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The more frequently that specialized language patterns in the brain fire together, the more they will permanently “hardwire” themselves together for increased usefulness.

What have we learned about teaching language from this research? Teaching any language should not begin with a sudden, formal introduction into the printed word. Language-learning expectations.

If more often than not in our schools, formal language instruction begins at the seventh stage of this sequence. The national push for “early literacy” standards runs counter to what we know from developmental neuroscience and research on how the young brain creates a capacity for processing language. Some say, “We don’t have time to teach all of these steps.” If time is not planned for the first six generative steps for language learning, in all fairness to the learner, we will need to lower our language-learning expectations.

The language connection to art and music.

Most cultures introduce infants to informal language development by singing songs and lullabies to babies, later teaching them to move their bodies to the music, which adds another dimension to language development by connecting it with the brain-body circuitry. Music, typically correlated to right-hemispheric function, has historically been one of the most effec-

From Object Recognition to Word Representation:

Circles, spheres, squares, blocks, cylinders, and cones are among the 24 basic “geons” (geometric forms) that we see in our natural environment. Most languages mimic these forms. Simplicitic representations of concrete objects elicit a mental reminiscence of the “real thing.” When one, two or three geons are combined, their orientation and arrangement can bring a mental picture of a truck, an automobile, or an ice cream cone, depending on their size and orientation (see Figure 1). “Geons.” These patterns are ripe for modification into symbols. Oral and written language reflect the cognitive relationships that link objects, images, thoughts and words together into the single complicated event we experience as symbolic communication.

The theory of object recognition seeks to explain how stimuli entering the visual cortex are matched with internal representations of those same forms (now stored in neural pathways). This matching strategy helps us make sense of visual information. Since object-processing in the brain preceded symbolic-processing abilities, the “words” found in many languages were initially created directly from pictorial representations of objects. Symbolic imaging is, and has always been, easier for the human brain to digest than written words.

Brain-building experiences after the very architecture of the language-sensitive centers in the brain and clear passageways to school-readiness and success. But it is impossible to build extensively on weak foundations. Language should be learned through a sequence of events (see The Seven Steps to Language Learning).

Language Learning

When we look closely at the human cerebral cortex, it resembles an oversized quilt, bunched up to cover the subcortical structures busy operating beneath it. If one unfolded and stretched out the cerebral cortex, its surface area could cover a desktop (2,500 cm2). Six or seven nodule-like layers, neatly stacked together, form the human cortex. The interactions between these neuron-rich layers foster the biological basis of our incredible catalog of human behaviors, including language.

The magic of human language

by Kenneth Wesson

The significant problems that we face cannot be solved at the same level of thinking we were at when we created them. —Albert Einstein

If a more complicated entity than the human brain exists on Earth, it has succeeded in maintaining its confidential nature. Not only is the brain the most multifaceted organ in the human body, and composed of the greatest number of diverse cell types in a single organ, it is also the most adaptable and complex single object in the known universe.

Prior to the 1990s, most information gathered about the human brain came largely by way of misfortune—brain-injured patients or disease. The balance of our knowledge was speculative or intelligent deductive conclusions. Brain injuries and postoperative behavior changes gave us a peek into the nature of processes such as movement, memory and language.

Aristotle (384–322 BC), a leading thinker of his day, was an advocate of the cardiocentric view of cognition. He believed the heart was central to all cognitive responsibilities, including morality and higher intelligence.

Central to all cognitive responsibilities, including language, is the human language faculty. When we look closely at the human cerebral cortex, it resembles an oversized quilt, bunched up to cover the subcortical structures busy operating beneath it. If one unfolded and stretched out the cerebral cortex, its surface area could cover a desktop (2,500 cm²). Six or seven nodule-like layers, neatly stacked together, form the human cortex. The interactions between these neuron-rich layers foster the biological basis of our incredible catalog of human behaviors, including language.

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Aristotle (384–322 BC), a leading thinker of his day, was an advocate of the cardiocentric view of cognition. He believed the heart was central to all cognitive responsibilities, including morality and higher intelligence. The brain was relegated to a more humble undertaking: cooling the warm blood circulated by the heart (demoted to the menial role of radiator). Today, we still refer to successfully memorized information as content we know “by heart.”

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The brain constructs an online, coherent interpretation of what is being heard. Words are used to think, not just to read.

Art, dance, and music give rise to understanding the significance of patterns, relationships, and symbolic representations. These are all useful tools for understanding the patterned nature of language. The physical evidence left behind by nearly every early human pertains to the patterned nature of language. It is hardly surprising that the 26 letters of the phonetic alphabet have "stuck," as are "lost," so is the story.

