How We Learn and Remember

The Conditions for Learning

Learning and memory are inseparable. Without memory there can be no learning. The traditional method of evaluating how much someone has learned is to test that person's ability to recall the information they've learned. If nothing is recalled, then nothing has been learned.

Professor Robert Cagne established three conditions that must exist if learning is to take place. They are:

1. motivation;
2. attention; and
3. developmental readiness.

All three are primarily internal conditions, or states of mind. According to Cagne, they are the most important factors in a student's preparation to learn which can be influenced by an instructor.

Since sleep learning is a method of learning, to understand it requires an understanding of how we learn.

Professor Cagne's conditions apply even more to sleep learning than to traditional methods of learning. In many respects, sleep learning students are self-instructors, who must exercise a strong influence on their own preparation for the learning experience.

Most educators agree motivation is the most important condition affecting a student's ability to learn. However, there are several types of motivation. Cagne believes the one most relevant to successful learning is "motivation to engage in learning." He called this establishing an intention to learn or a "learning set." This is especially important in sleep learning.

Several factors contribute heavily to create this motivation. They are external conditions that are, for the most part, products of our own lifestyles, needs, and goals. First is social pressure. This is the desire to win the approval of others, such as relatives, friends, or fellow workers. Second is the desire for mastery. This usually relates to skills that are generally considered intellectual in nature. Finally, there is the desire for achievement, which contributes to the self-motivation of those people who, for their own satisfaction, constantly strive for higher levels of skills and knowledge. These are the self-motivators.

Many students participate in the educational process because they are required by law to attend school, or are pressured by their parents to "get a good education." Neither reason produces a reliable motivation to learn. Although it's possible to acquire knowledge without motivation, the highly successful student is generally extremely well motivated.

In the next two chapters, we'll see examples of the amazing powers of judgment that are present during sleep. By establishing the proper learning set through genuine motivation to learn, we can control this judgment capability and allow the sleep learning lesson to be absorbed thoroughly into our subconscious memory. Without adequate motivation, it is doubtful if much of the lesson will be learned.

A properly motivated sleep learner actually experiences a form of subconscious learning even before the first lesson begins. This is accomplished by instructing me subconscious on what it should consider important information. A classic example of highly motivated subconscious learning is the mother of an infant who instructs her subconscious to awaken her if the infant cries, but not when extraneous sounds occur, such as a truck passing her bedroom window. A sleep learning student accomplishes the same thing by being truly motivated to learn the material to be presented in the nocturnal lesson.
The successful student’s close attention to the subject is of optimum importance to learning. The student who spends a majority of classroom time looking out the window is sure to learn less than the student who directs full attention to the instructor. Psychologists define attention as “the selectivity of the perceptual processes.” Put in simpler terms, we respond unequally to different things we perceive.

For example, we may focus our attention on some objects in a scene while ignoring others. The outstanding characteristics of objects that command our attention are known as “attention getters.” Usually, there is something unique about these objects. Contrast and movement are visual attention getters, while volume and pitch are auditory attention getters. We can see examples of their effectiveness everyday. A roadside billboard or a newspaper advertisement will be arranged so that we attention-getting words or objects are most prominently displayed. The word FREE is never buried in the text of an ad and may be the largest attention-getting word in the English language. Some companies will even incur extra expense to animate billboards to attract attention.

A brilliant example of an attention-getting billboard is the famous cigarette smoker over New York’s Times Square. Actually nothing on the billboard (which is the face of a person smoking) moves, but every few seconds a giant smoke ring emits from the smoker’s mouth.

Television viewers often complain that commercials are louder than the regular programming. Although broadcasters decline to discuss this, the higher volume is a method to gain viewers’ attention during commercials.

A humorous story about attention getting tells of a farmer who hit his donkey on the head with a large board. A passing stranger, seeing this, asked if the donkey was refusing to move. “No,” answered the farmer, “before I can tell him to move I have to get his attention.” Fortunately, paying attention to a sleep learning lesson requires no such drastic action. The environment in which most of us sleep is normally void of distractions. If an attention problem exists for the sleep learner, it will generally occur at the start of the lesson.

Professor Cagne describes the final condition, developmental readiness, as the stage a person must reach before specific kinds of learning can take place. For a sleep learner, this stage is determined by what you already know and by how much you have to learn in order to reach your goal.

For most sleep learners, motivation to learn will eliminate the need for attention-getting devices, because it will help them anticipate the lesson. For those who find self-motivation isn’t enough, two methods are helpful in focusing their attention. Whenever possible, sleep learning students should pre-record the lesson personally. The sound of one’s own voice is an attention getter in itself. A second is the frequent mention of the sleeper’s name. In several sleep learning programs, lists of names were read to sleeping subjects, who reacted more positively to the mention of their own name. We’ll deal with this in more detail later.

