NEUROPLASTICITY and the Whole Child Approach to Teaching

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Kelley Spainhour

This paper explores neuroplasticity and how the brain's ability to grow, change, and adapt over time helps both neurotypical and neurodivergent students learn new information. It covers effective teaching strategies and instructional activities that promote neuroplasticity. Educators will discover the importance of teaching their students to adopt a growth mindset, which increases student motivation and achievement. This paper concludes by connecting the importance of neuroplasticity and addressing the holistic needs of students through the whole child approach to education.

Kelley Spainhour is a special education professional with a decade of teaching and leadership experience. She is passionate about the unique needs of children with medical needs and enjoys collaborating in multidisciplinary contexts. Kelley currently serves as a special education consultant and writer.

Table of Contents

An Introduction to Neuroplasticity

Advancements in neuroscience research have led scientists to a stronger understanding of how students learn. Technologies such as neuroimaging have allowed researchers to observe how information moves from the body's sensory intake system to the brain's higher-order cognitive processing system—in as little as 13 milliseconds! (Trafton, 2014). Scientists know that our neurons, or brain cells, can grow, strengthen, organize, change, and adapt with time and experience. This fascinating ability is called *neuroplasticity*. This capacity allows us to continue to learn new things into adulthood and older age. The brain's plasticity even means it can sometimes regain lost function after an injury by rewiring some neurons to take over the responsibilities of other, damaged neurons.

An understanding of neuroplasticity is advantageous for educators. The young brains in our classrooms are actively growing and changing every single day (Bernard, 2010). Educators help shape these developing brains through teaching and mentorship. Certain instructional strategies, such as repetition and activating prior knowledge, are known to promote students' cognitive development by supporting brain plasticity.

The capacity for neuroplasticity is also advantageous for students with disabilities who benefit from multiple and alternative presentations of content. Neuroscience research teaches us that neural networks are strengthened through multisensory learning and building upon existing connections. While students with disabilities are not likely to overcome congenital deficits or skills lost in the early years of life through brain plasticity, high-level skills such as reading, writing, and mathematics can continue to develop over their lifespan (Thomas, 2018). Students with disabilities need specialized instruction to help their brains form and strengthen the neural networks that solidify new learning.

History of Neuroplasticity

Most experts consider Santiago Ramón y Cajal to be the "father of neuroscience." In the early 1900s, Ramón y Cajal, a Spanish neuroscientist, pathologist, histologist, and visual artist, produced groundbreaking illustrations of brain cells that showcase the interconnectedness of the brain's neurons. These illustrations have traveled to various galleries and museums as part of a display called *The Beautiful Brain: The Drawings of Santiago Ramón y Cajal* (Grey Art Gallery NYU, 2018). Ramón y Cajal was the first to observe that the human brain can and does change into adulthood, suggesting that neurons are constantly forming new connections (Ackerman, 2020).

About 50 years later, Polish neuroscientist Jerzy Konorski became the first to use the term neuroplasticity in his 1948 book, *Conditioned Reflexes and Neuron Organization* (Bijoch, Borczyk, & Czajkowski, 2020). In this work, Konorski described learning at the cellular level and called it synaptic plasticity, or the change in the connection between neurons. He emphasized the idea of preexisting connections between different regions of the brain and suggested that neuroplasticity is not just the establishment of new connections between neurons but also the remodeling of existing synapses (Bijoch, Borczyk, & Czajkowski, 2020). At the time, this idea of repurposing existing neuronal connections was revolutionary.

In the 1960s and beyond, more research into this "repurposing" of existing neuronal connections led to the discovery that neurons could reorganize after a traumatic event—like a brain injury. In some cases, with extensive therapy, critical functions such as speech and motor movement can be relearned.

Neurotypical Learners

A neurotypical student is one who thinks and behaves in ways that are considered "ordinary," "typical," or "expected" by the general population. Neurotypical students do not display intellectual or developmental differences that set them apart from their peers in a clinically significant way. Of course, neurotypical students have both strengths and weaknesses and sometimes need extra help, as do their peers with disabilities. Some professionals use the phrase "typically developing" to describe these students, but

this term tends to describe students who are making expected progress across developmental milestones more than it describes students' neurological abilities. The two terms are not quite interchangeable, but there is certainly overlap.

In a school setting, students who are neurotypical, or typically developing, usually participate in the general education curriculum. An effective teacher employs instructional and behavioral strategies that work for most of these students most of the time.

For example, consider Mr. Thais, a seventh-grade English general education inclusion teacher. Mr. Thais has 25 students in his class and recently finished teaching a unit on persuasive writing. His final prompt asked students to consider the inherent value of music. He explained that archeologists have discovered ancient instruments carved from bird bones and elephant tusks, demonstrating that music has been around for a long time. Mr. Thais asked the class to consider why music exists at all, given that it does not provide food or shelter or medicine necessary for survival. Students got to work responding to the prompt: "Make an argument for the value of music for human beings."