The English language is composed of nearly 600,000 words, constituting the largest number of words in one language. This descriptive database partially explains why English has become the lingua franca of business, international politics, and the Internet. Our everyday speech consists of 5,000 to 17,000 words, on average. In our daily communication, 400 to 600 high-frequency words are typically used, out of the 86,741 most widely used English words.

The faster a child's vocabulary grows, the greater is his ability to understand the ideas of others, as well as his ability to express his own ideas with precision. The words we learn are the words we subsequently use to think. Educational organizations host annual seminars on "closing the achievement gap." However, the achievement gap is primarily a vocabulary gap, due to parts of a vocabulary gap. Essentially, vocabulary is a proxy for knowledge.

The most common method of teaching vocabulary has been to break a word into its composite syllables, and pronouncing each of them in the order of their left-to-right appearance. However, the brain can process syllables more efficiently in their reverse order (another "trick" of the brain). Here is one example of that strategy:

Dactyloscopy is the practice of using fingerprints for personal identification. We instruct students to read the phonetic "du-klo-ku-kop" pronouncing each syllable in sequence. However, if students pronounce each phonetic part in the reverse order instead, learners will be far more successful in pronouncing any new polyphabetic word, often on their very first attempt (see Chart #4: Learning to Pronounce a New Word).

By placing a finger over all except the very last syllable, and exposing one syllable at a time moving from right to left, learners will experience considerably fewer problems recognizing and pronouncing new words than students taught the traditional left-to-right method.

Say the phonetic parts in their reverse order:

(-pyl) = pē
(-lpopyl) = la-kō-pē
(-syll) = to-lo-kō-pē
(-ductyl) = dūk-to-lo-kō-pē

From Geons to Graphemes
1. Say the phonetic parts in their reverse order.
2. Say the phonetic parts in their reverse order.
3. Say the phonetic parts in their reverse order.
4. Say the phonetic parts in their reverse order.
5. Say the phonetic parts in their reverse order.
6. Say the phonetic parts in their reverse order.
7. Say the phonetic parts in their reverse order.

Steps to Language Learning
1. Hearing Lullabies and Songs gives infants the building blocks—the distinct phonetic elements—of the local language. To build a foundation in the language, an infant must hear the sounds that it requires.
2. Sing Those Songs and learn to produce the sounds via mimicry while watching others. Songs for children characterize stress frequently used sounds and grammatical patterns found in the local language.
3. Listen to, Repeat, and Then Recite Children's Poetry, in order to learn similarities in sounds (rhymes) by practicing the dominant phonetic elements.
4. Listen to Stories emphasizing intangible concepts, such as "the" in language, subject-verb agreement, the word order for adjectives and the nouns (they describe, etc.).
5. Repeat/Retell Stories in a child's own words, making sense of vocabulary, the content and the context. Similarly, toddlers often engage in audible conversations with themselves, especially during multiple-step activities.
6. Draw Pictures of People, Objects, Concepts, Story Events, etc. Children must learn to create mental pictures of their "mind's eye." Nouns are mental realities that words do not name, intangible concepts, so drawing can bring the abstract world closer to mind. The creative nature of drawing does for the brain during the day what dreaming does for the brain at night.
7. Begin Reading and Writing Symbolic Language. Several lines of evidence now suggest that the first six learning events leading up to actually "reading" symbolic language should always precede it.

Pictorial representations and symbols have been part of the human experience for far longer than the printed word. Parents should encourage their children to draw at home. Learning to visually reproduce objects and concepts in the mind is also an integral part of reading, comprehension. To understand the printed word, readers must rely heavily on the "picture-word" mechanism in the visual cortex of the brain. Children first see and touch objects, then name and recognize them. The primary means of learning the sounds and intonal nature of any language, particularly when merged with speech (generally considered a property of the left hemisphere).

It is hardly surprising that the 26 letters of the English alphabet are frequently taught through the "Alphabet Song," to merge the orthographic representations of the English language with the sounds. When the 26 letters of our alphabet are sung to the familiar tune, "Twinkle, Twinkle, Little Star," the well-practiced song is connected to the English alphabet. The slower-processing right hemisphere assimilates the faster-processing left hemisphere in memorizing the order of letters, while also practicing their sounds. The same process allows stutterers to sing a song without stuttering, they can sing.

When the phonemes (the sounds of spoken language) are linked to the auditory cortex of the brain to the written symbols (the graphemes), the "brain basics" for written language learning are ready for activation.

1. Write Letters of the Alphabet: the earliest step in learning is ready for activation.
2. Say the sounds aloud: the next step is also available. The faster a child's vocabulary grows, the greater is his ability to understand the ideas of others, as well as his ability to express his own ideas with precision. Words are used to think, not just to read.

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