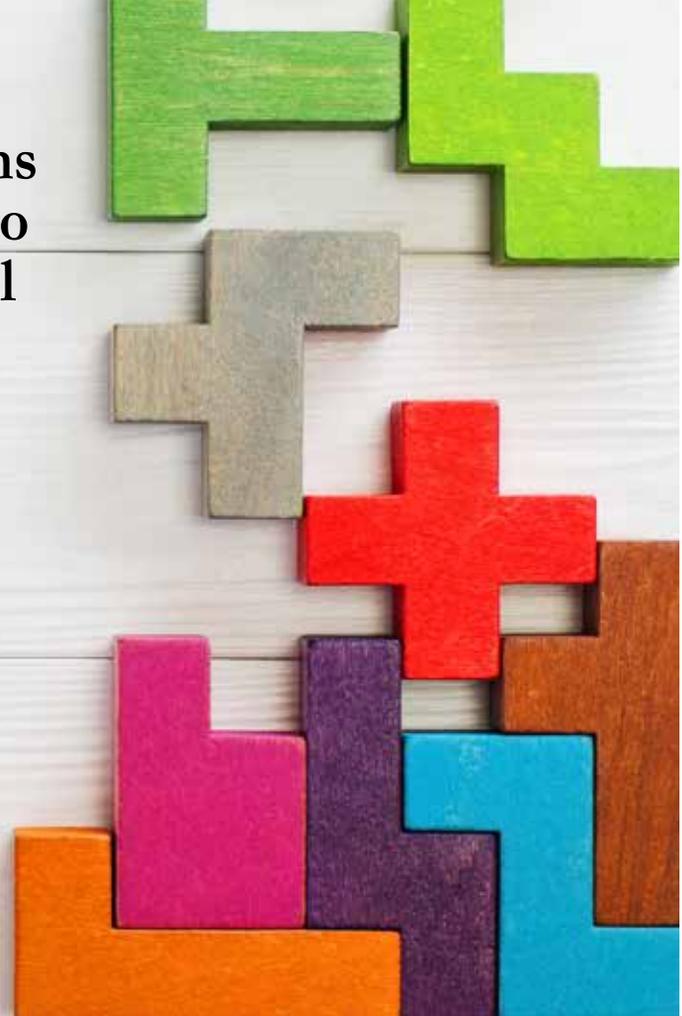


# Neuroeducational Evaluations - The School-Based Answer to Pediatric Neuropsychological Assessments

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## Underidentification of Traumatic Brain Injury

It is estimated that there are currently 145,000 children aged 0-19 who are experiencing significant long-lasting social, behavioral, physical and cognitive impacts related to a traumatic brain injury (TBI) (Zaloshnja, Miller, Langlois, et al., 2008). However, the number of students identified for special education services under the TBI eligibility category in 2014 was 26,000 (U.S. Department of Education, 2016). This suggests a gross underidentification of students with TBI for special education services. There are a number of reasons for this underidentification including, but not limited to:

- information not being shared with the schools,
- a lack of realization an injury that happened earlier in life could now be impacting a student's learning or behavior in school,
- a lack of training/understanding on behalf of school personnel about the causes and impact of the brain injury, and
- misidentification-some supports may be provided via a formal or informal plan (e.g., health plan, Multi-tiered System of Support (MTSS), a Section 504 plan, or an Individualized Education Program (IEP) under a different special education category than TBI (e.g., Specific Learning Disability, Emotional Disturbance, Other Health Impaired - ADHD). These categories can be limiting, and the breadth of needs of students with brain injury may not be fully identified or addressed.

An additional consideration is that while there are many academic, social and behavioral needs shared by students who are found eligible for special education across categories such as Specific Learning Disability (SLD), Emotional Disturbance (ED) and Traumatic Brain Injury

(TBI), a student who has sustained a TBI likely has broader needs than a student with a learning disability or emotional/behavioral issues.