Most students were intrigued by this assignment because they felt empowered to share their opinion about why music is important. Mr. Thais led the class through the writing process using modeling, graphic organizers, sentence starters, and other supports to guide his students. Some students needed additional interventions, but everyone eventually reached the final draft stage and submitted their work.

In his reflection of this unit, Mr. Thais noticed trends among his students according to these three categories:

1. Students with experience playing musical instruments
2. Students with a strong personal interest in music
3. Students with no previous experience playing instruments and/or little overall interest in music

The students in the first two categories—those with an existing experiential knowledge base and/or a personal interest in music—seemed to grasp the writing assignment more quickly than those without the experience and interest. These students' initial writing abilities varied considerably, but their prior knowledge was a clear motivator when taking notes, researching at the library, making edits, and completing the drafts.

Building upon existing knowledge to learn new things is one important way that neuroplasticity works. Neurologist Judy Willis defines neuroplasticity as the "selective organizing of connections between neurons" (Bernard, 2010). Neurons send information throughout the brain. When people practice an activity repeatedly (such as playing an instrument) or access a memory (such as a concert they attended or their favorite song), their neural connections, called synapses, are strengthened. Thicker or stronger synapses means recall is faster and clearer. Learning is enhanced.

Building upon existing knowledge to learn new things is one important way that neuroplasticity works.

Neurodivergent Learners

Students who are neurodivergent are those whose neurological development is considered "atypical" or "unique" by the general population. For example, students with attention deficit hyperactivity disorder (ADHD), autism, dyslexia, developmental coordination disorder (DCD), Tourette syndrome, and other kinds of disabilities are classified as neurodivergent. Another similar term is "atypical development." When using the term "atypically developing," though, practitioners usually refer to students who have developmental behaviors outside the norm for children their age, such as speech delay, low muscle tone, or difficulty completing basic activities of daily living.

In a school setting, students who are neurodivergent or atypically developing usually have formalized support through an IEP or a 504 Plan. They may participate in the general education setting with specialized instruction and services (inclusion) or learn in a full-time special education setting.

In the above example of Mr. Thais' seventh-grade English class, there are a few students with IEPs whose educational needs are met within this inclusion setting. One of them, Marcy, has Developmental Coordination Disorder (DCD). This means she has trouble

with some fine and gross motor skills. Both handwriting and typing are difficult for her. She can do them, but she needs extra time. She often uses a dictation software to help her express her thoughts during the brainstorming and initial drafting stages. Marcy is a neurodivergent learner.

Neuroplasticity benefits Marcy, too, meaning she can draw upon her existing knowledge and experiences to strengthen the neural networks that make recall quicker and clearer. The idea of neuroplasticity also includes the brain's ability to "repurpose" existing synapses and make new connections. Students who are neurodivergent and students who are atypically developing must learn to work around the challenges of their disabilities to train their brains to achieve their desired result. For example, Marcy's brain has had to learn to use verbal processing through dictation software to organize her ideas before she writes or types.

Strategies to Support Neurodivergent Learners in the Classroom

Neurodiversity is something to be celebrated in the classroom! To be a teacher of neurodivergent students is to have students with unique, insightful—and yes, sometimes challenging—learning profiles. Some students on the autism spectrum, for example, can present with a high intensity and focus for preferred activities. This may make them a wonderful team member during a project-based learning activity involving their preferred subject area. Some students with ADHD may offer great enthusiasm during a brainstorming session. Neurodivergent learners may offer nonlinear thinking, a willingness to question or challenge assumptions, or exceptional recall. Regardless of the ability, there are always strengths to celebrate.

Variability in brain development is normal. Creating an inclusive classroom environment is powerful for neurodiverse and neurotypical students to learn to work with each other's strengths. Teachers can use the following strategies to support neurodivergent learners.

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Presume competence

Some students have difficulty with verbal communication or present with physical or social cues that distract from their intellectual and emotional abilities. It's important for educators to presume competence and to interact with students with respect and honor, believing that they are paying attention and listening.

Identify and leverage strengths

Neurodivergent students have wonderful strengths, as do all students. It may take time and intentional work to determine the strengths of neurodivergent students, but it is worth the effort. Questionnaires, informational interviews with parents, observation of peer interactions, and other methods can be used to learn what students excel at, what they love, and what motivates them. Whenever possible, those strengths should be leveraged in the classroom.

Manage challenges with accommodations

Students with disabilities also have challenges that make learning more difficult in some ways. Support plans for neurodivergent students should include accommodations that work. For example, if a student with dyslexia struggles to read word problems in math class, a read-aloud accommodation should be in place. Computer programs, apps, and innovative strategies can be tailored to an individual's strengths.

