Studying to succeed: exploring effective studying habits needed to store information in long-term memory.

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Background
Semantic memory is defined as knowledge about the world stored as facts that make little or no reference to one’s personal experiences (Nairne, & Lloyd, 2008). Creating long term semantic memories involves three separate processes: 1) encoding, or the processes that determine and control how memories are formed, 2) storage, or the processes that determine and control how memories are stored and kept over time, and 3) retrieval, or the processes that determine and control how memories are recovered and translated into performance (Nairne, & Lloyd, 2008). Colleges measure performance of semantic memories by way of exams and tests. Grade point average is a standardized way to measure and assess how well students succeed in school. While semantic memory is not the only factor effecting semantic memory; factors such as the professor, learning ability, motivation and work load may affect a student’s GPA, it is the main component measured in college exams and is reflected in a student's GPA. In order to progress your education to a profession or graduate school and then a career, it is crucial to have a high GPA. For example, the average overall GPA for a student admitted to Harvard Medical School is 3.87 (“Medical school average,” 2008).

Secondary Research
The secondary research used in this paper was gathered from peer-reviewed journals found using Ebso-host search engine. Other secondary sources consisted of psychology textbooks. Information was extracted, summarized, and analyzed in order to understand semantic memory and created methods of improving memory.

Elaboration
Encoding and storing memories can be achieved most effectively by elaboration, or connecting materials to existing knowledge. Nairne and Lloyd identify 6 common ways to promote elaboration: (1) Think about meaning, (2) Notice relationships, (3) Notice differences, (4) Form mental pictures, (5) Space your repetitions, and (6) Consider sequence position.

Think about meaning. When students are listening to a professor lecture, they are often listening to the sounds of the words spoken in order to take notes. It is important to concentrate on the actual meaning of the words rather than how they sound. When it comes to test time, you are not paying attention to the sounds of the words, but the meaning of the words studied in your notes. It is imperative for students to take the time to read over their notes after lecture for this reason. Connect any new information from one lecture to previous lectures or from related lectures in other classes. Relating new information to old knowledge is the definition of elaboration. The only time listening to the sounds of words rather than meaning is useful is when learning a second language. Thinking about an English word that sounds similar to a foreign vocabulary word and then relating both to a visual image is a useful memory technique that has been shown to double the rate of learning vocabulary (Rough, & Atkinson, 1975).

It is also important to think about meanings of words when reading a textbook. A common problem with reading textbooks is that students believe they are learning by reading, when often times they are just practicing their reading skills. Pausing after reading each section and concentrating on meaning of what was just read can promote elaboration. Many students do not read or answer the critical thinking
questions or end of chapters’ questions. These questions are tools that are meant to help students think deeply about information and to force students to think about the same knowledge in different ways. “The deeper and more elaborative the processing, the more likely that memory will improve” (Nairne, & Lloyd, 2008).

Notice relationships. This is one reason why colleges and universities have pre-requisite courses. It is easier to understand Calculus III by noticing similarities between Calculus II and prior calculus classes. Noticing relationships between things that need to be remembered helps students later when trying to retrieve that new information. Another common area where it is easy to notice relationships is if lecture courses have accompanying labs. Labs commonly build on information presented in lecture and force students to use information in real world applications. This causes students to make deeper connections to the information learned.

Notice differences. This is equally as important as noticing relationships. Whereas noticing commonalities between things to be remembered promotes relational processing, noticing differences is what makes distinct and unique memories (Nairne, & Lloyd, 2008). Grams, liters, and cubic centimeters are all units of measurements, but students must be able to differentiate what each unit measures: mass, volume, and area. If you look in a dictionary, you may notice that words are commonly defined as what they are not. Knowing antonyms of words and information allows us to notice differences between words.

Form mental pictures. This method of producing an elaborate memory corresponds with a common retrieval device called method of loci. We will analyze the benefits of this method later. Precautions must be taken when using this type of method because some people are not visual learners (see Survey Results, VARK for exact numbers). Even if a student is a visual learner, this type of elaboration has drawbacks. “Visual imagery leads to excellent memory, but the memories themselves are not photographic-instead, they’re surprisingly abstract, and important details are often missing or inaccurate” (Nairne, & Lloyd, 2008). As mentioned earlier, the deeper and more elaborate the process, the more likely memory will improve. So, when forming a mental picture, it is important to try to focus on small details and hit on all five of the human senses. As an anatomy student, you are fortunate to have a real human cadaver to observe and study. I was able to form mental pictures of the cadavers days after lab by closely observing location of muscles, differences in shapes and lengths of muscles, and their relationships with bones and other muscles during lab. Noticing and breathing in the smell of aldehyde on the cadavers only deepens the elaboration process and helps memory formation and retrieval.

Space your repetitions. Repetition alone is not what improves memory. Spacing your repetitions out over a period of time improves elaboration and therefore memory. Study one subject for a while then take a short break. Come back to the studying later and you will see the same material in new ways. If you just read over your notes repeatedly, It is not likely that (1) you will learn something new or (2) you will improve memory (Nairne, & Lloyd, 2008). This is why use of flashcards should be limited to learning only definitions of terms.
Consider sequence position.

