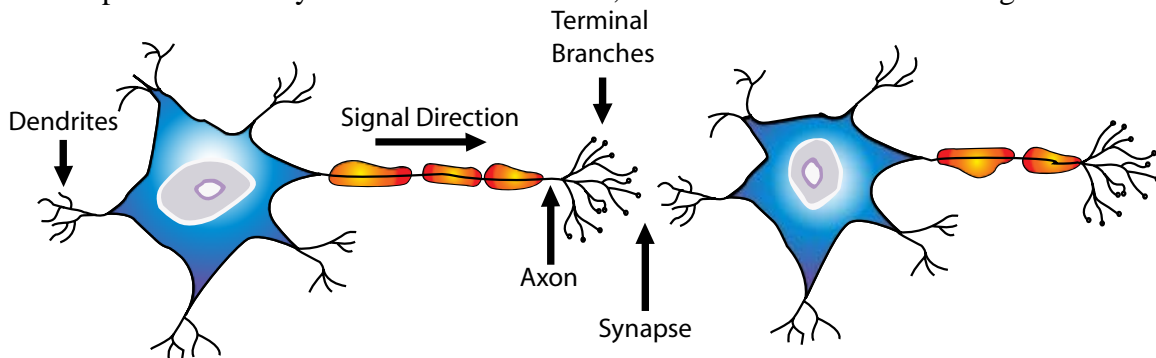


## Fostering Retention in Adult Learners

In the late 19<sup>th</sup> Century, German Psychologist Hermann Ebbinghaus established that humans forget 90% of what they learn in a class within thirty days<sup>1</sup>. Without some aid to help us retain what we learn, massive amounts of crucial information are lost. The most powerful and simple technique to improve retention is repetition.

### Neural Pathways

There are anywhere from 10 to 100 billion neurons in the brain. Neurons are the cells that make up the nervous system<sup>2</sup>. At its most basic, each neuron consists of a long thin



Simple Neuron Pathway

section, called an axon, with branches on both ends. Between neurons is a space called the synapse where electrochemical transmission of a neural message occurs from neuron to neuron – from the terminal branches of the “sending” neuron to the dendrites of the “receiving” neuron. These pathways of connectivity are how messages are transmitted and how memories are formed and stored.

As we learn, pathways within the brain are created. Without continued use, these pathways decay and you forget. The more often a pathway is used, the stronger the pathway becomes and the easier it is to retrieve the stored information. A primary purpose of education is to create new pathways and to reinforce those pathways to make them less susceptible to decay through repeated use.

### The Memory Process

The memory process consists of many parts, with certain focus placed on three. The first is Sensory Information Storage (SIS). This is when your brain snaps a mental picture of what your senses are taking in. "The functioning of SIS may be observed if you close your eyes, then open and close them again as rapidly as possible. As your eyes close, notice how the visual image is maintained for a fraction of a second before fading," says Richards Heuer, Jr., author of *Psychology of Intelligence Analysis*<sup>3</sup>. This image dissolves quickly and is only meant to provide your brain with a chance to process what it has just seen.

<sup>1</sup> Plucker, Jonathan. *Hermann Ebbinghaus*. 2004. Indiana University. 14 March 2006 <[www.indiana.edu/~intell/ebbinghaus.shtml](http://www.indiana.edu/~intell/ebbinghaus.shtml)>

<sup>2</sup> Kimball, John W. "Memory." *Biology* 03 August 2005. 13 March 2006 <[users.rcn.com/jkimball.ma.ultranet/BiologyPages/](http://users.rcn.com/jkimball.ma.ultranet/BiologyPages/)>

<sup>3</sup> Heuer, Jr., Richards J. *Psychology of Intelligence Analysis*. Washington, D.C.: Central Intelligence Agency, 1999.

From SIS, information could move to Short-Term Memory (STM). STM allows a person to retain handfuls of knowledge. Five to nine pieces of information can be stored indefinitely if they always remain at the forefront of a person's mind. Once another thought enters, something must be released to allow room for the new information. It can either be transferred to Long-Term Memory (LTM) or forgotten. The limit is on quantity, not time, and information can be retrieved almost instantly.

The storage potential for LTM is limitless, but that has its drawbacks. Stored facts suffer during transfer. Knowledge entering SIS, then moving to STM and finally to LTM can lose clarity and sharpness along the way. It is also lodged deep in the brain and, when called upon, may take a while to be retrieved.