Students should have access to literary and math content in whatever forms work for them, while they continue to practice skills and strategies that their disabilities make challenging. In other words, a child shouldn't be prevented from learning the story of *Macbeth* because he can't decode Shakespearean English.

Create a sensory-friendly classroom

Noise-cancelling headphones, sunglasses, fidget toys, flexible seating, mild lighting, and a movement-oriented schedule helps students who may be sensory-sensitive. It can also help to reduce visual distractions, unnecessary noise, strong smells, and poor ventilation.

Allow movement and encourage activity

All students benefit from movement. (All humans benefit from movement!) Physical activity should be allowed whenever possible and movement breaks included in the daily schedule. Recognizing that students with ADHD are often drawn to intense stimuli, teachers can try to work with this impulse, rather than try to fight it. Fun, appropriate challenges include standing on one foot to read a short story, doing 10 jumping jacks in between math pages, or completing a cube puzzle during a lecture. Inviting them to be active means finding the task that meets the special needs of students and providing boundaries around the task.

Develop consistent routines

Kids thrive with routine. Kids thrive with routine. Kids thrive with routine. Neurodivergent students are often *especially* drawn to and successful with consistent classroom routine. When changes to a schedule arise, it helps to give students advanced notice of what will change and how it will affect their day.

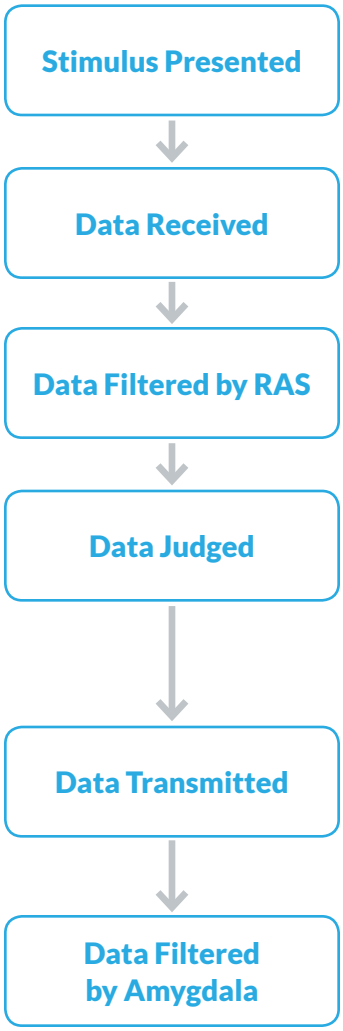
Be intentional about print

Some students with reading disabilities such as dyslexia must put forth extra effort, skill, and courage to engage with written text; therefore, teachers should create reasons for reading that are compelling and linked to students' goals and interests (Rentenbach, Prislovsky, Gabriel, 2017). While some texts may be required by the curriculum, these can be supplemented with high-interest readings that relate to their personal lives. For young children, this may mean finding stories about their favorite characters from movies, for example.

How the Brain Learns

The brain is always changing. Relationships, experiences, and environment all play a role in the brain's growth and adaptation. For educators, each lesson helps shape students' brains. To identify the best instructional strategies and learning experiences for students, educators must start with an understanding of how the brain receives new information and converts it into learning (McTighe & Willis, 2019).

For most of us, the brain takes in new information through the following process:



A stimulus is presented, such as a picture of the Egyptian pyramids in history class or the sound of the middle C note in music class.

The brain's sensory system receives this information, or data. It does not judge the data as being important, interesting, frightening, delightful or distracting, etc.

Before the data leaves the sensory system, the reticular activating system (RAS) acts as a filter between the sensory system and the brain's processing system.

The RAS *does* judge the data. It helps determine whether it is important for the brain to pay attention to the Egyptian pyramids or the sound of middle C. The RAS helps people attend to what is important, especially when the data from the sensory system suggests that something is new, different, changed, or unpredictable.

If the RAS determines the data is important enough to be transmitted to the brain's processing system, it will send the signal. When this happens, the data about the pyramids or middle C will go to the brain's processing system.

On its way to the brain's processing system, the data gets filtered through the amygdala. The amygdala helps determine if the incoming data should go to the lower brain, which is responsible for automatic bodily functions and the flight-or-fight response, or the upper brain (prefrontal cortex), where memory is constructed and neural networks of executive functions guide behavior with reflective (rather than reactive) choices.

Source: McTighe & Willis, 2019

Ideally, teachers present stimuli (learning activities) that enable students to display upper-brain responses such as recall, application, and analysis. When students are reciting the Declaration of Independence in history class or applying the steps of the Pythagorean Theorem in math class, they are using their upper-brain skills.