Students who have sustained a brain injury present a unique profile. One cannot categorize the needs of all students who have sustained a brain injury in one particular way. When an injury happens while the brain is still developing, which is well into our 20's, some deficits are obvious right away, while others emerge many years later making it imperative to monitor needs over time. Consequently, it is necessary to have a specific special education category for TBI to represent the ongoing changes associated with the complex and long-term health condition of TBI. In addition, evaluating students and their needs requires a multitude of tools - both formal and informal (including observation in the school setting). Traditional standardized assessments may not be sensitive enough to detect the nuances present in the functioning of a student with a brain injury. Because there may be gaps in some areas of functioning and unevenness in others (splinter skills), traditional tools can miss information or provide only generalized findings that are not discrete or useful.

## The Role of the School Team

The Individuals with Disabilities Education Act (IDEA), (34 C.F.R. 300.111), states school districts must identify, locate, and evaluate all children with disabilities who need special education and related services. The evaluation must assess the child in all areas related to the child's suspected disability. A school-based multidisciplinary team as well as the parents, make up the IEP team. The IEP team uses the evaluation results to decide the child's eligibility for special education and related services and to make decisions about an appropriate educational program for the child. It is the school's responsibility to

determine eligibility for special education services, including TBI. Other information (e.g., outside evaluations, hospital/rehabilitation records) is considered by the schools and may be added to the information or body of evidence, but nonetheless, it is the school's responsibility to provide data and determine eligibility within the context of education.

Many medical professionals and parents mistakenly believe that when assessing in the realm of brain injury or other areas of neuropathology, school professionals are not adequately trained to provide such evaluations. There is a common belief that pediatric neuropsychologists are best suited for questions related to neurological underpinnings as they relate to learning, behavior and social skills in schools. According to Miller and Maricle (2014) and Silver, Blackburn, Arffa, et. al (2006), outside clinical pediatric neuropsychological evaluations often assess intellectual ability, academic performance, memory, sensory, motor, visual spatial processing, language, processing speed, attention and executive functions. What medical professionals and parents may not understand is that properly trained and empowered school-based multidisciplinary teams, which include teachers, occupational therapists, physical therapists, speech language therapists, school psychologists, social workers, school nurses, vision and hearing specialists, etc., can also provide assessments in intellectual ability, academic performance, memory, sensory, motor, visual spatial processing, language, processing speed, attention and executive functions. Additionally, school-based professionals have a unique knowledge of the school setting as well as expertise in special education law and eligibility. Moreover, the members of the multidisciplinary team also have daily observation, and exquisite understanding of how these cognitive areas are "functionally" manifested in the school setting and effect learning and behavior. The school professionals use the results of the school-based assessment to identify interventions, accommodations, and supports that are the best fit for that particular student and environment.

There are many undeniable positives to school-based multidisciplinary teams assessing students with brain injury or other neurocognitive disorders, which include:

- School-based multi-disciplinary team assessments are available to all students at no cost. Unfortunately, there is frequently a shortage of clinical pediatric neuropsychologists and wait times for an outside neuropsychological assessment can be from six months to over a year. Additionally, a neuropsychological evaluation is often cost-prohibitive for many families.
- Student data collected in the school setting is relevant to current functioning and aligned with educational or behavioral areas of concern. Diagnoses from the Diagnostic and Statistical Manual of Mental Disorders (DSM) or information from a neuropsychological report may have limited utility if it overemphasizes medical terminology (Miller and Maricle, 2014) or may not directly translate into meeting the eligibility requirements of special education or even the need for special education services (Miller, 2013). Functional educational impact and the need for special education services must be assessed by the school-based multi-disciplinary team. An outside neuropsychological evaluation cannot stand alone as a comprehensive special education evaluation.
- Parents are an essential part of the team and a long-term partnership is created. Many times, students spend much of their grade school careers in one school system, and a partnership between the parents and the school-based team is advantageous. If an outside neuropsychologist recommends that a child "be placed in a special education program" but the child does not actually qualify for special education services (due to the fact that special education eligibility is governed by complex federal

regulations, not simply by the presence of objective data), it creates a situation that can be confusing and frustrating for parents and can lead to acrimony.