Professor Cagne describes the final condition, developmental readiness, as the stage a person must reach before specific kinds of learning can take place. For a sleep learner, this stage is determined by what you already know and by how much you have to learn in order to reach your goal.

For example, let’s suppose a group of young children are being taught the abstract rules of calculus. They can’t possibly be successful unless they have first mastered the concepts and equations of algebra. Such prerequisites are important at any level of learning. Complex skills are learned faster when the simpler skills that relate to them are mastered first.

Developmental readiness applies more to the subject of the lesson than to the method of teaching, and is influenced by the abilities of each individual student. It may not be completely necessary to meet this precondition for sleep learning. The number of verified sleep learning cases in which foreign languages were learned by people totally unfamiliar with them is ample evidence of this. Since language learning while asleep is best used for conversational purposes, there’s little need to get into the complexities of grammar.

Learning is acquiring knowledge or skill. The amount of knowledge or skill we learn is judged by what we remember. Retaining what we have been taught is the acid test of the learning process. A student takes periodic examinations to test the amount of knowledge he or she has acquired. A quality control inspector in a factory checks the products made by workers to insure they’re performing in accordance with the skills acquired through their training. These are forms of testing what has been learned and retained. An individual who is unable to retain anything is also unable to acquire knowledge and skills.

How We Remember

It is no exaggeration to say that memory is everything. Without memory we couldn’t “learn.” We wouldn’t have intelligence or a past. Since memories are an individual’s stored record of experiences, they are the individual.

There has always been disagreement among experts about the process of memorization. Several theories exist about the function of remembering, both the original storing of information and the recall of it at a later time. It is possible that someday researchers will identify several depositories for memory. Some of these may prove to be temporary storerooms of information where data is evaluated and processed before being integrated into permanent memory or discarded.

The irony surrounding our lack of knowledge about the processes that permit us to learn and remember was expressed by D. S. Halacy, Jr., in his book, Man and Memory: “We can understand anything—except the facility that makes all else understandable.”
Two respected brain and memory researchers give us an example of the differences of opinion that plague their field. Dr. Karl Lashley trained a group of rats to find their way through a set of mazes. When they learned this task sufficiently, he surgically removed a different portion of the cortical region of the brain from each rat. When they recovered from surgery, the rats were returned to the maze.

Lashley tested each rat individually to determine its ability to remember how to solve the maze. If a rat was unsuccessful, it could be assumed to have no memory of the previous training, which would indicate the portion of its brain that had been removed contained its memory. To Lashley’s surprise, every rat found its way out of the maze. Despite the fact some were maimed from surgery, the rats crawled through the maze just as they had remembered it. The results prompted Lashley to conclude that memory was not stored in the cortex. It had to be stored elsewhere.

In 1885, the German psychologist Hermann Ebbinghaus published the results of almost twenty years of research and experimentation on memory. Considered by many to be the father of memory research, Ebbinghaus plotted a “memory curve” which effectively demonstrated that the level of retention declines rapidly at first, then levels off to a constant amount.

Ebbinghaus used himself as a subject in one experiment. While in his mid-thirties, he memorized the poem “Don Juan.” His goal was to test his theory that in spite of a short-term rapid loss of most of the poem, some portion of it would never be lost from his memory. Twenty-two years later he was unable to consciously recall any lines of the poem, so he decided to learn it over again. He was able to re-learn “Don Juan” at a much faster rate the second time. This faster rate of learning convinced him that at least some parts of the poem remained in his memory, but he had been unable to retrieve them. He attributed his increased re-learning rate to dormant memory.

Ebbinghaus’ work resulted in two concepts of learning. One is re-learning. This means once something is learned it is never completely forgotten. Although it may not be recalled easily, it will enhance a later effort to re-learn the same material. The other concept is over-learning. This is based on the premise that repetition is essential for the mastery of the material to be learned. To over-learn, it is necessary to know how many repetitions an individual needs to memorize something. For example, if learning four lines of poetry requires twenty repetitions, most students will reach this point and stop studying, assuming they have successfully learned the poem. Applying the concept of over-learning, dozens of researchers since Ebbinghaus have proven that the student who continues the repetitions beyond this point has better recall than the student who stops at twenty. The more repetition, the better it’s learned.

The importance we place on a “good memory” is confirmed by the amount of money spent each year by tens of thousands of people who purchase books and tape recordings aimed at improving memory. Many of the suggestions offered can be used successfully by most readers, while others are of dubious value.