Ideally, teachers present stimuli (learning activities) that enable students to display upper-brain responses such as recall, application, and analysis.

There are tangible, proven strategies educators can employ that help students move information into the upper brain. Classroom environment, activation of prior knowledge, attention-getting techniques, use of graphic organizers, and mental manipulations are all important (McTighe & Willis, 2019).

Sometimes, though, new information gets "stuck" in the lower brain and students display lower-brain responses, such as acting out or zoning out. This is true for both neurotypical and neurodivergent students. Information might get filtered to the lower brain if the student is stressed out and the brain interprets that stress as a threat. Fear, anxiety, frustration, boredom, and other troubling feelings may be perceived as a threat.

For example, if a student is anxious about an upcoming presentation in which she must speak in front of the class, her anxiety may prevent her from organizing her thoughts in a coherent speech. A student who feels overwhelmed by his perceived difficulty of the new material may have a hard time copying the notes, asking clarifying questions, or engaging in discussion about the content.

Students who are neurodivergent or atypically developing may have an added layer of stress. Students who sustain an injury to the brain may have significant barriers to overcome in relearning lost skills as a result of the brain damage. In some (not all) of these cases, critical physical and cognitive functions can be improved or relearned (to a degree) through extensive therapy, special education services, and other interventions.

Teaching Strategies That Promote Neuroplasticity

A basic understanding of neuroplasticity, how the brain works, and how students learn empowers teachers to craft lessons and design classroom environments that work for and not *against* their students' abilities to connect, adapt, and grow.

Eight Strategies to Enhance Learning in the Classroom

1. Teaching Malleable Intelligence and Growth Mindset

Neuroplasticity is inextricably linked with the concept of malleable intelligence. Malleable intelligence simply means that intelligence is not static; it can increase or decrease over time as a result of different factors, such as practice and effort. Neuroplasticity means the structure and function of the brain can change with time and experience. The brain grows and adapts as neural networks are strengthened.

A growth mindset is believing that malleable intelligence and neuroplasticity are true. Students who hold a growth mindset believe that their hard work will make a difference. These students also show higher levels of academic achievement, resiliency, and self-regulation (Blackwell, Trzesniewski, & Dweck, 2007).

When students are explicitly taught that their intelligence can improve through study and practice, they do better in school. Multiple studies confirm the positive impact of growth mindset on student motivation and academic achievement. One such study comes from a 2007 Stanford University report. Researchers Blackwell, Trzesniewski, and Dweck demonstrated that students who were taught that intelligence is expandable had positive changes in classroom motivation and increased grades in their mathematics class (Blackwell, Trzesniewski, & Dweck, 2007).

When students are explicitly taught that their intelligence can improve through study and practice, they do better in school.

To help students adopt a growth mindset, teachers can provide explicit instruction on the cognitive processes that occur as they learn new information and can make growth mindset lessons a big deal! Students will notice what is important and begin to internalize the mindset. Teaching them how to track progress on their personal and academic goals over the course of the school year will help them tangibly see their growth.

2. Repetition

"Practice makes permanent," as the neuroscientists say. Practicing an activity and reviewing material in multiple ways helps the brain build stronger and thicker neural networks. Neural networks are groups of neurons that fire together, creating electrochemical pathways (Bernard, 2010). The more one practices an activity or accesses a memory, the stronger the connection. Over time, if the practice stops, the brain eventually eliminates the connections.

Ideally, teachers should aim to provide students with multiple opportunities to practice their current learning skill through multiple modalities. For example, a foreign language teacher might introduce a new unit's key vocabulary words in class and have the students practice the vocabulary for the next two weeks with these activities:

- Writing the word and drawing a picture that demonstrates its meaning
- Playing charades in small groups to act out the meaning of the new words
- Using the new vocabulary words in written sentences
- Playing a whole-class listening game where the students make tally marks for each time the teacher says one of the words throughout a lesson
- Writing each word five times
- Conversation pairs practicing using the words in short stories, or practicing pronunciation

3. Building Trust and Establishing an Inviting Classroom Culture

When students feel safe, accepted, and heard in their classrooms, they are more available for learning. "Serotonin is associated with a feeling of well-being and is a powerful modulator of neuroplasticity," writes neuroscience education professor Martha Burns. Building trust with students helps them feel confident in the educational process (Burns, 2019).

4. Using Mnemonic Devices

Some students naturally discover tricks and tools that help them remember new content. Most students, however, need explicit memory training to learn how to memorize and recall important information. A mnemonic device is a learning technique that helps with information retention or retrieval (remembering) (Literary Terms, n.d.). One common mnemonic is the acronym, PEMDAS, which stands for "Please Excuse My Dear Aunt Sally." The capital letters in this acronym reflect the order of operations for performing multistep arithmetic problems: Parenthesis, Exponents, Multiplication, Division, Addition, Subtraction. A mnemonic device can be an acronym or any other tool that helps a student remember.