- School-based special education evaluations are well-rounded and consider the whole child by gathering multiple pieces of formal and informal data, including formal cognitive and academic assessments, observations in multiple school settings and social situations, teacher, parent and student interviews/reports, response to intervention data and a history of performance and behavioral data. Classroom observations, peer interactions, and student response to school-based stimuli are all important aspects of understanding the student's abilities and their deftness for learning and behaving. Outside neuropsychological reports frequently incorporate limited school data, and when included, it is commonly general perceptions provided by the parents or statewide standardized test scores which may not provide an accurate reflection of how the child is performing in the school setting or as compared to their same aged peers. When a neuropsychologist is available and working with the family, communication is essential. The sharing of data about school performance, learning, behavior and a reflection of how the child is performing in the school setting compared to same aged peers is necessary for an accurate reflection of a child's functioning across environments.
- The school-based multidisciplinary team typically has unique and valuable information about, and experiences with, the child that is essential to the special education evaluation in relation to the child's cognitive, academic, emotional and behavioral strengths and weaknesses. Personal and long term knowledge of the child, his/her abilities and the history of academic records are all valuable sources of pre- and post- functioning performance for a student with a brain injury. The outside neuropsychologist, however, may only have short-term contextual knowledge of the child within the assessment setting (Fletcher-Janzen, 2005).
- The school-based multidisciplinary teams and many school psychologists are trained in and able to robustly assess the functional impact of cognitive deficits in the school setting and are in possession of relevant, day-to-day, information about how the deficits impact the student's ability to function in the academic setting. School psychologists who do not believe they possess the expertise to provide the in-depth evaluation required when assessing a student with a TBI may choose to enroll in an online school neuropsychology specialization. This additional training, however, is at their own expense and time.

It is clear that when both an outside neuropsychologist and a school-based multi-disciplinary team are available, close communication and collaboration is essential. When that happens, as it does in numerous communities, the needs of the student (both objectively and functionally) are well defined and met. However, there is a reality that far more families have access to a school-based multi-disciplinary team than they do to a neuropsychologist. With just a small amount of specialized training, school-based multi-disciplinary teams can provide both the functional AND objective assessment information of neurocognitive deficits and are available to all students at no cost to parents. While neuropsychologists can provide objective testing data, they are limited in their availability and, when one is available, they rarely have access to the school setting wherein many of the functional impacts of the student's neurocognitive deficits will be manifest. Further, since these professionals typically do not work in schools, they may only have cursory knowledge of special education law. Lastly, they are often cost-prohibitive to families.

As the number of students with possible neurocognitive deficits rise due to wider awareness and better medical management, intentional and concerted brain based training to all school-based related service providers is a responsible solution. A hybrid between neuropsychological testing (testing by a neuropsychologist) and psychoeducational testing (testing by multi-disciplinary team of school-based professionals) leads to a neuroeducational model. One such approach is represented by the TBI Consulting Team Model where the goal is to make available to schools statewide a group of trained, multidisciplinary, school-based consultants to provide in-service training and ongoing consultation to educators of children with TBI (Glang et al., 2010). It is beyond the scope of this article to go into depth on each state's model but there are a handful of states that have developed such models (Colorado, North Carolina, Oregon, and Pennsylvania). The TBI consulting team model was adopted in the mid-1990's by the state of Oregon. Pennsylvania has had the BrainSTEPS School Consulting Team model ([www.brainsteps.net](http://www.brainsteps.net)) for over a decade, and Colorado has recently developed their own BrainSTEPS consulting teams.

Another example is in the state of North Carolina. The Department of Public Instruction Exceptional Children's Division has addressed the TBI training needs of its school-based personnel since 1993 by providing systematic professional development to school psychologists, special education teachers, and related-school-based personnel (Hooper, 2003; Hooper, Walker, & Howard, 2001). In this model, participants are asked to participate in a didactic component that addresses three broad core competencies: (1) Increase the knowledge base of school psychologists and other school-based personnel in the area of TBI; (2) Increase the skills of school psychologists in neurocognitive assessment of students with TBI; and (3) Increase the intervention skills of school psychologists for students with TBI.