We’ve all been impressed by individuals with a “photographic memory,” or “total recall,” as they answer difficult questions with apparent ease. Many famous people have shown tremendous capacity for memory. Arturo Toscanini is said to have been able to conduct symphonies without the help of written scores, having committed them to memory. General George Marshall could discuss minute details of events of World War II after the war ended. One admirer described Marshall's memory in this way: “He organized and arranged facts in his mind as he did soldiers in the field.”

In Swift’s Gulliver’s Travels, the Master of the Mathematical School taught his pupils by writing each lesson on a wafer with special ink. When students swallowed the wafer, the chemicals in the ink made their way to the student’s brain, thus imparting knowledge. A wafer with magic ink or a pill that would improve memory after being swallowed has been an age-old fantasy of mankind.

Besides the factors discussed earlier, motivation to learn, whether by traditional methods or through sleep learning, is influenced by our personal feelings about the subject matter. The degree to which we are able to recall information we’ve heard or read can be directly affected by our bias concerning that information. Our memorization process can discriminate against statements with which we disagree, and in fact, reject such material entirely. This memory selectivity also takes place when we are exposed to verbal, written, or visual material in which we have no interest.

As we saw earlier, this discrimination is a product of the conscious portion of our mind. In most situations, it causes no real problem to avoid memorization of material in which we have no interest. Formal education is an exception. Students taking required courses in which they have little interest don’t do as well as they do with courses that stimulate their imaginations and desire for knowledge.

The process of memorizing begins with the desire to learn and remember. If there is no genuine interest to learn, the material is less likely to be memorized and, therefore, will not be learned. We see the evidence of this every
day. We constantly hear, see, and experience things that are never committed to our memory. The reason we don't memorize these events is simply that we don't have the desire to do so. Either they hold no meaning or, if they do, we may decide that knowing where the information can be retrieved is sufficient.

The importance of memory to learning was expressed by Dr. Ian Steele Russell of London University College, when he wrote, "The phenomena of memory and learning are inseparable: memory without learning is NO more feasible than is learning without memory."

**Repeating to Remember**

The two components indispensable to learning are the capacity to acquire knowledge or skill and the ability to memorize that knowledge or skill. When we're concerned with acquiring knowledge that can be verbalized, as in sleep learning, the key to memorization is repetition.

Repetition as a means of remembering is used more frequently than we may realize. A common example is the child sent to the grocery store by his mother. Most parents will not trust many purchases to a child's memory, so they will write the items wanted on a piece of paper. If only a few items are to be purchased, a parent may rely on the child remembering them. Usually the mother will repeat the description of the purchase to the child several times then have him or her repeat the list back to her.

Shortly the child is on the way to the grocery store, repeating the list over and over, "One quart of milk, one loaf of bread, one-half pound of butter. One quart of milk, one loaf of bread, one-half pound of butter..." The repetition helps insure nothing is forgotten.

A reader is struck by something she wishes to remember and reads it over several times until she believes she will be able to repeat it accurately. In both instances, repetition is used to enhance the process of memorizing.

If we could interrupt the reader or the child and inquire why they were repeating the material, they would most likely reply they were trying to "know it by heart." Even today we persist in the use of this term that originated in an age when people believed that functions of the mind originated in the heart.

Although repetition is the most common tool for memorizing something, there are others that can be equally effective. Memorization can be activated by emotional reinforcement. An event that arouses our emotions lodges itself in our memory with a degree of strength similar to that produced by repetition. If we witness a fire, the scene remains in our memory for an extended time. If the fire was especially spectacular, with considerable damage or loss of life, the scene is riveted even more vividly in our memory. The power of emotional reinforcement to produce strong memorization is enhanced by higher levels of emotional stimulation.

Emotional reinforcement has a residual effect of increasing our recall of events that preceded the one arousing our emotions. For example, we might remember what took place the morning preceding the afternoon fire, but can't recall the events of the morning of the day following the fire. Almost everyone has experienced this type of memory reinforcement. Except for those too young to be emotionally affected by the assassination of President John F. Kennedy, most of us can still recall many of the details of our own activities on November 22, 1963. Yet few can recall details of November 21, 1963.

In 1965, the North Eastern states suffered a massive power failure that left millions without power for hours. For several years after, conversations throughout the states involved were sprinkled with "what were you doing during the blackout" stories. Memories of activities and events occurring during the power outage survived a long time because they were emotionally reinforced.

For most of us, the recollection of our activities the day Kennedy was assassinated remained "fixed" in our memory longer than those of the blackout, due to the higher degree of emotional stimulation. Regardless of one's feelings about Kennedy the politician, the sudden, violent death of the President of the United States was an event with enormous emotional impact. It had a strong influence on our memories every bit as effective as repetition.

