Effective Learning Techniques

For more than 100 years, cognitive and educational psychologists have been developing and evaluating learning techniques used by students. The following techniques are designed to help organize high volumes of materials and assimilate them into long-term memory. The efficacy of the techniques for you will depend on many factors, including your learning style and the content to be mastered. To maximize your learning, try choosing one or two techniques from each of the cognitive skill domains (spaced review, deep learning, and active learning). All of the following techniques are easy to use and shouldn't greatly extend study time

Spaced Review

Distributed Practice

Though cramming (or massed review) is better than not studying at all, studies show that distributing learning over time (either within a single study session or across sessions) typically benefits long-term retention more than does massing study back-to-back or in relatively close succession. According to research, spaced practice (1 day or 30 days) was superior to massed practice (0 days), and the benefit was grater following a longer lag (30 days) than a shorter lag (1 day). The theory behind the gains in learning is that students do not have to work very hard to reread notes or retrieve something from memory when they have just completed this same activity, and furthermore, they may be misled by the ease of this second task and think that they know the info better than they really do. Furthermore, the second presentation of to-be-learned material serves to remind the student of the first learning activity, leading it to be retrieved, a process well known to enhance memory.

It's likely that your time spent studying increases as exams approach. Try rearranging your study practice to distribute study over the block rather than massing at the end of block.

Interleaved Practice

Most student intuitively study in blocks, focusing on mastering one topic or subtopic before moving on to the next set of material. Recent research suggests that interleaved practice, in which students alternate their study of different topics, better prepares students for exams covering a large amount of information. It appears that interleaved practice promotes organizational processing and integration of information. In addition, in blocked practice, the relevant information resides in working memory so your brain can easily retrieve the information. By contrast, interleaved practice requires retrieving information from long-term memory, which boosts memory.

Deep Learning

Elaborative Interrogation

The key to this technique is to generate an explanation for an explicitly stated fact to facilitate learning. As you read, ask yourself, "Why does it make sense that . . .?", "Why is this true?", "Why would this fact be true of this [X] and not some other [X]?", or simply "Why?" Educational experts theorize that elaborative-interrogation enhances learning by supporting the integration of new information with existing prior knowledge.

Self-Explanation

A similar approach to the one above is to explain what each sentence or paragraph means to you as you read. You might explain a difficult concept in your own words or explain how the new information relates to or expands upon what you already know. To be effective, make sure that you are providing explanations and not summaries or paraphrases of information (see below). Studies have shown self-explanation has positive effects on comprehension and memory, including free recall, fill-in-the-blank tests, and multiple-choice tests.

Summarization

When you have to learn large amounts of info which requires you to identify what is important and how different ideas connect to one another, a popular technique is to write summaries of texts. Successful summaries give in condensed form the main ideas of a body of material and contain only vital information and the facts that assist or complement the main points. The highest quality summaries link new material to prior knowledge. Studies show that summarizing and taking notes on to-be-learned texts were both more beneficial that verbatim copying of text for test performance because it requires selecting and distinguishing between the important and the unimportant. As you summarize, reduce sentences to phrases, phrases to meaningful words that will be more easily remembered.

There is conflicting evidence on the best approach to creating summaries, so experiment with what works best for you. You can summarize smaller pieces of a text (more frequent summarizing) or capture more of the text in a larger summary (less frequent). Having the text present might help you prepare a better summary, summarizing a text without having it present involves retrieval, which is known to benefit memory, and also prevents student from engaging in verbatim copying.

Active Learning

Imagery Use

This technique targets visual learning and right brain processing. As you read, mentally imagine the content of each paragraph using simple and clear mental images. You can also draw pictures that represent the content of each paragraph. In a study, mentally imagining the content of each paragraph significantly boosted the MCQ test performance. The theory behind this technique is that developing images can enhance your mental organization or integration of information in the text, and that the images of particular referents in the text that you create can help you retrieve the information from long-term memory.

Graphic Organizers

Create tables, charts, concept maps, and other graphic tools for organizing and representing knowledge. The most useful graphic organizers allow you to visually display and emphasize the relationships between facts and concepts. The process of creating the maps or diagrams requires you to analyze and synthesize material and articulate connections, allowing for in-depth learning, moving information into your long-term memory, and forging multiple pathways to retrieve the information for later use.

Practice Testing

More than 100 years of research involving hundreds of experiments has shown that practice testing is one of the most effective ways to enhance learning and testing. Practice testing is defined as low-stakes or no-stakes practice or leaning activity outside of class that students can engage in on their own. Types of practice tests include flashcards, completing pre-created practice tests, or taking a test that you created on your own. One approach is the Cornell note-taking system, where you leave a blank column when taking notes in class. Enter key terms or questions in the column shortly after taking notes to use for self-testing when you review notes at a later time.

For the most effective practice testing, consider the following:

- *Format*: Studies suggest that short-answer practice tests are more effective than practice tests than fill in the blank or multiple choice. It's important to note that practice tests can benefit learning even when the format of the practice test does not match the format of the criterion test.
- *Frequency*: Basically, more is better. Studies show that final-test performance has consistently been better following multiple practice tests than following a single practice test.
- *Timing:* Studies have shown more benefits when practice tests are spaced apart rather than back-to-back, and that repeated practice testing produces greater benefits when lags between practice sessions are longer rather than shorter.

There are two theories as to why practice testing improves learning:

- *Direct effects*: Practice testing can enhance retention by triggering elaborative retrieval processes. Attempting to retrieve target information involves a search of long-term memory that activates related information, and this activated information may then be encoded along with the retrieved target, forming an elaborated trace that affords multiple pathways to help you access that information later.
- *Mediated effects*: Practice testing facilitates the encoding of more effective recall cues, enhances how well students mentally organize information, and how well they process idiosyncratic aspects of individual items, which can support better retention and test performance.

Some of the information in this handout was adapted from Dunlosky, J. et. Al (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.