Strategies & Guidelines for Using PRACTICE TESTING to Promote Robust, Durable Learning

- Practice Testing or Retrieval Practice – the act of trying to remember what one has previously learning or studied without looking back at the material. Synonyms: test enhanced learning, practice testing, practice quizzing, self-testing
- Test Effect – an increase in long-term memory of material as a result of retrieval practice. Trying to recall previously learned material improves learning.
- Retrieval-based learning – Learning involves two major processes – encoding and retrieval. Encoding involves making sense out of new information and getting it into memory. Retrieval is the process of trying to recall information from memory. Students devote most of their study time to trying to get new information into memory, *encoding*. More time should be dedicated to *active retrieval*, which promotes meaningful, long-term learning.

Practice Testing Strategies

1. Practice tests. Students take low stakes practice tests prior to high stakes graded exams. Note: Students *take* the practice test. Practice testing does not involve studying the exam questions.

2. Reading quizzes. Students answer several questions after reading class assignments. For example, in one of my classes students took short online [D2L] reading quizzes after each reading assignment [25 of them!]. They received feedback on a quiz only after completing it. The quiz was due a day before the class period. Some of the quiz items later appeared on course exams.

3. Practice quiz at the start of class to test students' knowledge of concepts relevant to the day's lesson. The practice quiz serves two purposes – it involves retrieval practice and activates prior knowledge relevant to the topic in class.

4. Clicker questions. Using clicker questions can be a good strategy to help students work out their initial understanding of concepts in class. They can also be used for retrieval practice. Consider using clicker questions about material learned in previous class periods. Do these at the start or end of class.

5. End of class quizzes. Give students a quiz at the end of class. Include some questions on material from previous class periods.

6. Minute paper. At the end of class ask students to write a summary or what they remember from the class period. Periodically, ask students to include ideas from previous class periods.

7. Self-testing. Encourage students to use self-testing as a learning strategy. See the Self-Testing Tip Sheet that describes various ways students can incorporate self-testing (practice testing) into their study routine.

Practice Testing Works Best When	What Instructors Can Do
1. forgetting has started	Allow time between learning/studying and practice tests/quizzes.
2. there are multiple practice sessions spread out over time	Create intervals between practice sessions, i.e., spaced practice.
3. questions are open ended rather than multiple choice	Multiple choice works but not as well as free recall or cued recall.
4. students receive feedback	Provide correct or model answers to questions. Not necessary to give individualized feedback.
5. students use their recall performance as feedback to identify gaps and then restudy	Allow and encourage students to restudy material after retrieval practice. Unless students can go back and revise their thinking, RP may not lead to better understanding of the material they *missed*.
6. have some grasp of the material	Students who don't have *some* understanding of the material may not benefit from RP. They need to spend more time trying to make sense of the concepts.
7. it is low stakes	Don't grade practice quizzes/tests. Good option is to give credit for completion that counts toward grade.
8. students try hard to recall the material	Students shouldn't look at the answer until they have produced it or tried hard to produce it. They often assume they know an answer without really trying to recall the material.
9. practice questions target the same concepts as graded test questions	RP is test item specific. Practice test questions will enhance learning of tested concepts, but not of non-tested concepts.
10. some practice test items appear on graded exams	Include practice test items on graded examinations. Include *high importance* practice questions on more than one exam, i.e., make them cumulative. Use practice tests to enhance learning of core concepts. Use cumulative practice tests during the semester to promote long-term learning of core concepts.
11. practice test questions test full range of learning objectives	Include quiz or practice test items that test your learning objectives, e.g., analytical thinking, synthesizing ideas, evaluating concepts, generating concepts or other types of thinking germane to your course and subject area. Practice items that test only for basic knowledge will not enhance complex learning and thinking.
12. students need a potent strategy to support their learning in class	If it ain't broke, don't fix it. If you already involve students regularly in deeper processing that leads to durable learning, retrieval practice *in class* may not be necessary. However, you may still encourage students to use self-testing as a study strategy.

13. students see the value in practice testing and in putting forth the effort	Test fatigue. Students may perceive extensive practice testing as routinized, excessive, tedious busy work. To support a positive attitude toward practice testing: 1) promote RP as a learning strategy that will benefit student success, 2) make RP a low stakes activity, e.g., students get credit for completing RP tasks, 3) include RP questions on graded exams so that students see the direct connection between practice and summative performance, 4) provide feedback so that students can adjust their learning.
14. the instructor promotes RP as an effective learning strategy that will enhance student learning in the course	Explain the rationale for using RP in the class. Point out how it will help them learn more effectively. See below

Encourage Students to Use Self-testing As a Study Strategy (on their own)

1. You may need to sell self-testing. Studies show that students tend not to use self testing, don't like it, and see it as less effective than other strategies such as rereading and highlighting.

2. You may need to show students how to use self-testing effectively. For example, students who use flashcards tend to look at a card and flip it over quickly to see the answer. As they become more familiar with the answer, they may assume they *know* it. Self-testing involves effort, and sometimes struggle, trying to retrieve the material. Advise them to:
   - keep trying to remember rather than flipping over the card
   - put the card back in the stack to test again even if they think they know the answer
   - use multiple self-testing sessions, spread out over time

3. Urge students to self-test, and then re-study to fill the gaps in their understanding. Failing to remember may be an indicator of poor comprehension. Encourage students to ask whether they really understand the material, e.g., could they explain it to someone else. If not, they may need to restudy the material.

4. Read-Recite-Review Study Strategy. The 3R technique leads to better learning than rereading and note taking, and takes less time. Students **read** a passage in the text, then close the book and try to **recite** (retrieve) as much of the material as they can out loud. They go back and **review** the passage to identify errors or gaps in their knowledge. Encouraging students to give up their routine study habits and adopt a new approach is a hard sell. Emphasize that research shows that 3R works better than rereading and takes less time. Suggest they try it out, especially if they are having difficulty remembering material in the course. Highlight the importance of trying to remember – even when it is difficult and seems like it is ineffective. Working harder to remember the material creates stronger memory for the material.