

Instructor Guidelines Using SPACED PRACTICE to Promote Learning

A common practice of college students is cramming for tests in which they study large amounts of material in a single session just prior to a test e.g., five consecutive hours the night before an exam. In several surveys, more than half of college students “reported that they most often study in a single session before a test” (Rhodes, Cleary, & DeLosh, 2020, p. 159). Unfortunately, cramming is a weak learning strategy; students may retain enough information to pass an exam, but they soon forget most of it.

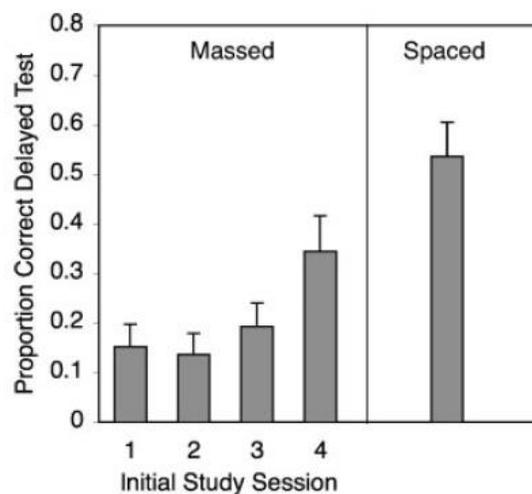
The better study approach is spaced or distributed practice which involves spreading out study activities over time. For example, in a spaced practice schedule, a student might study a total of five hours for an exam, but do so in five, one-hour time blocks spread out over a week.

In general, spaced practice is good. For example, a research summary of 254 studies involving more than 14,000 participants found that students scored about 10% higher on tests after spaced study than after massed study (Cepeda, Pashler, Vul, Wixted, & Rohrer, 2006).

The *distributed practice effect* refers to the finding that distributing learning over time typically benefits long term retention more than does massing learning opportunities back-to-back or in relatively close succession.

(Dunlosky, Rawson, Marsh, Nathan, & Willingham, 2013, p.35)

The graph below shows the results of a study in which students learned a list of synonyms (GRE type word pairs, e.g., apotheosis-deification). They studied either by cramming (massed practice) or spaced practice. In the massed condition students studied the material in one lengthy session either 1, 2, 3, or 4 days before taking the test. In the spaced condition, students studied the material in short sessions on different days up to four days before the test. Time was controlled so that all students had the same amount of study time. As the graph indicates, students in the spaced condition far outperformed those in the massed conditions.



Students may recognize that cramming is not an optimal way to study but continue to do it anyway (Blasiman, Dunlosky, & Rawson, 2017). To help support better learning, instructors can build spaced

practice into their courses. They can also use spaced practice experiences in class to highlight its effectiveness, and encourage students to adopt it for their independent study.

Recommendations for using spaced practice in classes

- Make a case for using spaced practice. Explain the role and benefits of spaced practice in the course. Emphasize the importance of long-term learning and mastering the subject as opposed to simply passing exams. Use research evidence to illustrate its effectiveness compared to cramming, and explain why spaced practice works better than cramming.
- Adopt cumulative or semi-cumulative learning experiences and assessments in the course, i.e., quizzes, tests, assignments, class activities, that draw upon knowledge and skills from throughout the course. Emphasize the cumulative nature of learning, and that long-term retention and mastery of a subject or skill require long-term practice.
- Cumulative in-class review sessions. If you do in-class review sessions, make them cumulative or semi-cumulative by including some questions from preceding units. To make them especially effective, use practice tests or quizzes as the basis for the review. Students will benefit more if they do the review, i.e., recall and organize the material, than if they listen to the instructor review the material.
- Cumulative or semi-cumulative exams. Include questions from previous units on each course exam. According to one overview of spaced practice,
 - . . . one particularly effective strategy is to pair distributed practice with retrieval practice. As noted earlier one good way to do this is to administer cumulative (or semi-cumulative) exams. For example, in a psychology research methods course (taught by the second author), each of the five exams conducted during the semester consisted of a mixture of old (20%) and new (80%) content. The final exam covered the entire course. With semi-cumulative exams students are given spaced exposure, get retrieval practice, and are motivated to study lessons from the entire course.