It takes substantial effort to convert information from STM to LTM. Repetition is a way to solidify something into LTM. "Information from Short-Term Memory is stored in Long-Term Memory by rehearsal. The repeated exposure to a stimulus or the rehearsal of a piece of information transfers it into long-term memory," says Harish Kotbagi, of the Georgia Institute of Technology<sup>4</sup>.

Repetition priming is a "form of memory that is accompanied by reductions in neural activity when an experience is repeated<sup>5</sup>." Gagan Wig's article suggests that the more often you recall a specific piece of information, the less brain activity it eventually takes.

### **Repetitive Learning**

Science and plain, old-fashioned observations have proven that humans learn massive quantities from repetition. Advertising is a primary example of this phenomenon – with companies spending billions of dollars to present us with seemingly mind-numbing repeated messages. These messages work, even though they are basically passive. Repetition is even more effective when it is an active process. Dr. Karen Jarrett Thoms, of St. Cloud State University, writes that if repetition has "meaningful results, then learning will take place<sup>6</sup>."

Repeat retrieval is one way to plant information into LTM. Dr. Deb Ulmer, of the Midcentral Region Center for Teaching Excellence, calls into focus a movement among educational psychologists that says, "a new concept may need to be repeated 20 or more times for it to become automated<sup>7</sup>." She notes that repetitive practice is one of the most effective ways to successfully master new material. Even on an independent basis, study guides promote reading your notes over and over as a useful learning tool<sup>8</sup>.

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<sup>4</sup> Kotbagi, Harish. *Human Memory*. 1997. Georgia Institute of Technology. 14 March 2006 <www-static.cc.gatech.edu/classes/cs6751\_97\_winter/topics>

<sup>5</sup> Wig, Gagan S., et al. "Reductions in neural activity underlie behavioral components of repetition priming." *Nature Neuroscience* September 2005: 1228.

<sup>6</sup> Jarrett Thoms, Karen. *They're Not Just Big Kids: Motivating Adult Learners*. 2001. St. Cloud State University. 13 March 2006 <www.mtsu.edu/%7eitconf/proceed01/22.html> .

<sup>7</sup> Ulmer, Deb. *The Basics of Learner-Centered Instruction*. 20 Nov. 2001. Virginia Community College System. 14 March 2006 <vccslitonline.cc.va.us/mrcte/dr\_\_deb\_ulmer.htm> .

<sup>8</sup> Fleming, Neil. "Read/Write Study Strategies." *Vark* 2001. 14 March 2006 <www.vark-learn.com>.

Cyndi McDaniel of Northern Kentucky University writes, “Many studies have demonstrated strong positive effects of repetition on learning. Repeated presentation of items increases memory for those items. Repeated retrieval is also reported to improve memory<sup>9</sup>.” By repeating important concepts and then forcing the learner to retrieve those concepts several times, you strengthen the neural pathways, making subsequent retrieval easier and retention more durable and long-lasting. In the words of John Sutton,<sup>10</sup> “In us, memories do not naturally sit still in cold storage.”



*Dr. Linda Eagle is Founder and President of The Edcomm Group Banker's Academy—a 21-year-old multimedia education and communication consulting firm specializing in the development of creative business solutions that improve productivity, customer service and market share - providing bottom-line results. The Edcomm Group Banker's Academy has had the privilege of assisting many distinguished clients with business solutions in the form of eLearning programs, classroom instruction, multimedia production and online and print based documentation. Edcomm Banker's Academy offers many off-the-shelf and customized courses such as Teller Training, Compliance Training and Systems Training specifically designed for Banks, Credit Unions and Money Services Businesses (MSBs).*

888.433.2666

+1.212.631.9400

[www.edcomm.com](http://www.edcomm.com)

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<sup>9</sup> McDaniel, Cyndi. *Misconceptions Persist Despite Repeated Testing*. 29 May 2003. Northern Kentucky University. 14 March 2006 <[www.psychologicalscience.org/cfs/program/view\\_submission.cfm?Abstract\\_ID=4095](http://www.psychologicalscience.org/cfs/program/view_submission.cfm?Abstract_ID=4095)>.

<sup>10</sup> Sutton, John. *Memory: Distributed Models of Memory*. 2004. Stanford University. 14 March 2006 <[plato.stanford.edu/entries/memory/](http://plato.stanford.edu/entries/memory/)>.