A Message from Your Body: Dream the Answer

By Jalae Ulicki

So, you are sitting in class and listening to the professor’s lecture and pretty soon the professor’s voice starts droning on and on and you find yourself nodding off...your brain activity has started slowing down and you find your body muscles relaxing. As the class disappears around you, you have now entered the first stage of sleep from which you can easily be awakened. Suddenly, you hear your name being called by the professor and you jerk wide awake (called a myclonic jerk) and you ask the professor, “Could you please repeat the question?”

As law professors, we have heard “Could you please repeat the question?” umpteen times but many of us have little or no knowledge about the role that sleep plays in memory retention for our students or the effect that the characteristics of the surrounding environment have on recollection and retrieval of stored memories.

We are all familiar with the terms “long-term memory” and “short-term memory” and have a rudimentary understanding of what the terminology represents, but it is likely that you haven’t learned about the processes involved in memory retention. In sum, memory involves encoding, consolidation, storage and recall/retrieval. In earlier years, experts thought that memory was simply putting something away in the brain as if in a filing cabinet. But memory is much more complex. In the first place, we really don’t have one spot in the brain where memory is neatly filed away. Memory is a group of systems that, when processed by the brain, comes together to provide retrieval of that memory.

Encoding is the start of a memory. It is biological in that it begins with perception from our senses — hearing, seeing, touching, or smelling. That memory is then encoded and these bits of information are stored in various parts of the brain. Studies have shown that the characteristics of the environment also attach to the memory during that memory formation as part of a memory trace. This becomes important to us as professors because replicating the testing environment under “test-taking” conditions, such as silence, may increase student performance because of the similarities with the
characteristics of the environments that were part of the encoding process in students’ brains while they were studying—for instance, in silence—and thus enhances the memory retrieval process.

Our long-term memory is divided into what is called “explicit” or declarative memory and “implicit” or non-declarative memory. So when you ask your student a question regarding facts or events they are consciously recalling this information that is stored and retrieved using their “declarative memory.” The declarative memory is further subdivided into episodic memory and semantic memory. The episodic memory consists of our memories of our own experiences and specific past events in time that are associated with our emotions. For example, you probably remember not only when you first heard about the unfolding events of 9-11, but also what you heard and where you heard it. Our semantic memory refers to our general knowledge about the world we live in and the meaning that we attribute to it.

Our short-term memory is limited and is only briefly stored unless a conscious effort is made to retain it, which will then transfer it into our long-term memory. We use our short term memory to keep information for a short period of time, such as remembering a telephone number retrieved from 411 long enough to dial it on our mobile phone. Our short-term memory also provides the basis for performing cognitive operations on those memories. The process of short-term memory serves as the “working memory” similar to the analogy of RAM — or the random-access memory in the computer which is either discarded or saved for later retrieval.

For many of us older professors we can recall our elementary teachers making us repeatedly write out a phrase in our composition notebooks at least “100 times.” Well, those teachers really did have a point. Repetition improves moving information from short-term memory into long-term memory. As law professors, we can integrate that repetition into our classes by using a self-check review of the information from our class for the students, beginning the next class with a short review of the previous class, or a multitude of other lessons that require repetition.
So what does sleep have to do with memory? One thing that is pretty consistent in research is that sleep has a positive effect on memory. While your body is out cold and you are asleep, your brain is busy processing memory consolidation; that is, you have uploaded a bunch of information and your brain now takes those memories and integrates them with other prior memories.

Most researchers have spent a century taking a look at sleep and the benefits of retention memory. Early research concentrated on rapid-eye-movement (REM) sleep, which occurs during the second half of the night when you are in a deep or “delta” sleep. The newer research has focused on slow-wave-sleep (SWS) which occurs in the early stages of sleep during the first half of the night.

The researchers that focused on REM sleep hypothesized that REM sleep contributes to memory consolidation. Research indicates that the REM sleep is linked to the procedural and emotional memory while non-REM sleep is linked to declarative (factual) memory. One thing that has emerged fairly recently is the role of sleep on memory consolidation. The newer studies are focusing on the dynamics of memory formation as an active consolidation process that takes place during sleep and is actually one of the functions of sleep.

In a recent study conducted in Brazil, the computer game Speedy Eggbert Mania was used to probe problem solving. None of the 29 students used for the experiment had played that video game prior to the test. The groups were split into 15 for the control group and 14 for the napping test group. After playing for an interval the test group slept for 90 minutes while the control group remained awake. After that, the students were given another interval of game playing involving the problem solving. From the control group only 7 out of the 15 students were able to solve the problem while 12 out of the 14 nap students were able to solve the problem. The study showed that after sleeping, students were twice as likely to solve the problem when compared with the other students who spent the same amount of time awake. The researchers found “that sleep can improve cognitive performance through an active process of memory consolidation and integration of recent experience into previous developed networks.”

Cramming all night to prepare for an exam simply doesn’t work. The longer awake a student is, the more sluggish their minds become. In fact, that type of cramming to learn new facts decreases the ability to do so by 40%! What does help is napping. In research from the University of California, Berkeley showed that a one and a half-hour nap dramatically boosted and restored brain power. In that study 39 participants were divided into two groups – the nap group and the no-nap group. They were given a task that involved storing fact based memories. The results of that study showed that those who napped did much better than the no-nap group and actually improved their capacity to learn. The results of the study reinforces the fact that sleep is needed to