(Putnam, Nestojko, & Roediger III, 2017, p. 115)
- Frequent low stakes quizzing. Build spaced practice into the course routine by using frequent low stakes quizzes. The quizzes should include
 - a combination of questions on current and past material
 - feedback
 - time to review the feedback

Schedule the quizzes so that students are tested on the material 2-3 times.

- There is no hard and fast rule about the optimal length of the interval between study sessions. However, longer intervals between study sessions tend to be more beneficial. In a study of trivia learning, performance was best when the learning episodes were spaced 10%-20% of the retention interval (the retention interval is the amount of time between studying and testing). To remember something for one week, the study sessions were 12-24 hours apart. To

remember something for 5 years, study was spaced six to 12 months apart (Dunlosky, Rawson, Marsh, Nathan, & Willingham, 2013).

- Model spaced practice and give explicit cues or advice about what to study and when. Some students need the reminders.
- Recommend a study timetable for a course unit that includes dates for studying and working on assignments according to a spaced schedule. Again, emphasize the benefits of spacing study as opposed to cramming before exams, i.e., students will learn more, retain it longer, and experience less stress. Challenge students to incorporate spaced practice into their study routine.
- Although students may realize that spaced practice is beneficial for learning, they may not know how to use and maintain it on their own. To scaffold their effort, ask students to submit a study plan for each exam in which they identify how and when they plan to study for the test (See Spaced Practice Study Plan). Instructors can also ask students after exams to evaluate how well they followed their plan and how they can improve it for future assignments and tests.
- Encourage students to use effective learning strategies. Otherwise they are not making the best use of their time. Promote the use of self-testing, self-explanation, studying with a partner or group, doing practice problems, writing answers to study guide questions and so forth.
- Give students practice with effective learning strategies in review sessions, e.g., give a practice test rather than summarize material for them, or engage students in explaining or teaching the material to one another.

References

Blasiman, R.N., Dunlosky, J., & Rawson, K.A. (2017). The what, how much, and when of study strategies: Comparing intended versus actual study behaviors. *Memory*, 25, 784-792.

Cepeda, N. J., Pashler, H. Vul, E., Wixted, J. T., Rohrer, D. (2006). Distributed practice in verbal recall tasks: A review and quantitative synthesis. *Psychological Bulletin*, 132(3), 354-380.

Dunlosky, J., Rawson, K. A., Marsh, E., J. Nathan, M. J., & Willingham, D. T. (2013). What works, what doesn't. *Scientific American Mind*, pp. 46-53.

Dunlosky, J., Rawson, K. A., Marsh, E. J., Nathan, M. J., & Willingham, D. T. (2013). Improving students' learning with effective learning techniques: Promising directions from cognitive and educational psychology. *Psychological Science in the Public Interest*, 14, 4–58.

<http://dx.doi.org/10.1177/1529100612453266>

Kornell, N. (2009). Optimising learning using flashcards: Spacing is more effective than cramming. *Applied Cognitive Psychology, 23*, 1297–1317.

Morehead, K., Rhodes, M.G., & DeLozier, S. (2015). Instructor and student knowledge of study strategies, *Memory*, DOI: 10.1080/09658211.2014.1001992

Putnam, A. L., Nestojko, J. F., & Roediger, H. L. III (2017). Improving student learning: Two strategies to make it stick. In J.C. Horvath, J.M. Lodge, & J. Hattie (Eds). *From the Laboratory to the Classroom: Translating Science of Learning for Teachers*. NY: Routledge.

Rhodes, M.G., Cleary, A.M., & DeLosh, E.L. (2020). *A guide to effective studying and learning: Practical strategies from the science of learning*. NY: Oxford University Press.