It may be helpful for teachers to ask their students to volunteer how they remember new or challenging information. One student's trick for recalling the names and order of planets might turn on a light bulb for another student who hasn't yet mastered the skill.

Using mnemonic devices and other memory-training activities enhances connectivity in the part of the brain responsible for higher-order cognitive thinking.

5. Activating Prior Knowledge

Building upon existing neural pathways makes it easier for students to integrate new information. Activating prior knowledge may take many forms, depending on the age and abilities of students. Here are a few strategies for piquing students' interests and tapping into their existing knowledge and experiences related to the content.

Building upon existing neural pathways makes it easier for students to integrate new information.

- Use a K-W-L chart.

K	W	L
What do you already know?	What do you want to learn or find out?	What did you learn?

- Show picture books to share visual images related to a new content area.
- Complete a class brainstorm web.
- Ask students to write a personal reflection or journal entry on the new topic.
- Incorporate interdisciplinary learning (e.g., a warm-up question in math class that requires students to use close reading skills to mark up the word problem).
- Write (or tweak) curriculum to make content personally relevant to students' lives.

6. Integrating the Arts

The arts are stimulating to our sensory system and experiencing the arts enhances the connectivity of the brain—even when it is at rest. Creating or participating in art also boosts one's memory, empathy, attention, and focus (Ackerman, 2020). Incorporating music, dance, drama, creative writing, painting, drawing, etc. into classroom routines and within the curriculum will help students encode new learning into long-term memory.

Ways to do this include:

- Making the classroom environment both print and image rich, but taking care not to make the environment over stimulating
- Using songs to teach multiplication facts or the days of the week

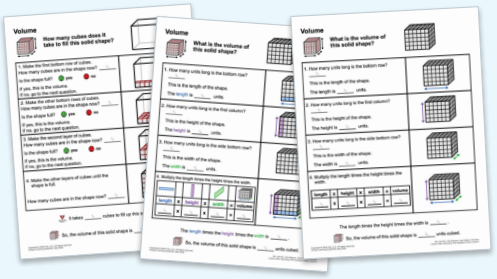
- Sharing or posting pictures of detailed period pieces when studying history or literature
- Asking students to research and find appropriate images that communicate the tone, style, or theme of a poem
- Teaching students physical gestures to solve integer problems in math or help them learn the sequence for their morning routine

7. Incorporating Movement

Exercise has been shown to enhance neuroplasticity and improve learning (Lin, Tsai, & Kuo, 2018). While it is not likely feasible or appropriate to incorporate extended exercise routines into academic classes, it is possible to incorporate short movement breaks and encourage whole-body learning. In whole-body learning, students use physical activity to explore and learn. Students learn by *doing* rather than through passive observation. Multisensory reading programs, experiential learning (e.g., field trips, learning outside), and hands-on learning activities such as math manipulatives and science experiments are a few examples of whole-body learning.

8. Offering Appropriate Challenge

Boredom is one reason new information may not make it from the sensory intake system to the brain's processing system. If students are not appropriately challenged, they are more likely to zone out during class and focus on other stimuli of greater personal interest. Teachers can promote strengthened neural networks by providing appropriate challenges (Ackerman, 2020). To do this well, educators must have a strong understanding of students' academic strengths and weaknesses as well as their interests. Ideally, extension activities and problem sets will be meaningful, relevant, and enticing challenges.



unique® learning system

n2y's Unique Learning System equips teachers with research- and evidence-based lessons and practices to keep students connected and learning. The high-interest, captivating content includes interactive online tasks, hands-on activities, experiments, crafts, and more. Lessons are differentiated to three levels in each grade band, meaning that students are getting the appropriate level of challenge to empower learning and create motivation for further learning. Multiple ways to interact include text to speech, drag and drop, auditory-visual cues, and more. With access to a robust built-in assessment, data, and reporting hub, teachers can monitor students' progress and further tailor instruction to ensure they are providing consistent challenge and advancing students toward standards mastery.

9. Other Activities That Enhance Neuroplasticity

Several other activities are thought to enhance neuroplasticity and aid with learning and memory. Promising research suggests that dancing, traveling, playing a musical instrument, learning a new language, reading fiction, getting adequate sleep, and practicing intermittent fasting promote the brain's plasticity. Teachers may consider teaching lessons on the critical importance of sleep to their students, especially if they teach adolescents, who often prefer to stay up late and have difficulty waking in the morning.

