

Science Concepts

1. Development is Bi-Directional

The ongoing, dynamic interaction between nature and nurture – our genes and environment – drives all development.

As Fischer and Bidell (2006) explained, “There is no separation of nature and nurture, biology and environment, or brain and behavior, but only a collaborative coordination between them” (p. 383). Although our DNA is composed of over 25,000 genes, fewer than 10% are ever expressed. Cues from our social and physical world initiate a chemical process in our bodies, which determines which genes are expressed, along with how and when. This back-and-forth biological process, called epigenetic adaptation, highlights the malleability of the development of our brains and bodies.

2. Context Matters

The malleable nature of development is both an opportunity and a vulnerability, depending on the context.

A child’s context includes the array of relationships, environments, and societal structures they interact with both directly and indirectly – and all of which play a critical role in the dynamic nature of development.

In a positive developmental context, a safe and affirming environment, attuned and responsive relationships, and rich instructional experiences support healthy development and learning. Schools capitalize on this positive context when they connect to, leverage, and build upon the assets of students’ culture and communities as an inherent part of the educational experience.

In a negative developmental context, experiences of significant adversity and trauma don’t just happen to children – they happen inside their brains and bodies through the biological mechanism of stress. Chronic stress, especially in the absence of a buffering adult, can affect the developing neural architecture critical for learning, instead putting children on “high alert” for danger. These experiences can include adversities in a child’s immediate context (such as abuse or neglect), and also in a child’s larger, societal context (such as systemic racial oppression).

3. Learning is Integrated

Learning isn't "academic" OR "social and emotional" – students become increasingly capable of complex skills through the integration of their cognitive, social, and emotional development.

The brain’s architecture is made up of trillions of connections, forming complex and integrated structures as experiences create, strengthen, and reorganize connections and eliminate unused pathways. The brain becomes highly connected, efficient, and specialized over time. No part of the brain develops in isolation – it is structurally and functionally integrated. In other words, the way our brain reads words on the page of a book and the way our brain conducts a conversation about that book are not independent processes.

The Building Blocks for Learning framework outlines the holistic, integrated set of skills and mindsets critical for students’ success at school and beyond. These skills and mindsets (e.g., stress management, self-regulation, and self-direction) align to a vision of a child as a learner, are grounded in research connecting them to academic growth and mastery, and are measurable and malleable. With this understanding, we can design integrated learning experiences that mirror the integrated nature of the brain.

4. Pathways are Unique

There is no such thing as an average student – each is on their own individual developmental trajectory.

The science of learning and development clearly shows that each child develops via pathways that are non-linear and jagged, instead of along a fixed and stable course.

Much of the research that has been used to make programs and curricula developmentally appropriate assumes that most children develop along a singular pathway, through predictable stages, and that any deviation from that trajectory is abnormal. The research also assumes that a group average represents most individuals; this can mean boiling down the experiences, needs, and growth of dozens or hundreds or even thousands of students into a single story – one that is often shaped by White supremacist, patriarchal, heteronormative, and ableist assumptions of what is “normal.” This story is then used to create standardized schools that aren't prepared to embrace the wide range of actual students in their building. However, when we take a closer look at the data on learning and development, we clearly see that there are many unique pathways that individual students take, and it is the challenge of educators to support the fullest expression of what a student can do by designing both shared and individualized experiences that support their holistic development.

5. Students are Active Agents

Developing agency and resilience requires shifting the balance of power towards students.

In a positive developmental context, strong foundations of trust, attunement, and responsiveness between adults and students set the stage, but critically, these dynamics must go beyond well-meaning adult control. When they receive guidance, support, and authentic opportunities, students can and should be empowered to be drivers in their own learning and growth. Shifting the balance of power towards students within this safe and supportive context also serves to counteract long-standing oppressive barriers within the education system, moving towards more equitable opportunities and outcomes.