4). *The Interleaving Effect: Mixing it up boosts learning*. <https://www.scientificamerican.com/article/the-interleaving-effect-mixing-it-up-boosts-learning/>
- Rohrer, D., & Pashler, H. (2010). Recent research on human learning challenges conventional instructional strategies. *Educational Researcher*, 39(5), 406-412. <https://doi.org/10.3102/0013189X10374770>
- University of Arizona Academic Affairs. (2019, July 25). *L2L strategy - Interleaving*. <https://academicaffairs.arizona.edu/l2l-strategy-interleaving>.

If you have any questions or wish to discuss interleaved practice in more depth, please contact your [R.I.S.E. scholar](#) or the Learning Academy.

## Let's practice!

### *Interleaved practice within a single course*

Interleaved practice is a great way to enhance rigor in any course. Before implementing this strategy in your courses, it is a good idea to identify the following: 1) the new skills and content that you want students to learn, and 2) the previous skills and content that you want students to retrieve and review. Use this information to develop an activity that helps students make connections between and practice with the new content and the previous content concurrently.

For example, you could have a discussion or essay prompt that encourages students to make connections between new and old material. You could also give students a role-play scenario that would require them to use the new and previous skills simultaneously. You could ask them to create a concept map that shows connections among concepts, or an infographic that explains them. There are endless possibilities!

To ensure that you are interleaving on a consistent basis, you also must consider how often (at what intervals) you want students to work with new and previous material. Ideally, this would happen at regular intervals throughout the course.

Using the questions below, please take a few minutes to consider how you could use interleaved practice in one of your courses. Remember that the goal is to develop an activity that helps students practice skills/concepts and make connections between the previous content and the new content.

- What new content/skills do you want students to learn?
- What previous content/skills do you want students to review and practice?
- What activity could you use to review and learn the content/skills that you identified in the previous questions?

If you have any questions or wish to receive feedback on your ideas for this practice activity, please contact your [R.I.S.E. scholar](#) or the Learning Academy.

### ***Interleaved practice across courses (program-level approach)***

Interleaving is an excellent way to make good use of curriculum mapping and to enhance the rigor of an entire program. If you intentionally use interleaving within and across courses, students will experience their program of study as more coherent, better understanding how concepts, skills, and areas of the discipline are connected and build on each other. Moreover, if interleaving is part of the program, when your students get to their capstones, internships, and practicums, they will be well prepared to apply what they've learned throughout their coursework.

When implementing interleaved practice across courses, there are several things to keep in mind.

1. First, consider what skills/content students need to revisit and build upon. For example, what information reviewed in introductory or lower-level courses should students revisit or build upon in upper-level courses?
2. Next, consider where in the curriculum should this revisiting of skills happen. In which courses and at what moments.

3. Finally, consider how, in these courses, you could review this previous content while introducing new, related content. What approaches or opportunities would allow students to practice previous skills while learning new ones?

Using the questions below, please take a few minutes to consider how you could use interleaved practice across courses at the program-level. Remember that the goal is to develop approaches to help students practice and build upon the skills/concepts they learn in early courses and make connections to related skills/concepts in later courses – this makes their learning better and your program more coherent.

- What content/skills do you want students to revisit?
- In which course(s) should content/skills students have learned be revisited and connected to new content/skills?
- What approach could you use to interleave the content that you identified in the previous questions?

We hope that this teaching strategy information encouraged you to include interleaved practice in your courses and program to help enhance rigor and improve student learning. If you have any questions or wish to receive feedback on your ideas for the practice activities, please contact your [R.I.S.E. scholar](#) or the Learning Academy.

## References and More Resources on Interleaved Practice:

Butler, A., Marsh, E., Slavinsky, J., & Baraniuk, R. (2014). Integrating cognitive science and technology improves learning in a STEM classroom. *Educational Psychology Review*, 26, 331–340. <https://doi.org/10.1007/s10648-014-9256-4>

Dunlosky J., Rawson K., Marsh E., Nathan M., & Willingham, D. (2013). Improving students' learning with effective learning techniques: Promising directions from cognitive and educational psychology. *Psychological Science in the Public Interest*, 14(1), 4-58. <https://doi.org/10.1177/1529100612453266>

Nakata, T., & Suzuki, Y. (2019). Mixing grammar exercises facilitates long-term retention: Effects of blocking, interleaving, and increasing practice. *Modern Language Journal*, 103(3), 629–647.

Nilson, L. (2016). *Teaching at its best: A research-based resource for college instructors*. (3<sup>rd</sup> ed). Jossey-Bass.

Nilson, L., & Goodson, L. (2018). *Online teaching at its best: Merging instructional design with teaching and learning*. Jossey-Bass.

Pan, S. C., Tajran, J., Lovelett, J., Osuna, J., & Rickard, T. C. (2019). Does interleaved practice enhance foreign language learning? The effects of training schedule on Spanish verb conjugation skills. *Journal of Educational Psychology*, 111(7), 1172-1188. <https://doi.org/10.1037/edu0000336>

Rohrer, D. (2012). Interleaving helps students distinguish among similar concepts. *Educational Psychology Review*, 24(3), 355–367. <https://doi.org/10.1007/s10648-012-9201-3>

Wong, S. S. H., Low, A. C. M., Kang, S. H. K., & Lim, S. W. H. (2020). Learning music composers' styles: To block or to interleave? *Journal of Research in Music Education*, 68(2), 156–174. <https://doi.org/10.1177/0022429420908312>