

The Eight Neurodevelopmental Constructs

The human brain is a like a complex orchestra; each player's role varies depending upon the situation. Just as the strings or woodwinds may be highlighted in a particular musical piece, different brain functions take the lead when students study English or math, have to write a report, or take part in athletic activities. Similar to the way instruments create harmony in an orchestra, different neurodevelopmental functions ("neuro" = of the brain; "developmental" = changing over time) interact to enable students to acquire certain knowledge, skills or sub-skills, or to accomplish specific school task.

When students are having difficulty with a particular academic skill, the task of parents, teachers, and clinicians is to pinpoint the areas of difficulty, to specify the weak sub-skills, and to create a plan for strengthening strengths as well as areas in need of improvement.

There is a need to ask: Where is the breakdown occurring? Which sub-skill is not playing its role? And within that sub-skill, which related functions are not operating well? For example, students with strong vocabulary skills and memory abilities may still have problems remembering words. In this case, the difficulty might lie with their word retrieval ability, a very specific sub-skill that enables students to remember words on the spot.

Therefore, it is helpful to understand how a student's profile of strengths and weaknesses affects both his/her learning and school performance at any given time. The Center for School Success looks at a student's learning profile in terms of eight neurodevelopmental constructs, as defined by Dr. Mel Levine, which are described below.

ATTENTION

Attention is a system of controls that can help students with such tasks as working consistently each day, focusing on the right details when reading, and thinking ahead about what to say. Attention is grouped into three areas. The first area is *mental energy control*, the alertness or energy for thinking. The second is the *processing control*, where both visual and auditory information is received. The third area is the *production control*, or output center.

HIGHER ORDER COGNITION

The most sophisticated component of human thinking, higher order cognition, includes *concept formation, creativity, reasoning, mental representation, understanding and use of rules, and critical thinking.*

LANGUAGE

Language involves *receptive* (processing and understanding incoming oral and written information) and *expressive* (communicating and producing ideas orally and in writing) functions. Language skills are described in terms of a hierarchy from the sound (*phonological*) level at the bottom to extended language (*discourse*) level at the top. Being able to articulate and understand language is central to the ability to do well in school. Developing language functions involves elaborate interactions between various parts of the brain since many separate kinds of abilities are involved — for example, awareness of different sounds, pronouncing words, comprehending written symbols, understanding grammatical structures, and telling or writing stories.

MEMORY

Memory is the ability to *record, retain/store* and then *retrieve* learned information, facts and skills. School places more of a burden on memory than most careers. Once a person has understood, organized, and interpreted information, she must be able to file it in memory, and then later recall, that information, or her performance suffers dramatically. Memory has three main components: *short-term, active-working* and *long-term*.

NEUROMOTOR FUNCTIONS

Neuromotor functions rely on the connections and interactions between the brain and muscles. Whether students are trying to write their first words, catch a football, type at a computer keyboard or draw a picture, the brain's ability to coordinate motor or muscle functions is key to many areas of learning.

SOCIAL COGNITION

One of the often overlooked components of learning is the ability to succeed in social relationships with peers, parents, and teachers. Students may be strong in other construct areas, and yet have academic difficulties because of an inability to make friends, work in groups, cope effectively with peer pressure and/or relate well to adults.

SPATIAL ORDERING

Closely related to the functions of time and sequence, spatial ordering is the ability to distinguish between spatial configurations, such as a circle and square, or to remember related information using images. On a more complex level, spatial ordering helps musicians, for instance, "see" a piano keyboard or architects "imagine" the shape of a particular room.

TEMPORAL-SEQUENTIAL ORDERING

Temporal-sequential ordering is the ability to interpret, remember and create information in a specific order or sequence. The order in which data or information is presented often affects its meaning or application. Examples include telling time, the order of steps in a mathematical problem, time management and the motor movements needed for cursive writing.

CROSS CONSTRUCT PHENOMENA

In a neurodevelopmental learning profile, there are constructs that often influence one another. In addition, pace, volume, strategy use and metacognition (the ability to think about one's own thinking) may also affect a student's performance.

Based on the work of Dr. Mel Levine, *All Kinds of Minds Institute*, www.allkindsofminds.org