

**Neural Pathway Development**  
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(as recommended by *Education Week*)

When a baby is born, the brain has significantly more neurons than it does as an adult. As a child matures many neurons do not survive. "The death may involve anywhere from 15 to 85 percent of the initial neuronal population" (Gardner, 1983, p. 44). If the brain is damaged while a child is young, long term damage may not necessarily be the result. Other areas of the brain can take over for the injured part of the brain.

"Learning is the process of acquiring knowledge about the world. Memory is the retention or storage of that knowledge. . . alterations in the brain (are) produced by learning" (Kupfermann, 1991, p. 997). It should be important to educators to understand how that alteration in the brain occurs and what educators can do to increase that growth. As a child learns to associate symbols in the environment, certain pathways within the brain are reinforced. These pathways within the brain are developed before birth and are composed of electrochemical messages between neurons. As a child begins to associate images with words, these electrochemical messages between neurons become routine. With use, the correlation between a particular sound like Mommy and the sight of a face become a well worn pathway. The more often a pathway is used, the more sensitive the pathway becomes and the more developed that pathway becomes in the individual brain. As these pathways develop, the collective group of used pathways become a map of how an individual thinks, reasons, and remembers.

Neurons which are not stimulated in these pathways tend to wither away and become unusable. These neuron cells either die or change in ways which render them ineffective. If pathways are never developed, they never become usable in the sense that they can handle significant traffic in terms of electrochemical communication within the brain. If neuron cells are not used, they can be lost. Long term non-use of connections between sensory neurons and motor neurons can result in a loss of pathway between the two. Increased sensitivity from increased demand on the brain can also increase the number of pathways between neurons in order to handle that communication. A primary purpose of education is to stimulate more pathways in the brain so that more neurons are used and pathways are able to handle additional traffic.

Items are classified by the brain and stored in categories by the brain. An example of how items are stored in long term memory is the tip-of-the-tongue (TOT) phenomenon. It is not unusual for people to have a word on the tip of their tongue and yet they can't remember it. It is because they are searching down a pathway which is not connected to the word which they are searching. If they were search for the word yellow, the word might be in the part of the brain with words which start with yellow. It might also be classified as a word with l's in it.

Each time an item is stored and cross referenced in the brain, a new pathway to that item is sensitized. Many people associate a memory when listening to a particular song. Each time that song is heard, the memory is relived. The same can be said of smells. A particular smell might stimulate a specific memory each time that smell is recognized.

There are a variety of ways that memories can be labeled in the brain. Memories can be stored with a visual, audio, or other sensory perceptions. These types of storage are part of LTM system. Educators are wise to encourage LTM storage as opposed to STM storage which requires rehearsal and a minimum of cross referencing in the labeling system. With more pathways sensitized and networked within the brain, it is easier to access items in the memory where they might be stored.