A Model for Language Learning:
From a Brain-considerate Approach

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Language is one of the most complex competencies that human beings master, in spite of the fact that early language learning appears to be a remarkably natural component in child development. Quite often, it will take six separate exposures (the hearing, saying, touching, seeing and feeling the constituent elements of a given notion or experience) before new information enters into long-term memory for permanent storage inside the brain. Consequently, a multi-sensory approach to language acquisition is ideal for all learners.

Other than infants who are born deaf, virtually any new “citizen of the world” can learn to master one or more of the 3,000 languages spoken on earth today. The 100 billion neurons in their young brains are actively seeking auditory stimuli that will play a crucial role in building the developing brain’s language systems.

Learners of new languages, whether they are infants, toddlers or even adults:

(1) Should hear “children’s” songs/music, which help them in distinguishing the phonetic units - the building blocks of speech and in laying down a foundation for learning the language’s most useful sounds

(2) Sing or mimic those songs, which typically will stress the high frequency/high utility sounds and grammatical patterns found in that local language

(3) Hear, recite and learn “children’s” poetry next, so they can learn how to produce those high frequency phonetic elements using the distinctly different contributions made by each cerebral hemisphere

(4) Should hear short stories emphasizing sentence structure

(5) Repeat/re-tell stories on their own terms making personal sense of them, which prepares a child for developing his/her ability to process descriptions, abstractions and experiences in his/her “mind’s eye”

(6) Begin learning symbolic language.

These first five learning events should precede the introduction of symbolic language, because these experiences change the architecture of the brain and alter the way it processes subsequent language learning. We, more often than not, begin our language instruction in schools at the sixth stage. The national push for "early literacy" runs counter to the contemporary research in neuroscience on how the brain creates neural networks for learning "to language" effectively.

When new concepts are registered through a variety of learning modalities, (1) those concepts are

“stored” in several interconnected neural networks, thus enhancing the probability that a specific memory will be maintained, and (2) the cerebral cortex establishes an abundance of neurophysiological “access routes” *back* to that specific target concept, which enhances the speed and ease of memory retrieval. Neurons are the carefully wired “network communicators” inside the brain. Their neural pathways represent an “improvised dance” that reflects one’s genetic program and how it has been uniquely and continuously modified by environmental influences. The more frequently a specialized circuit of neurons fires together, the greater is the probability that they will later “fire together” and permanently “hardwire” themselves together leading to increased skill proficiency, in this case, to language competency. If this competency is properly nurtured, changes in both neurochemistry and circuitry (“neural plasticity”) will continue for a lifetime.

Historically, music has been one of the most effective vehicles for learning the tones and sounds of a language (a dominant function of the right hemisphere), when they are merged with the critical speech elements, which is a discrete language function primarily facilitated by the left hemisphere although not exclusively. Music is not only an ideal conduit to language, it is also the most natural way to begin the learning of any language. Most cultures serendipitously initiate informal language acquisition by exposing children to songs and encouraging children to listen to those songs (and to dance to them, which helps in the development of the emergent the brain-body circuitry) and to learn how to mimic the indispensable sounds germane to a particular language.

Therefore, it is not surprising that learning the "Alphabet Song," is such an effective method for introducing speech sounds to young learners. Basically the twenty-six letters of the English alphabet are sung to the familiar children’s tune, "Twinkle, Twinkle Little Star.” The song connects the recognizable music and the alphabet in the learning event to *both* cerebral hemispheres. This constitutes a more “brain-considerate” approach to language learning, which can reduce the incidences of students with auditory processing problems (which appear to be somewhat atypical in the so-called “primitive” cultures), because it recruits both hemispheres in learning to process the most important language sounds. By doing so, the right hemisphere learns to assist the faster-processing left hemisphere in language processing.

Similarly, stutterers can sing a song without a single stammer, since the circuits operating in the auditory cortex provide a comparable feedback loop reducing motor delays in the prefrontal motor cortex. These individuals are incapable of reading or reciting the lyrics of the same song without the accompanying music or they risk stuttering.