However, in the learning process, repetition remains the critical factor: This is why successful sleep learning lessons rely heavily on multiple repetitions of the information or instructional material being broadcast.

**Remembering and Forgetting**

In recent years, several new theories have been proposed as to why we remember some material while some is forgotten. Most were discarded or disproved through experimentation and practical application. The most widely supported rationale for why we forget something we want to remember is based on interference. This belief is based on the rule, "Interference during learning and after learning reduces the amount of material that can be recalled." Interference is also a major factor in successful sleep learning.

Paradoxically, the primary type of interference that hinders learning is additional learning. An example of this sort of interference is the learner's inability to memorize a long list of words. At some point the list becomes too long to allow the student to memorize all the words. There are too many words, or "too much to learn." When too much
material is presented, the later material interferes with learning and memorizing the earlier material.

Interference after learning is also created by additional learning, although the new learning may take place at a later time. Let's take a look at the students who study in the afternoon, right after school. When homework is completed, many students will spend their evenings watching television or listening to records. These activities can be classified as learning that interferes with the processing of information learned earlier, both at school and during home study. The same applies to material learned during the early and late parts of the school day. Each interferes with the other.

Interference of earlier learning on the retention of later learning is known as proactive inhibition. This simple equation was devised to measure the degree of proactive inhibition on individuals:

\[
\begin{array}{ccc}
\text{Group I} & \text{Learn A} & \text{Learn B} & \text{Recall B} \\
\text{Group II} & \text{Rest} & \text{Learn B} & \text{Recall B} \\
\end{array}
\]

To calculate the effect of proactive inhibition, subtract what Group I recalls of B from what Group II successfully recalls. If both groups have equal recall ability, Group II will do a better job of recalling B because that's all it has learned. There's no prior information to be processed.

The second type of interference is called retroactive inhibition. This applies to the example of the students who watch television after studying. It's the interference of subsequent learning on the retention of material previously learned. By making several minor changes in the equation used for proactive inhibition, we can devise one for retroactive inhibition:

\[
\begin{array}{ccc}
\text{Group I} & \text{Learn A} & \text{Rest} & \text{Recall A} \\
\text{Group II} & \text{Learn A} & \text{Learn B} & \text{Recall A} \\
\end{array}
\]

The recall ability of both groups being otherwise equal, the learning of B will interfere with the ability of Group II to recall what was learned in A. The difference between what is recalled by Group I and Group II is the degree of retroactive inhibition.

In our first equation, Group II will have a higher rate of recall. In the second equation, Group I will have the higher rate. The recall rate of both groups will be affected by the presence of a rest period in which no learning takes place.

Since almost every activity requires some type of learning, studies involving both forms of inhibition have required unusual precautions regarding the rest periods. If proactive inhibition can be reduced by limiting the amount of material to be learned, retroactive inhibition presents the greater problem to researchers. A Princeton University study shows the lengths to which scientists will go in their efforts to overcome this interference caused by activities taking place after learning.

Twenty students were selected as paid participants in a project designed to test the theory that some memory loss is due to the experiences we have following the learning period. The students were told they would not receive payment if they failed to follow all instructions accurately. Each was placed in a darkened chamber alone. After one minute of isolation, each was read a passage from Tolstoy's War and Peace. They were told to listen closely to the one hundred and eighty-two word passage, as they would be asked to repeat it verbatim.

When the passage was read, each student was asked to repeat it. Next, half the students were released and instructed to go about their normal activities. Before departing, they were asked to return in exactly twenty-four hours to conclude the project. The ten remaining were confined to beds placed in their chambers. Alongside each bed were food, water, and toilet facilities.

After twenty-four hours, the students who had been restricted to bed, totally isolated and undisturbed, were asked to repeat the Tolstoy passage. When the first group returned from the normal activities, each was placed in a chamber and also asked to repeat the passage. Not surprisingly, the students who remained in the chamber had a far greater ability to recall the passage than those who went about their normal activities.

The results confirmed the expectation that learning followed immediately by a period of diminished mental activity is retained much better than learning followed by normal mental activity.

Numerous additional studies have been done in which participants who were isolated after a learning session exhibited greater recall than when their learning was followed either by further instruction or normal daily activity. These consistent results prove that external stimulation interferes with the retention of previously learned material.

