Unlocking Learning Potential:
The Process of Learning –

By Maggie Dail, M.A., CND

Part 1 – Sensory Input

As early as 1854 (D.E. Broadbent) the learning processing theory has been used to help us understand how a person learns. The computer makes a good example of how we learn. (Gale Research, 1998)

Step 1: Sensory Input (or "sensory register" Ganly, 2010) Computer hardware is essentially useless without input or software. Babies receive input from the moment of conception – some of that input is genetic and much is environmental.

While the two main learning senses are visual and auditory, the other senses can affect how one learns. "If there are any problems with the information coming into our brain, it will stop or decrease our ability to learn."(Ringoen, 1999) To determine what the cause of a learning problem is we must look at each sense to see if there is a problem with how the brain receives information.

<u>Eyes</u>

- Acuity (seeing well enough)
- Convergence (the eyes working together)
- Enhanced peripheral vision (seeing too much from the sides of the visual field)
- Underdeveloped central / detail vision (not seeing enough of what is right in front of you)
- Horizontal and vertical tracking
- Various other eye sensitivities. (Ringoen, 1999)

<u>Ears</u>

- Hypersensitivity to sound (causing a defensiveness to sound, hearing and listening) [i.e. inability to concentrate with the slightest noise, Ness, 1999]
- Tinnitus (ringing or sounds in the ear) and
- Ear fluid (major developmental caused by inconsistent quality input) (Ringoen, 1999)
- History of ear infections, tubes and sinus congestion (Ness, 1999)

Touch

- Hyposensitivity to input – limits quality input
- Hypersensitivity to input – distorts quality input
- Atypical reaction to pain, light touch, temperature

Taste and Smell

- Hyposensitivity to input – limits quality input
- Hypersensitivity to input – distorts quality input
- Poor appetite
- Picky Eater
- Sensitive to smells that other don't smell
- Atypical response to smells

Vision and hearing are gateways to learning. Touch, taste and smell can so dominate a person that one cannot attend to learning content. One of the first tasks of a neurodevelopmentalist is to determine if learning is impeded in this first step of learning - sensory input. Is the brain receiving quality input?

Part II – Processing

"Processing," the next step in the process of learning, "is the ability to hold information in your short term memory." (Ringoen, 1999) Processing or short-term memory manifests itself in the ability to pay attention visually and auditorily. Ganly refers to this as the "working memory." "Working memory is where information is processed and "problem solving" occurs; the working memory usually only processes thing for a short period of time." (Ganly, 2010)

Low auditory processing shows up in the following difficulties:

- Following directions
- Immature speech patterns
- Understanding cause and effect relationships
- It affects whether a person can use phonics to learn to read or not. (Ringoen, 1999 "Phonics vs. Sight Reading)

Low visual processing appears:

- Preschoolers have problems recognizing:
  - Numbers,
  - Letters and
  - Words.

- Older students have problems with:
  - Math
  - Spelling
  - Visual attention
  - Picking up visual cues
  - Eye contact

How do these skills develop?

Blackwood explains that in the past (and in some families today) children developed auditory processing skill by sitting at the dinner table and listening to the conversation of older members of the family. When there was no television or other electronic visual stimuli, listening to others read or to radio shows contributed to a person's auditory processing. "We learned to use our imaginations to create the characters and scenes in our minds." (Blackwood, 1998) Visual processing skills begin developing when our faces are within 12-18 inches from the baby. Presenting babies with input the appropriate size and distance from the face begins the process. Today most children develop visual skills much more easily because of all of our visual stimuli. (Blackwood, 1999)

How do we test these skills?

For years the digit span has been used as a measurement of processing skills. While in the past our forefathers had exceptionally high processing skills, the average in our society today is 7 units of information for any one 7 or older. Beginning with young children, a one-year-old can process one piece of information at a time. In their case we do not use digits, rather we say: "Touch your nose." For the average two-year-old, we can get them to touch two body parts: "Touch your nose, ear." Each year a child can process one more unit of information until he gets to 7. Once an individual understands numbers, we can test using digits. To do this for auditory processing we say a series of digits at one-second intervals, in a monotone. When an individual is able to do 2 out of 3 series of digits (i.e. 2-5-1-9) he is said to have a digit span of 4. You keep adding one more digit (i.e. 7-3-6-2-8) as long as he can do 2 out of 3. With visual processing, we can test by showing a card with the digits on it. In this case, we show the series of digits for 3 seconds. For more direction on how to do this test see the Auditory Processing Test Kit link under "Sources."

