






Stages of Learning

You can find hundreds of techniques and strategies designed to help you improve your learning and retention of information. But without understanding how your brain learns and retains information, these may or maynot make sense to you. Learn more about why these techniques work and improve your ability to adopt a learning system that works for you.



Ultimately, learning is the development of goal-oriented neural networks.

Remember this: single neurons aren't smart.  But, integrated groups of neurons that fire together are very smart.     This orchestrated neural symphony that goes on inside your brain is what learning is all about.

Elaborate neural networks are developed over time through the process of:

- ✓ making connections,
- ✓ developing the right connections, and
- ✓ strengthening the connections.

Optimal learning (connections → connections → connections) occurs in a predictable sequence. Let's work through the first three stages.

STAGE 1: PRE-EXPOSURE OR PREPARATION STAGE

This stage provides a frame-work for new learning and primes the learner's brain with possible connections. This stage may include an overview of the subject, a visual representation of related topics, etc. The more background a learner has in the subject, the faster they will absorb and process the new information.

STAGE 2: ACQUISITION

The first stage of learning is receiving sensory input; does that mean you've learned it? In answer to this question, let's say, for example, that you just heard a very funny joke. You laugh out loud and make a mental note to share it with your friends tomorrow at lunch. But when the time comes, you've forgotten the joke. So, the question is did you learn the joke?

Before you answer, think about this: If you were given five choices from which to choose the joke, would you recognize it? Probably, right? Then perhaps you actually did learn it!

The AH-HA!



HA-HA!



The Ah-Ha and Ha-Ha create the same neurological event in the brain: both are moments of insight which trigger chemical releases i.e. the creation of a neural connection.

However, the connection might have been weak, so it deteriorated in a matter of hours. While a 'moment of learning' is a vital step in the learning process, making connections between cells is one thing and retaining them is quite another. AND, maintaining accurate connections is yet another. The critical point to remember is this: Never confuse a 'moment of insight' with learning. While "ha-ha" and "ah-ha" have the same impact on the brain, to remember something, **elaboration** is necessary.

The neurological definition of acquisition is the formation of new synaptic connections. The cell body of a neuron has spindly branches called dendrites and a single longer projection called an axon. The single axon of a cell reaches out to connect with the multiple dendrites on other cells. *These connections are formed when the experiences are both novel and coherent.* Quite simply, if the input is incoherent, only weak connections (if any) will be made. However, if the input is familiar, existing connections are strengthened and learning results.

Obviously, the acquisition stage is the making of connections (neurons "talking" to one another). The sources for acquisition (i.e. learning) are endless and can include: discussion, lecture, visual aids, environmental stimuli, hands-on experiences, role modeling, reading, videos, reflection, group projects, and partner-shared activities.

Example of the Impact of Prior Knowledge

A head rolls into a bar and asks the bartender for a drink. The bartender gives him one and, amazingly, the head grows the rest of a body and becomes a human. The head is very happy and asks for another drink. But this time, when the head drinks the body melts away. This prompts the bartender to say "You should have quit when you had a head." This joke (or attempt at one) only makes sense if you possess the prior knowledge and understanding of the idiom "to quit while you're ahead".



Remember, however, that this first step of making a connection is highly dependent on prior knowledge to make the necessary connections. In fact, the greater the prior knowledge, the greater the likelihood of an "ah-ha" or "ha-ha" experience and the development of a connection based on a familiar input (i.e. prior knowledge).

As illustrated by this 'joke' example, a synaptic connection can be made temporarily and then lost. Neural space is expensive real estate and the brain is most concerned with saving that which is important for survival. To ensure that the brain maintains the synaptic connections made from new learning, additional elaboration is usually necessary.

STAGE 3: ELABORATION AND MEMORY DEVELOPMENT

Neural networks are a product of many (i.e. thousands) of neural connections and are developed through trial and error. The more experimentation and feedback, the better the quality of the neural network. Smarter students don't always get the answers first and they don't always get them right. But they do eliminate wrong answers better than their peers. And this ability to avoid bad choices is developed by trial and error. It is *NOT* developed by a faculty member telling us the right answer and then having us repeat it back to them. This type of rote learning may produce good scores on a standardized test, but it does not produce critical thinking in the learner. To enhance your learning by creating strong neural connections you need to use as many learning strategies as possible. In addition to reading, listening, doing homework, taking notes, you may also want to use simulations, role playing, model-making, question charts, mind maps, T Diagrams and other

proven learning tools to first help get the knowledge you need, make sure your knowledge is correct, and then strengthen your neural connections that make it uniquely yours.

After incorporating the elaboration and memory formation strategies cited above, you might think your brain would have permanently encoded the day's learning. Unfortunately, it's not quite that simple. Sometimes even after you have had plenty of opportunity for experimentation and interaction, the memory trace is still not strong enough to be activated at test time. There are a variety of additional factors that contribute to the "retrievability" of your neural networks:

- ↪ **Adequate Rest** (Rest, especially REM sleep time) is vital to learning. This is the time when much of the information your brain is processing is consolidated.
- ↪ **Emotional Intensity** also strengthens learning. Emotional responses to what you see, read, and experience triggers the release of neurotransmitters. This biologically marks the event as significant and one to be maintained.
- ↪ **Nutrition** plays a role because the food you eat provides the raw materials needed to produce those all-important "memory chemicals" your brain needs to create significant and long term memory networks.
- ↪ **Context.** The context in which you learn affects the creation of your neural connections. If you have nothing to connect your new knowledge to it is harder to develop those pathways. The connections do not need to make sense to others, only to you.
- ↪ **Quality and Quantity of Associations.** Much like context, the quality and number of associations your brain can form with other knowledge it has already stored, the stronger the neural connections it will make.
- ↪ **Prior Learning.** With prior learning that you can connect to new learning the easier your brain can make strong neural connections. If you are studying something uniquely new for you, you will need to identify ways to connect the new knowledge with knowledge you already have. As with context, the connections need to make sense to you and your unique neural networks.



While you may be tired of hearing about the impact of these environmental factors (Rest, Emotion, Nutrition) on learning, they do make a difference in how well your brain functions and, in the process, your learning.

When all is said and done, learning is complex: It's more than neurons getting electrocuted while holding hands. The development of neural networks made up of cells that have fired together often enough to wire together, are activated by complex interactions between genes and your environment, and are modulated by countless biochemicals.

Remember too, that to truly understand new context, you must move from the micro to the macro and back to the micro. In this process, information may become oversimplified and out of context, but as elaboration occurs, the pieces of the puzzle reunite to form an accurate picture that results in accurate learning.

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