Since it's impossible for everyone to construct their own isolation chamber to enhance the learning environment, the quest began for a more practical means of reducing retroactive inhibition. The answer was sleep.
For years it was believed that the passage of time was responsible for memory loss. It was thought that material learned earlier simply faded or decayed. Ebbinghaus' memory curve disproved this concept. He found memory loss was most pronounced immediately after learning, and then the amount of loss tended to level off and the material retained remained constant. With the time-decays-memory theory in disrepute, the interference theory came into its own and still stands today. This is the proactive and retroactive inhibitions discussed earlier.

Dramatic support for this theory came from the Psychological Laboratory at Cornell University, when Dr. Karl M. Dallenbach conducted what became the classic study on interference and memory. The results showed "a marked difference in the rate of forgetting during sleep and waking."

Dallenbach's work proved that sleep helps considerably in remembering material learned, because no other learning takes place during sleep. Traditional daytime learning takes place before other activities, so it suffers from interference.

Although studies such as Dallenbach's demonstrated that retention of material learned was greater following several hours of sleep than normal daytime activity, several appeared to contradict their own results when the subjects were tested one hour after learning. When testing took place following one hour of sleep, the amount of material remembered was generally the same as after one hour of being awake. This raised an important question. If the reason for better retention during sleep is the absence of interference that normally occurs while we're awake, why are the results similar following one hour of being asleep and one hour of being awake?

The answer was given by Edward Van Ormer in the Psychological Bulletin. He suggested this was based on another activity, one that had yet to be examined. He said the first hour after learning is the most important for retention because there may be a process of consolidation that takes place before the actual memorizing. Assuming such an activity takes place during the first hour after learning; then the interference caused by being awake hinders that consolidation process. This same hindrance can occur to the person going to sleep after learning. This idea is best understood by breaking down into minutes that one hour between learning and being awakened for testing.

It takes the average person about ten minutes to fall asleep after learning. During those ten minutes, which may be the most important time for the consolidation process, the interference caused by waking activities or thoughts hinders the process. The very act of falling asleep may be an interference. Then, being awakened for testing probably causes additional interference. So, of the sixty minutes, at least the first ten are subject to interference inhibiting memorization. Add a few more minutes for the time it takes to fall asleep and we have a condition of negative memory.

During the next forty-five to fifty minutes, the memory process may be attempting to recoup what was lost during the first part of the hour. If being awakened causes interference, it will affect some of what we recouped. The time actually spent sleeping during that first hour may not be sufficient to offset what was lost through interference and achieve the improved level of memorization indicated by the test results following two or more hours of sleep. After two hours, results attained during sleep maintain an ever-widening superiority of recall over the same time spans of being awake.

Following these studies, numerous experiments have been conducted testing the relationship of sleep to memory. They've established conclusive proof that sleep has a positive affect on a person's ability to memorize information. This prompted some educators to question the efficacy of the conventional concept of students attending class during the early part of the day, followed by activities requiring additional learning.

Reviewing the theory of retroactive inhibition as a means of destroying the memorizing of learned material, and the role sleep plays in avoiding it, provokes the question most pertinent to this book: Is learning during sleep improved by the fact that there is no retroactive interference during the time the material is being processed into our memory?

While there have been no scientific studies on this specific question, we can draw some conclusions based on the work discussed in this chapter. That work supports the answer that learning during sleep will increase our ability to remember what is taught. Sleep learning enjoys some obvious advantages over traditional daytime learning methods. First, there's no interference while we're, sleep learning. The environment in which we sleep is usually free of distractions that compete with learning. Second, if we're conscientious in preparing the sleep learning lesson, it will not be overloaded with too much information. Third, we've seen that repetition is a key to remembering. Repetition plays a major role in sleep learning. Fourth, we're learning during sleep, the great rest period that eliminates retroactive inhibition. Finally, when we're learning during sleep, our subconscious is a direct conduit to our memory.

"You know what the greatest tragedy is in the whole world?" said ginger, ............ "It's all the sons who become blacksmiths because their fathers were blacksmiths. It's all the people who could be really fantastic flute players who grow old and die without ever seeing a musical instrument, so they become bad ploughmen instead. It's all the people with talents who never even find out. Maybe they
are never even BORN in a time when it's even possible to find out."

She took a deep breath.

"It’s all the people who never get to know
what it is they can really be.

IT’S ALL THE WASTED CHANCES.

- TERRY PRATCHETT

Start Your Sleep Learning Experience TODAY!
Click here to visit http://www.sleeplearning.com

Reclaim a third of your life for self-improvement and personal enrichment!
If you've ever wanted to master another language, cram up on any subject, commit to personal growth/change or just pass those exams - then you've come to the right place. Dramatically increase the rate at which you learn and comprehend!

Copyright© 2005 sleeplearning.com All Rights Reserved.