The state of Colorado has adopted a neuroeducational model entitled The Building Blocks of Brain Development and has committed to the statewide training of school-based related service providers at no cost to schools. The model below outlines Colorado's neuroeducational framework which has been manualized and can be replicated in other state departments of education. The intention of the Colorado neuroeducational model is to build on the expertise of neuropsychology with the accessibility of the school-based multi-disciplinary team. The result is breadth and depth and most importantly, the ability to more quickly and comprehensively assess and support students with neurocognitive deficits in a school setting.

## Neuroeducational Evaluation is More than Just Assessment

Due to schools being the foremost service provider for children, the school-based neuroeducational evaluation not only focuses on how a child is functioning in the context of special education eligibility but also on the consideration of what the results mean for the child in the classroom setting. D'Amato, Rothlisberg and Work (1999) have emphasized that the purpose of any evaluation is to provide effective intervention.

Members of the school-based multidisciplinary team are able to assess and consider:

- each child's individual pattern of strengths and weaknesses;
- the school and classroom environment; and
- effective intervention programming and classroom supports.

When the brain injury is more recent, the child's cognitive functioning, academic skills and emotional/behavior adjustment are frequently changing, with the most change observed in the first few years post injury (Morrison, 2010). Due to unevenness in performance and recovery of brain functions in children with brain injury, frequent monitoring is recommended for changes in academics, behavior and social functioning (McCoy, Gelder, Van Horn, et al., 1997).

This profile of learning makes it essential for communication and collaboration among the school team, parents, rehabilitation team and any outside providers in order to effectively support the child across various settings. Schools have daily access to the child, which provides the ability to constantly monitor and observe changes during a variety of different tasks and situations as well as various cognitive, academic and social demands to guide in the timely adjustment of accommodations, supports and targeted interventions.

## The Building Blocks of Brain Development - A Framework for Neuroeducational Evaluation & Intervention

We have learned a tremendous amount of information in past decades about how the brain functions, however, there is still no one agreed-upon model that truly captures the complexities of this remarkable organ.

In an effort to support school-based multidisciplinary teams in completing thorough neuroeducational evaluations that produce rich data for the special education eligibility process, the Colorado Department of Education (CDE) along with the Colorado Brain Injury Steering Committee, applied the most current research on brain function, neuroanatomy and assessing the various brain processes and developed a user-friendly framework titled, the Building Blocks of Brain Development.

FIGURE 1

### Building Blocks of Brain Development



CO Brain Injury Steering Committee: Adapted from Miller, 2007; Reitan and Wolfson, 2004; Hale and Fiorello, 2004

This framework aligns the:

- eligibility criteria for the special education category of Traumatic Brain Injury (TBI), as defined by IDEA,
- definitions of the typical cognitive and behavioral impacts of brain injury,
- formal and informal neuroeducational assessments that can be used in the school setting, and
- strategies and interventions to address the unique needs of students with brain injury.

Essentially, each area of impairment within the definition of TBI is a “building block” which follows the neurological growth or maturation of the brain. Within the framework, each building block is defined. The framework then specifies how each building block affects learning and behavior, what a deficit in the building block “looks like” in the classroom setting, school-based assessment suggestions to evaluate student functioning, and strategies or interventions to address the deficits. Even though the original development of the Building Blocks framework was to support TBI assessments and interventions, the model applies to all acquired brain injuries as well as other conditions impacting neurocognitive functioning.