By analyzing the serial position curve as created through a study done by I. Neath, we discover both a primacy effect and recency effect. Primacy effect is the better memory of items near the beginning of a list and recency is the better memory of items near the end of a list. If you wanted to create a list of things to be memorized, you would put the most important thing first, then second most important last, then the third most important in position two etc. The table below shows the importance of an item and the recommended position for a list of 6 things.

<table>
<thead>
<tr>
<th>Importance</th>
<th>1&lt;sup&gt;st&lt;/sup&gt;</th>
<th>3&lt;sup&gt;rd&lt;/sup&gt;</th>
<th>5&lt;sup&gt;th&lt;/sup&gt;</th>
<th>6&lt;sup&gt;th&lt;/sup&gt;</th>
<th>4&lt;sup&gt;th&lt;/sup&gt;</th>
<th>2&lt;sup&gt;nd&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>List Position</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>

We start with the most important thing first because we see that it is remembered correctly over 90% of the time, whereas the recency effect is less at under 90% of the time. It would be even more favorable to the studier if the items on the list were organized different every time a list was studied. This compliments with the space your repetitions process. Each new time you study a list, put the items in different positions in the list. For example, if you wanted to learn the flow of blood through the cardiovascular system, start from a different location each time. For standard learning, textbooks generally start at the right atrium: this decreases the elaboration process. The cardiovascular system is a circuit and there is no reason to start from only one location every time you cover blood flow.

**Mnemonic Devices**

**Method of Loci.** If you have ever left your car keys near the door to the garage, you’re practicing part of the method of loci. The method of loci is a visual image process. Like mentioned earlier, if a student is not a visual learner, this method may fail. It works by placing images of things to be remembered on a familiar, common traveled path. For example, the walk to school might be a familiar path for a university student. If the student wanted to remember to print off a paper before a class, he or she could visual place an image of a printer on the sidewalk along his path. “The method of loci is an effective memory.
aid because it forces you to use imagery—creating an elaborate and distinctive record—and the stored records are easy to recover because the storage locations are easy to access (Nairne, & Lloyd, 2008).

**Peg-word method.** “The peg-word method resembles the method of loci in that it requires you to link materials to specific memory cues, but the cues are usually words rather than mental pathways (Nairne, & Lloyd, 2008). A Common example of this method is rhyming words with numbers. A mental picture is then formed associating the thing to be remembered with the rhymed word. You then simply count to remember the items. An example would go as follows: one is a gun, two is a shoe, etc. The student would then visualize a laundry basket next to a gun case and a paper and notebook in a shoe. The student would then only have to count and he/she would recall that he/she needs to do; laundry and write a paper for class. Another example of a peg-word memory method is acronyms. These use letters instead of words to help memorize the entire word. You can use the beginning letter of each word in a phrase to denote the first letter of the word to be remembered. When learning the carpal bones of the wrist in human anatomy the phrase ‘Some Lovers Try Positions That They Can’t Handle’ was used to memorize the eight carpal bones of the hand: Scaphoid, Lunate, Triquetrum, Pisiform, Trapezium, Trapezoid, Capitate and Hamate. Another version of acronyms is to use the first letter of words to make another word. VARK is an acronym where each letter means another word: Visual, Auditory, Read/Write, and Kinesthetic. This version essentially allows you to remember many words by memorizing one word.

**Retrieval**

**Transfer-appropriate processing.** This is “the idea that the likelihood of correct retrieval is increased if a student uses the same kind of mental processing during testing that he/she used during encoding (Nairne, & Lloyd, 2008). This simply means study the same way you take a test. If you are preparing to take a multiple choice test, practice writing multiple choice questions from your notes and answering them. Answering essay questions is not going to prepare you for taking a multiple choice test and vice versa. This ides of transfer-appropriate processing is why chewing gum or mint while studying and chewing the same flavored mint/gum during the test has been suggested. The smell and taste of mint is distinct and increases the elaboration process during studying. The smell and taste act as a retrieval cue during the testing. Lastly, it works in conjunction with transfer-appropriate processing because you are doing the same activity during studying as during testing. This increases the chance of effective retrieval of memories.

**Interference**

Retroactive interference is defined as the process in which the formation of new memories hurts the recovery of old memories (Nairne, & Lloyd, 2008). This means that whatever memories you make during a certain period after studying will interfere with the memories of the information you studied. A way to avoid this is to study before you sleep. Jenkins and Dallenbach (1924) conducted a test that measured two students memory at Cornell University. The graph below shows that the student who slept after memorizing meaningless syllables remembered more syllables when tested later than that of the student that stayed awake.
Conclusion
Elaboration is an important process for encoding memories into long term memory for later retrieval. There are six basic ways to promote elaboration:

1. Think about meaning.
2. Notice relationships.
3. Notice differences.
4. Form mental pictures.
5. Space your repetitions.
6. Consider sequence position.

Mnemonic devices are good memory aids that help in recollection. Studying for a test in an environment and style that is similar to the test and test conditions promotes transfer-appropriate processing.
References


