

## Study Tips for All Occasions:

Research in cognitive psychology has provided a great deal of information that can be applied directly to studying habits. The suggestions listed here focus on the following topics, which are all related to storing information effectively in semantic memory (the portion of long-term memory that contains factual knowledge):

1. How to best spread out study sessions (as opposed to studying the night before the exam);
2. How to organize information to make it easier to remember and apply in different situations/for different types of tests;
3. How to think about the information when studying it (e.g., repeating it verbatim vs. rewording it to focus on its meaning);
4. How to create connections among related ideas (to make them both more meaningful and easier to remember);
5. How to evaluate how effectively you are studying; and
6. **How testing your memory after every study session can improve your ability to remember the information you studied (this is a very important part of studying).**

## Overview of Studying Guidelines:

1. Break your studying into segments, with each segment containing related information (and study each segment more than once).
2. Create a framework, or outline, that organizes the material by representing how the concepts are related to each other and to the broader topics. The framework should contain as few words as possible (to make it easier to remember) and you should study the framework to encode it into memory (as well as the concepts that are connected to it).
3. Elaborate on each concept – think about what it means, and put the information about the concept into your own words. Generating an example of the concept will also be useful.
4. Once you have studied individual concepts, think about how they are related to other concepts and to broader ideas.
5. Evaluate your progress – the best way is to use self-given quizzes that require you to apply the concepts as well as remember their definitions. Remember to correct any errors you make (so you don't end up encoding the errors as accurate information).
6. **Testing yourself after studying improves memory – retrieving information from memory improves one's ability to remember it in the future. Giving yourself a memory test after each study session can be as important for learning as studying.**

## Six Principles for Increasing Studying Effectiveness:

1. Distributed practice (vs. massed practice – i.e., “cramming”):
  - a. Study a small amount of material at a time.
  - b. It’s best to study groups of concepts or ideas that are related together.
  - c. Review the material more than once.
  - d. This will minimize the amount of interference created from other information you are trying to encode into memory.
  - e. This will also make the information more distinctive.
  - f. You will probably not remember everything you studied from a given study session, but you will retain some information, with the amount that you “save” increasing across multiple sessions (and each time you review material you’ve already studied, you will be able to devote less time to studying it).
  - g. In addition, when you need to study multiple topics in the same study session, it’s best to study topics that are as different as possible. This is because one reason for not being to access information is interference from related information. For example, if you were to study French and then Spanish, you would have more difficulty remembering information from both topics than if you were to study French and then physics.
  
2. Organize related material by creating a framework or “big picture” for related concepts:
  - a. This framework should be an outline of the main topics.
  - b. It should also be arranged as a hierarchy that shows how specific ideas are related to broader ideas.
  - c. It should also be relatively sparse, containing as few words as possible – this will make the framework itself easier to remember.
  - d. Once you have created the framework, you should study it to encode it into memory. One thing that we know about the structure of semantic memory is that concepts are **not** stored in semantic memory like individual entries in a dictionary – they are stored in an interconnected network. The implication of these connections is that thinking about one concept can help you to remember related concepts. Likewise, thinking about one of the organizing concepts in your framework/outline will help you to remember the concepts that are included in that framework because of the connections in memory that you created between the individual concepts and the broader framework.
  
3. Elaborate on the material you are studying (referred to as “Type 2 rehearsal” or “elaborative rehearsal”):
  - a. Elaboration = thinking about the meaning of what you are studying; that is, putting the ideas in your own words (and you cannot do this without figuring out the meaning of what you are studying).
  - b. Another form of elaboration is creating an example of the concept you are studying.
  - c. Elaboration is important in part because it is possible to study something without thinking about what it means; for example, when you repeat the information over and over. Simply repeating what you are reading (referred to as “Type 1 rehearsal”

or “maintenance rehearsal”) results in very little memory storage – it will not be useful unless the memory test involves recognizing the exact words that you studied.

- d. Elaborating on the material forces you to extract the meaning of the material – this will allow you to apply the concept (i.e., use the information you studied) as well as recognize the correct definition of the concept.
- e. Rewording the material and creating your own examples involve generating information; repeating the information involves recognizing it. In general, information that you generate is remembered better than information that you simply recognize.

4. Actively create connections among concepts:

- a. In a broad sense, “knowledge” can be operationally defined as having connections among related concepts stored in semantic memory.
- b. The connections among related concepts that exist in semantic memory are not created automatically – you need to intentionally think about how concepts are related to create these connections.
- c. Before trying to create connections among concepts, you should focus on studying individual concepts. Often, you will encounter pairs or small groups of concepts that are all related – a good strategy would be to study each one individually, then think about how they are related, or how they all relate to a broader concept.

5. Accurately monitor how effective your studying is (i.e., metamemory):

- a. Research on the topics of metamemory and metacognition (literally “thinking about our own memory” and “thinking about our own thought processes”) suggests that we are not very good at evaluating our own memories and thought processes – we often overestimate how well we will remember material and do a poor job of correcting poor studying strategies
- b. One bad way of self-evaluating would be looking at the material in the text or in your notes and judging how familiar it looks, or how much sense it makes to you. Positive evaluations of either dimension would be interpreted to mean that you will understand and remember the material at a later time – this is not necessarily the case.
- c. A good example of Point b is understanding a discussion of a given topic during class, and on that basis thinking that you will remember the material later for an exam – there is a substantial difference between being able to understand something and being able to remember it at a later time.
- d. A better method of self-evaluation would be to give yourself a quiz – test yourself on the meaning of concepts, their relation to other concepts, the implications of various experiments for the concepts to which they apply, etc. – this will give you a more accurate measure of how well you have encoded the material
- e. Important note: if you use self-administered quizzes, always be certain that you correct any errors – otherwise, these errors will be encoded into memory (and you may later remember the “wrong” answer as a consequence).

**6. Make testing your memory part of your studying practice – this can be as important to the learning process as studying:**

- a. Research on memory retrieval has shown that the act of retrieving information from memory (i.e., “remembering something”) can affect how we later remember the information. Retrieving the same information repeatedly **and correctly** can strengthen the memory for that information and make it easier to remember in the future. In contrast, remembering something incorrectly (and not correcting your mistake) can result in your remembering the **incorrect** information.
- b. Recent research has shown that giving yourself a free-recall test after studying (i.e., taking a blank piece of paper and writing down as much of what you can remember from what you just studied) increased the amount of information people remembered when they were tested 1 week after studying the material. (For more information on this study, you can search for the terms “Karpicke and retrieval practice” – bibliographic information is included at the end of this document for this article; Jeffrey Karpicke is an assistant professor in the Department of Psychological Sciences at Purdue University).
- c. You could apply this principle as follows: **1)** study a small amount of related information, focusing first on each concept, then **2)** think about how the concepts are related or connected to each other and to the “big picture” or framework into which they fit, then **3)** test your memory by writing down as much of the information as you can remember, then **4)** correct any mistakes you made on the memory test (to avoid remembering the mistakes instead of the correct information).

#### References

Karpicke, J. D., & Blunt, J. R. (2011). Retrieval practice produces more learning than elaborative studying with concept mapping. *Science*, 331, 772–775. doi: 10.1126/science.1199327