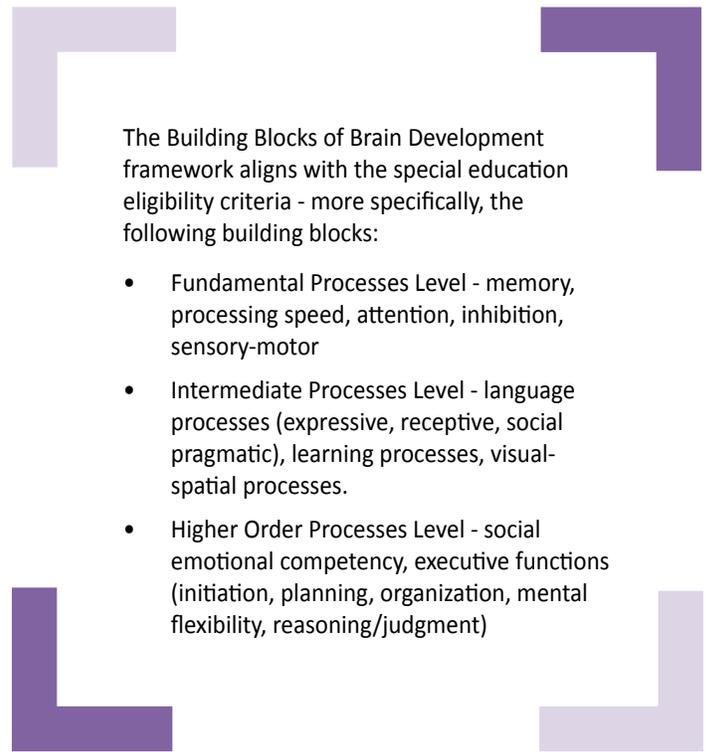
When considering the many neurocognitive processes (or building blocks) a person develops over time, it is important to understand the hierarchy of functions in their development. That is to say, the development of one process or function precedes, at least in part, the development of another. Thus, the building blocks and subsequent processes are cumulative and compounding. Meaning, that our brains develop each building block in a progressive manner, but each building block continues to mature and become more complex over time.

The Building Blocks of Brain Development (see FIGURE 1) explains, in a simplistic manner, the interaction between the more basic or fundamental skills, and the higher-order cognitive skills. This is not an exhaustive list of cognitive functions; rather the building blocks represent the areas most commonly affected by brain injury.

The Building Blocks of Brain Development framework is color-coded for ease of use and proceeds from foundational processes (indicated in orange) to more complex functions (indicated in green, blue and purple). At the base of the chart is the orange, fundamental level. These are critical in all learning and behavior; they are also the most sensitive to being impacted by a brain injury.

The intermediate level (as seen in green) depends on the fundamental building blocks in order to develop and become more complex. The higher order thinking skills (as seen in blue) rely on the lower levels to be solidly in place in order to fully develop and be available. And finally our top cognitive processes of overall achievement (as seen in purple) is the peak of functioning. This highest level allows us to operate in our many environments and to be productive citizens – and it is wholly dependent on the three preceding levels being intact and working in concert to produce our desired outcome, which is reasoning and overall functioning.

A brain injury may cause disruption or gaps in one or more building blocks, impacting our learning and behavior, and ultimately our overall achievement. Due to the inter-relatedness and integrated nature of our brains – just one building block that is not functioning well can affect all of the others, as depicted in FIGURE 2.



The Building Blocks of Brain Development framework aligns with the special education eligibility criteria - more specifically, the following building blocks:

- Fundamental Processes Level - memory, processing speed, attention, inhibition, sensory-motor
- Intermediate Processes Level - language processes (expressive, receptive, social pragmatic), learning processes, visual-spatial processes.
- Higher Order Processes Level - social emotional competency, executive functions (initiation, planning, organization, mental flexibility, reasoning/judgment)

As stated earlier, it is important to have assessment tools available to school-based multidisciplinary teams that are sensitive enough to identify a student’s functioning levels within each of the building blocks. To assist school-based multidisciplinary teams in completing a neuroeducational evaluation, the Building Blocks of Brain Development framework includes a wide range of assessment suggestions, broken down by each building block, which can be administered by school professionals.

The formal and informal neuroeducational assessments identified within each building block can assist multidisciplinary teams in conducting a full neuroeducational evaluation, by identifying cognitive strengths and weaknesses, providing data to help determine eligibility for special education services and assist in the development of student specific intervention plans.

FIGURE 2



CO Brain Injury Steering Committee: Adapted from Miller, 2007; Bellar and Wolfson, 2006; Hale and Escalfo, 2004

The suggested neuroeducational assessments are commonly available in the school setting and/or are frequently part of training programs or practice for the various professional members of the multidisciplinary team. The assessments identified within the framework are just suggestions and are not endorsed by the Colorado Department of Education (CDE). This collection is not an exhaustive list and is always changing with revised editions and new tools being added each year. In an attempt to maintain this ever changing collection, the CDE and the Colorado Brain Injury Program have teamed to develop a website that provides a dynamic and user friendly way to access the Building Blocks of Brain Development framework. The Colorado Kids Brain Injury Resource Network website is available at: [www.cokidswithbraininjury.com](http://www.cokidswithbraininjury.com).