Healing the Brain After Trauma

The brain is remarkably plastic. So much so that there is potential for it to recover and regain lost function following physical trauma, such as a traumatic brain injury (TBI) or stroke. To be sure, neuroplasticity does not mean that complete healing will take place or that every person who sustains trauma to the head will regain all lost function. Rather, plasticity allows the brain to create alternate neural pathways where the damage has occurred and, in some cases, create new neurons and pathways. The creation of new neurons is called neurogenesis. When the brain creates these alternative and new neural networks, it is "rewiring" itself with an adapted structure and function.

An extreme example of this can be seen in young children with severe epilepsy that causes seizures on just one side of the brain. Children with this condition who do not respond to medications may be candidates for a hemispherectomy, which is a rare neurological procedure in which half of the brain is disconnected or removed to stop the seizures. Though the recovery process is long, when this procedure takes place in young children, the other half of the brain learns to "take over" or compensate for the lost half, and much of the lost function can be relearned (UPMC Children's Hospital of Pittsburg, 2021).

Teaching Students with Acquired Brain Injury

Students returning to school after a brain injury or illness face many challenges. These students may be relearning how to complete some activities of daily living, such as the steps for preparing a peanut butter and jelly sandwich, while also attempting to participate in their academic courses. Special educators and other teachers who work with these students must bring a growth mindset to planning, instructing, and assessing. Students with acquired brain injuries need specific instructional strategies and interventions to participate in their education and help their brains rewire those neural connections. Repetition and specific, concrete practice are two examples of such strategies that are known to encourage neuroplasticity in recovery from injury to the brain.

Educating the Whole Child—A Paradigm Shift

Students are multifaceted learners with physical, psychological, cognitive, social, and emotional needs. These areas of development are interconnected and influence how students learn. Just as neuroplasticity allows neural networks to strengthen, adapt, and grow with time and new experiences, students grow and change throughout their educational journey as whole beings.

The whole child approach to education recognizes the interconnectedness of all areas of child development. It seeks to design curriculum, develop teaching practices, and promote policies that support this interconnectedness. Whole child education honors the neuroscience of learning. When schools adopt a whole child approach to teaching and learning, they recognize that the physical and chemical nature of students' brains changes as they learn new information.

When schools adopt a whole child approach to teaching and learning, they recognize that the physical and chemical nature of students' brains changes as they learn new information

Biological factors such as the quality of food and sleep can impact brain structure and learning. Social factors such as relationships with peers and trusted adults can also impact brain structure and learning. Psychological factors such as safety and self-constructs also play an important role. The whole child approach to education strongly takes into consideration the factors that impact learning. Neuroplasticity, the brain's ability to grow, adapt, and change, and whole child education, are intimately linked.

The Learning Policy Institute, a nonprofit and nonpartisan education policy research organization, discusses the need for and impact of whole child education in its 2018 report on the topic. Researchers Darling-Hammond and Cook-Harvey explain that "effective learning depends on secure attachments; affirming relationships; rich, hands-on learning experiences; and explicit integration of social, emotional, and academic skills" (Darling-Hammond & Cook-Harvey, 2018).

To this end, whole child education requires a paradigm shift in how our nation collectively thinks about education.

From 2002 to 2015, national education policies focused on raising academic achievement and student test scores under the umbrella of the No Child Left Behind (NCLB) Act (Lee, n.d.). This was sometimes at the exclusion of other goals such as student health, social and emotional learning, or critical and creative thinking skills. Critics of NCLB argue that the policies forced districts to "teach to the test" because of the emphasis on standardized test scores. Some proponents of the legislation point to the accountability and sanctions that did lead some schools to improve. In most of these cases, it was the top-level leadership that changed and spurred improvement (Turner, 2015). Ultimately, while state test scores did rise, national measures of progress remained stagnant, and international tests measuring higher-order skills declined across most subject areas (Darling-Hammond, 2014).

n2y's Total Solution addresses the needs of the whole child through differentiated academic and life skills lessons; a social-emotional learning and classroom management solution that integrates proactive behavior strategies into daily routines; enriching current events activities that connect students to the world; relevant symbol communication tools that empower language, learning, and self-expression; and high-interest educational games that provide repetition for skill building and independent practice. A powerful, collaborative IEP system ties it all together, ensuring students are meeting goals and on a path to independence.

The educational paradigm is shifting from this narrower view of academic success as measured by test scores to one of holistic education of all children to become healthy, productive, and contributing members of society. We look to an educational philosophy that champions the personal engagement and nurturing of the whole child and honors a child's developing, growing, changing, and adapting mind. Successful learners are "knowledgeable, emotionally and physically healthy, civically inspired, engaged in the arts, prepared for work and economic self-sufficiency, and ready for the world beyond formal education" (ASCD, 2007).