For youngsters whose auditory center deciphers and processes consonants sounds at 0.3 seconds per sound as opposed to the customary 0.008 seconds per consonant sound, this boost in managing phonemic language is vital to a child keeping up with the fast pace necessary for comprehending oral language in the typical classroom setting. The children who most frequently fall behind are those who will listen to a lesson or to directions and reveal their language impediment by regularly asking, “Can you say that again?” It is not uncommon for these students to complete the processing of the first sentence, while the teacher begins the third sentence. That child has often missed the second sentence altogether impacting his/her understanding of what now seems to be a disjointed statement from the teacher, although the problem is in his/her auditory processing.

The cerebral cortex’s specialized region responsible for understanding language (Wernicke's area) gets "wired" well before the maturation of the motor area responsible for producing speech (Broca's area), we have long been cognizant of the fact that infants and toddlers will regularly demonstrate that they “understand” language 12-18 months before they begin to speak. “Ma-ma” and “Da-da” are not necessarily counted as “learning language,” since deaf children will even utters these sounds without ever hearing them first. All children find ways to use gestures to communicate their wants and needs, referred to as “baby signs” well before they learn to speak

their first words. Toddlers at Ohio State University's Infant-Toddler Laboratory School and other locations have learned "to sign" using American Sign Language during late infancy (at the end of their first year), which allows them to express their ideas, their desires and intentions abstractly without the spoken word.

Parents of toddlers are keenly aware of their young child's ability to recognize the correct names of objects, people and actions before the child can articulate the precise word describing them. Mom and Dad help foster language development through "parentese" the exaggerated speech used worldwide by parents to emphasize the important sounds to infants and toddlers. The instinctive use of parentese and poetry are two sides of the same linguistic coin designed to develop a growing awareness of speech sounds important to eventual mastery of the local language.

Around twenty-two months of age, the neural circuitry has often physically connected Broca's area (the posterior inferior portion of the third convolution in the frontal lobe) to Wernicke's area (located in the left temporal lobe, posterior to the primary auditory complex), the cortical region devoted to assisting with semantic analysis. Once these connections are established, a child will begin constructing his/her first short sentences predictably composed of a single verb and a single noun ("Tyler eat").

When there is (1) damage to either of these two regions of the brain, (2) a gross deficiency in stimulation required for their initial normal development in the child's postnatal environment, (3) low levels of myelination (the neuron's "insulation" which affects the velocity with which the electrical impulses travel through the nerve cell's axon allowing it to communicate efficiently with other brain cells) in Wernicke's or Broca's areas, or (4) an unusually low number of neural connections or synaptogenesis taking place in the arcuate fasciculus, (which serves as the neurophysiological pathway linking the primary motor and the sensory speech sites), any of these conditions can lead to language production problems, to language comprehension deficits or both. Networks that are not used are subsequently "pruned" away. Once the pathways for a specialized function have all been eliminated or modified to support another function, the "window of opportunity" for developing a particular ability begins to close. Once neurons have committed themselves to another neural system, they can seldom be coaxed into returning to their previous task rendering the deficiency irreversible.

Active and/or concrete learning experiences for both children and adults provide the most substantive basis for concept development, conceptual understanding, as well as the potential for future concept extension. The mental constructs derived from first-hand experiences, especially when verbalized, later serve as the foundational basis for symbolic language and, subsequently for the more sophisticated hypothetical constructs (the "what if" queries) and embellishments leading to the higher levels of cognition and achievement.

Art, dance, and music give rise to appreciating the important notions of "patterns," "relationships" and "symbolic representation." Even more importantly, the creativity involved in art and music do for brain during the day, what dreaming does for the brain at night. In addition to music, art should never be eliminated from the school curriculum. These are all critical in developing abstract thinking, as well as to the understanding of mathematics, language and science. Perhaps that is why compelling evidence has been left from nearly every early human society that art, dance and music were elements vital to their existence. Perhaps that is also why they are referred to as the basic of the "Humanities."

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