While the online framework provides the neuroeducational evaluation tools, there is also a manual, available electronically. The manual defines and fully illustrates each building block. It is called the Brain Injury in Children and Youth: A Manual for Educators, and is available for free on the CDE website: <http://www.cde.state.co.us/cdesped/sd-tbi> and the CO Kids Brain Injury Resource Network: <http://cokidswithbraininjury.com/>). The manual provides a detailed explanation of how each building block may be affected in the school setting if a brain injury occurs. In addition, an extensive list of accommodations, strategies and interventions for each building block are provided in the manual.

It is important to note that the Building Blocks of Brain Development framework represents one of several possible conceptualizations of how neurocognitive processes are organized. Despite the simplicity of the building blocks framework, it describes the deep complexity of neurocognitive functioning and inter-relatedness. Currently, there is no optimal model of neurocognitive development agreed upon by the majority of researchers, though much debate occurs, and it is understood that parts of this framework can be theoretically challenged.

## Conclusion

The Building Blocks of Brain Development framework created by the Colorado Department of Education (CDE), along with the Colorado Brain Injury Steering Committee, is a framework for parents, school-based multidisciplinary teams and outside providers to identify, understand and address the effects of brain injuries in students. The framework provides common language and understanding for communication about a student's level of functioning within the school, home, and community environments. Educators can apply the framework to identify skill deficits through neuroeducational assessment and address those deficits through appropriate educational interventions and supports. Ultimately, all students can benefit from the increased awareness gained from this simple tool about the interaction between brain processes, learning and behavior.

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## Author Bios

**Nicole Crawford, PhD**, is a Brain Injury Specialist at the Colorado Department of Education (CDE). She provides training focused on supporting students who have experienced acquired brain injuries or other neurocognitive impacts. Nicole has over 17 years of experience working in the schools as a school psychologist. She has developed district wide brain injury teams and served as a member or facilitator of those teams. In her role, she has supported schools at all levels in the assessment, identification, and support of students with acquired brain injuries. Nicole served as a Brain Injury Educator Liaison through the Colorado Traumatic Brain Injury Trust Fund where she supported school districts in the development of their concussion management processes and brain injury teams. She is licensed as a School Psychologist through the CDE and is a Nationally Certified School Psychologist. Nicole is a Psychologist Candidate through the Colorado Department of Regulatory Agencies.

**Heather Hotchkiss, MSW**, is a Brain Injury Specialist at the Colorado Department of Education (CDE). She provides consultation and training on brain injury in addition to Fetal Alcohol Spectrum Disorder (FASD). She brings over 25 years of leadership experience in school mental health and special education services for children in CO. Heather is involved nationally - serving as a board member and president elect for the National Association of State Head Injury Administrators (NASHIA) and a member of the National Collaborative on Children's Brain Injury. Heather has functioned in a variety of capacities including: teacher assistant, mental health clinician in locked facility schools, behavior specialist, school social worker, State Mental Health Consultant, a member on numerous legislative work groups, Response to Intervention/Positive Behavior Interventions and Supports Coordinator, and Special Education Director. She is dually credentialed as a Licensed School Social Worker and Special Education Director in Colorado.

**Karen McAvoy, PsyD**, is dually credentialed as a clinical and school psychologist. She has been involved with the Colorado Department of Education as a Brain Injury Consultant since 2010 and was instrumental in the crafting of language leading to the stand alone special education eligibility for Traumatic Brain Injury (TBI) in the state of Colorado in 2013. Karen has 27 years in education; 20 of those years in a school district holding positions as school psychologist, coordinator of the TBI team, coordinator of mental health services and coordinator of manifestation determinations. Karen provides trainings to Colorado school districts on neuroeducational assessment and intervention, understanding the function of skill deficit in behavior and executive dysfunction and is an adjunct professor in the University of Colorado Denver School Psychology PsyD program.