# Improving Student Achievement with Effective Learning Techniques

"But I studied for *hours!* I don't understand why I got such a low test grade!"

I am sure that most faculty have heard these words spoken at least once during their teaching careers. What some students do not yet realize is that the *quality* of study strategies matters almost as much as the amount of time they spend using them. What advice can be given to these motivated students who struggle to study effectively?

In a recent monograph, Dunlosky and colleagues[1] reviewed research from educational and cognitive psychology surrounding ten popular learning strategies. Their findings suggest that some very popular study strategies are actually detrimental to learning and understanding (and were rated 'low utility'), some are somewhat helpful or are only helpful under certain circumstances (and were rated 'moderate utility'), and some are helpful in virtually any learning setting (and were rated 'high utility').

**High utility** strategies include Practice Testing and Distributed Practice. **Practice Testing**, also known as retrieval practice, supports both recall and comprehension of course material for students of all ages, all abilities, and in many subject areas. Practice testing can be aided with practice questions from faculty, or could be as simple as using flashcards to check memory of key terms. The key component to practice testing is that students must retrieve the answer from their long term memories. There are no benefits to looking up the answer in the book, or flipping the flashcard over immediately. **Distributed Practice** is about spacing out study sessions over time instead of "cramming" the night before a test. Encourage your students to use these two strategies. If possible, make them required parts of your courses so that everyone can benefit from them.

**Moderate utility** strategies include Elaborative Interrogation, Self-Explanation, and Interleaved Practice. **Elaborative Interrogation** involves the student generating an explanation for why a fact or concept is true. **Self-Explanation** is similar. Students explain how new information is related to known information, or explain steps taken during problem solving. Both of these strategies help students connect new and already-known information, which aids in memory encoding. Both work best if the student, not the instructor, generates the explanation. **Interleaved Practice** is a schedule of practice that mixes different kinds of problems within a single study session. This strategy shows the best results in math classes. Switching between different kinds of computations may result in lower performance during class, but in the long run, learning to identify which types of problems need which type of computations is quite helpful. Help students understand how and when to use these strategies when they come to you for help.

**Low utility** strategies include Summarization, Highlighting/Underlining, Keyword Mnemonic, Rereading, and Imagery for Text. **Rereading** and **Highlighting/Underlining** are two of the most frequently reported

[1] Dunlowsky, 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*(1), 4-58. DOI: 10.1177/1529100612453266

student study strategies, but unfortunately, are two of the least effective. Some research on highlighting/underlining shows that it may even harm the student's ability to make inferences about that topic. **The Keyword Mnemonic** not only requires excessive instructor support, it also is not helpful in many subject areas, and may lead to accelerated forgetting. **Imagery for Text** and **Summarization** do not actually harm learning like other strategies in this category, but they are not as helpful as the high or moderate utility strategies in improving learning. When discussing learning strategies with students, encourage them to use those that have proven to be more efficient and effective.

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