The Five Tenets of a Whole Child Education

The Association for Supervision and Curriculum Development (ASCD) is a nonprofit, nonpartisan organization devoted to program development, resources, and services for educators. In 2006, the ASCD commissioned a multidisciplinary team of experts to develop a common language and deep understanding of the whole child approach in education. The Commission on the Whole Child continues to be a top resource among leading thinkers, researchers, and practitioners who teach, counsel, coach, and lead the next generation (ASCD, 2007). In 2020, the commission updated its work from 2006–2007 with the publication of The Learning Compact Renewed, (ASCD, 2020) which offers a fresh perspective on the five central tenets of a whole child education:

1
Healthy
Students enter school healthy and learn about and practice a healthy lifestyle.

2
Safe
Students learn in an environment that is physically and emotionally safe for students and adults.

3
Engaged
Students are actively engaged in learning and are connected to the school and broader community.

4
Supported
Students have access to personalized learning and are supported by qualified, caring adults.

5
Challenged
Students are challenged academically and prepared for success in college or further study and for employment and participation in a global environment.

Source: The Learning Compact, Renewed, 2020, pages 14–25

Schools alone cannot meet all the needs of children. The whole child approach requires the collaboration of the school and community. Families, educators, health professionals, coaches, policymakers—the whole "team"—must work together to develop a truly effective and sustainable whole child education in a school community.

1. Healthy

Maslow's Hierarchy of Needs provides an excellent framework for schools and communities to understand how to prioritize when adopting a whole child approach to education. Maslow's hierarchy is a five-tier model of human need, usually depicted as levels within a pyramid (Maslow, 1943). The first and most pressing need is physiological. Students must satisfy physiological needs like hunger, thirst, and sleep before they will be available for learning. Teachers everywhere understand just how challenging it is for a student to focus on learning when he or she has not eaten since the night before. Once physiological needs are met, students need to feel psychologically safe to explore and learn. Psychological safety includes a sense of security and belonging. Only after these needs are met are students truly ready and able to engage with higher-order cognitive processes in the classroom.

A whole child approach to education suggests schools and communities work together to implement policies that promote students' health. Some of these policies may include:

- Investing in school nurses, appropriate medical supplies, and medication training for qualified adults
- Increasing physical education time—even at the expense of less academic instruction time. Providing additional opportunities for exercise has been shown to have favorable effects on students' academic achievement (California Department of Education, 2005).
- Implementing a healthy choices campaign within the school that encourages a balanced diet and physical activity. Partnering with local food banks, urban gardens, whole foods groceries, local gyms, or other community agencies or resources is a good way to increase community support.

Not every school has the resources to fully fund a student health center, offer meals to whole families, or provide diet and exercise education. However, every school can reach out to its local community partners to make connections and provide resources to families. It begins with school leaders acknowledging the huge impact a student's physical and emotional health has not only on his or her sense of well-being, but also on grades and attendance.

2. Safe

The next two levels on Maslow's hierarchy are the needs for safety (feeling secure and safe from danger) and belonging (need for friends and family). Safe schools engage in trauma-informed teaching practices such as social-emotional learning initiatives, character education, peer mediation, conflict resolution, restorative discipline practices, and other similar programs (ASCD, 2007). These programs and practices help students develop the skills and attitudes that help keep them safe. When students learn to advocate for themselves, for example, they are more likely to seek adult help when presented with stressors such as academic overwhelm, anxiety related to a peer conflict, or bullying.

Safe schools reflect high expectations and an understanding of child and adolescent growth. In these environments, students are provided with learning opportunities and challenges that reflect their developmental readiness, and behavioral interventions that do the same. Requiring elementary students to sit still and be silent for an hour or more at a time, for example, does not honor key ideas from the learning sciences. It does not acknowledge that children learn best through hands-on engagement with new content or honor the fact that multisensory learning helps the brain encode new information into long-term memory.

The whole child approach embraces malleable and variable child development, leading to a safe school climate where students feel free to explore at the pace that works best for them.

3. Engaged

A third tenet of the whole child approach emphasizes the need for connection and engagement within the school community. Students are more likely to succeed when they feel connected to school. There are many ways to build student connectedness. Researchers out of The Center for Adolescent Health and Development at the University of Minnesota developed a set of core principles for schools to draw upon when seeking to increase school connectedness. The team's 2004 report, *Wingspread Declaration on School Connection*, states that the following are critical to help students feel connected to their school:

- High academic expectations with appropriate support
- Positive adult-student relationships
- Physical and emotional safety

Students are more likely to succeed when they feel connected to school.

Project-based learning, experiential learning, community service, interest-based activities and clubs, and student leadership are a few of many ways to build meaningful student involvement and a sense of connection. Schools with high reports of student connectedness report increased student educational motivation, more positive classroom management, and better attendance, and decreased rates of disruptive behavior, substance abuse, and emotional distress (Wingspread Declaration on School Connection, 2004).