What can we do if processing skills are low?

Once we know what the current level is we can begin working on the next highest digit giving the individual up to 3 tries on each series. Doing this, 2-3 minutes 2 times a day over time will increase processing skills. Since each digit

represents one developmental year, it will take some time, however with specific stimulation to the brain, it will not take a year. See the Auditory Processing Test Kit linked below. Parents can make the digit span decks and / or use a free website: www.cognitivefun.net. Ask us about other ready-made products that are available for purchase.

Part III – Storing and Utilizing

Our brains process information (Step 2), in part, to determine if it is "worthy" of keeping in long term memory (Step 3). Sadly, some information that we want to remember does not make it to long term memory. Why is this? This constitutes one of the big issues that neurodevelopmentalists explore. We are designed to have a one-side dominance, which allows us to function most efficiently. Neurodevelopmentalists see the following where a mixed dominance exists:

- Remember one day, and not the other
- Constantly losing things
- Reversals (transpositions, omissions, inversions)
- Right/left confusion
- "Mirror writing"
- Difficulty remembering letters, numbers or sight words
- Stuttering or stammering
- No sense of time
- Overreact to situations
- Emotional melt downs – especially related to learning

(Coots, 2003)

"When a child is well-organized neurodevelopmentally, information and learned academics are retained and accessible for further learning. Emotionality is under control and is expressed in reasonableness and settling down quickly after emotional events, such as tests or social situations." (Coots, 2003)

When neurological organization (a one-side dominance) exists all information enters the body on one side and is stored in a specific location of the brain. Then, when the information needs to be used (step 4) it is easily accessed. On the other hand, when a person is mixed dominant, sensory input (step 1) enters the body from different sides and is processed (step 2). Where the input enters, determines where it is stored (step 3). Since information is stored in different parts, a person needs to "look for" it. While looking, we get frustrated – maybe giving up before we find it or at least slowing down the process considerably.

If neurodevelopmentalists see these behaviors (inconsistent memory, disorganization, losing things, reversals, etc.), then we explore dominance. Observation is the key to this exploration. We look at which hand the individual uses for writing, eating, sports and personal hygiene. Further, we observe the eye, ear and foot the person uses. There are other factors that have been found to guide us to the proper side, but it can be a long process of discovery, even of trial and error.

In addition to observing the above mentioned activities during day-to-day living, you may need to set up situations where you can get your children to use one ear or eye. Examples of things you can do: for near point vision provide your child with toys or objects that require the use of only one eye such as kaleidoscope, telescopes, microscopes or simply a paper towel roll. For far point, have them point to your finger as you point to theirs. Have them make a window with their hands through which they can look as they stretch out their arms. For the ear, have them make real or pretend phone calls or listen to a watch to see if they can hear it tick. Further, have them hop on one foot or kick a ball (real or imaginary). Ideally you should observe in natural settings over a period of time, recording each time which side they used. This will give you a good picture of whether your child is mixed dominant.

When the neurodevelopmentalists observes (observation and behaviors reported by the parents) a mixed dominance in a child, we include appropriate activities in the Individualized Neurodevelopmental Plan that will move the child toward / to a one-side dominance and neurodevelopmental organization. Foundational to establish a dominance is to do a variety of cross patterning activities, including doing the army crawl (on tummy), creeping on hands and knees, fast walks and jogging. If, after several months, you do not observe an improvement in memory and emotional control, you may want to consult a neurodevelopmentalist for additional help.

“When a child has difficulties that relate to dominance issues they will not “grow out” of these difficulties. But, by treating the root causes, dominance can be corrected and the difficulties related to incorrect dominance will not longer hold a person back from his or her full potential.” (Coots, 2003)

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