4. Supported

It takes just one caring adult to change the trajectory of a child's life. The caring adult could be a parent or other family member, teacher, administrator, coach, counselor, mentor, or any other safe adult who consistently and respectfully shows up for the child. Children learn to mirror and internalize what they see from the adults around them—social values (such as care for the environment), physical behaviors (such as the habit of jogging), and cognitive practices (such as active listening). When adults show interest in who children are and what they like to do and how they think, children are "more likely to respond to what those adults value and take those values as their own" (ASCD, 2007).

Supportive adults also positively impact student brain chemistry. Caring adults and stimulating school environments, "spur the brain to form, prune, and strengthen connections that promote further development and learning. A lack of social and emotional support and stimulation can hamper development and growth" (Aspen Institute National Commission on Social, Emotional, and Academic Learning, 2018).

The quality of relationship among staff and students is the most important factor in determining the school environment (California Department of Education, 2005). Children feel safe and secure—and available for learning—when the adults in their lives are trustworthy, respectful, reliable, and caring. This kind of positive adult-student relationship is critical for building school connectedness and student success.

Strategies that can help educators build strong relationships include:

- Learning students' names quickly and correctly
- Displaying student work frequently
- Sharing appropriate personal information about themselves, such as a hobby enjoyed or a trip taken
- Providing intermittent positive, meaningful feedback to help increase a student's self-determination
- Asking students for their feedback about lessons and, when appropriate, implementing their suggestions
- Showing an interest in students' lives by attending after-school activities, sports, or clubs when possible
- Seeking to learn about students' personal interests through surveys and informal conversation
- Playing team-building games in class
- Being willing to be wrong and admit mistakes

- Increasing wait time when asking students to respond to a question—showing respect for the student's ability to answer—and providing a prompt or help if needed!

- Offering choices to help increase motivation

5. Challenged

The fifth tenet to the whole child approach is ensuring an appropriately challenging education for each child. An appropriately challenging education means a well-rounded and diverse education, one that adequately prepares children and adolescents for what comes after high school. This includes offering students opportunities to discover what they enjoy and what they are good at with exposure to the arts, music, sports, civics, and all the academic courses. To help shape the next generation, schools must consider how they are shaping the whole child, focusing not just on how a student does arithmetic but also that student's skill in painting and interest in foreign language.

Teachers are some of the most creative and hard-working professionals, constantly adapting to the needs of their students and looking for ways to engage them. Educators can expand students' education by helping them build an understanding of language and culture, teaching technological proficiency, presenting multiple viewpoints and opinions on national and global matters, and explicitly teaching critical-thinking skills. A whole child approach applauds teamwork, critical thinking, and communication as necessary components of any educational curriculum.

Moving Forward

The human brain is truly remarkable. With its 100 billion neurons, the brain receives and processes an enormous amount of information almost instantaneously, paying attention to what's important and disregarding what isn't (Herculano-Houzel, 2009). The enormous circuity of neurons integrates new information, such as nineteenth-century English poetry, into the complex and orderly networks already in place. Teachers who understand how to tap into the wiring of their students' brains are at a huge advantage in helping their students understand and remember content. An English teacher working on identifying imagery in Alfred, Lord Tennyson poems with her students may first invite them to gather spring flowers from the school's garden, share a memory of playing in the rain, or invite them to paint an abstract picture of the "colors of battle." Students are constantly trying to organize the ceaseless flow of information that comes their way. When they are able to connect new learning to existing knowledge, experiences, feelings, and relationships, they are far more likely to encode and permanently store the new information.

Moving forward in an era of whole child education, leaders recognize that school is not just for accomplishing academic gains. Rather, a full and excellent education addresses the physical, social, emotional, civic, and spiritual aims of the whole child. To do this, educators must respond to the dynamic nature of their students' minds through intentional teaching strategies that enhance neuroplasticity.

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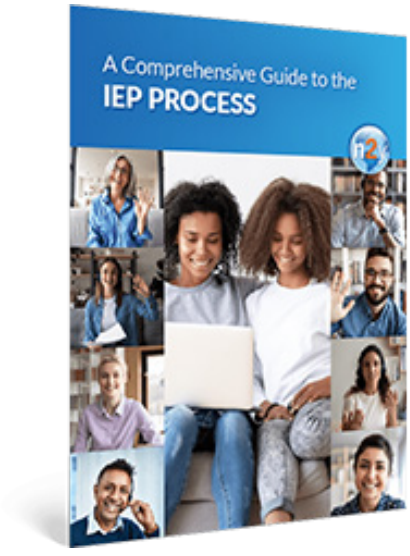

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