



# THE SCIENCE OF CHILD DEVELOPMENT AND LEARNING

The Institute of Medicine (IOM) and National Research Council's (NRC) 2015 report, *Transforming the Workforce for Children Birth to Eight*, offers recommendations for building a high quality early childhood workforce that has the preparation, knowledge, and skills to promote children's development and learning in the early years. This brief summarizes what the report says about the science of child development and learning.

## THE DEVELOPING BRAIN AND THE NEUROSCIENCE OF LEARNING

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The human brain begins developing prenatally and continues developing through early adulthood. The prenatal and the first five years are the fastest periods of brain development. During these periods, children's brains experience rapid growth, producing as many as 40,000 synapses, or connections, per second. This is followed by pruning, or elimination of synapses that are used less frequently.

Nature and nurture are weaved together with biology (nature) and experiences (nurture) influencing one another. Studies show that experiences can turn genes on or off and modify their effects on brain development and

behavior. Researchers have also learned that genes can affect the way children are influenced by their environments.

There are some periods in development where the brain is more susceptible to change than others. In early childhood, brain development is strongly influenced by children's environment and experiences. Positive and enriching experiences with adults support healthy brain development. On the other hand, lack of positive experiences or negative experiences can result in serious consequences in children's learning and wellness. The sensitivity of this period makes the early childhood years a high risk, high reward time for children, which means that effective teaching and caregiving is essential during these early years.

"A continuous, dynamic interaction among experiences (whether nurturing or adverse), gene expression, and brain development underlies the capacity for learning, beginning before birth and continuing throughout life."  
(IOM & NRC, 2015)

## CHILD DEVELOPMENT AND EARLY LEARNING

The report categorizes child development into four domains: cognitive development, general learning competencies, health, and socioemotional development. All four domains are interconnected and dependent on each other. These four domains are described below.

### Cognitive development

Children are making sense of the world around them, building explanations for their observations, organizing knowledge, and learning communication skills. Early in infancy, children read social cues, and the sophisticated processes underway in infant's brains are not always noticeable. Adults often underestimate infants' and toddlers' capabilities, resulting in missed learning opportunities.

The same underestimation is true of preschool-aged children. One study found that children's actual performance was six to eight times higher than estimated by their teachers.

To ensure children's cognitive development, adults can provide learning opportunities across all interactions and activities. For example, teachers can ensure children have a rich language environment by talking, reading, and singing with children throughout the day.

### General learning competencies

The report summarizes research on a range of emergent developmental skills—including executive function, mastery motivation, approaches to learning, and noncognitive skills. These skills correlate with children's learning in academic areas.

Executive functions are a set of related processes that manage a child's cognitive resources, including memory, attention, planning and problem solving. Executive functions allow children to focus attention, plan ahead, and connect the future action with past events through memory. A somewhat broader idea—self-regulation—also includes controlling emotions and behavior.

Self-regulation and regulation of emotion also contribute to early learning success. Children with poor self-regulation have a hard time participating in classroom and learning activities, and do not do as well in school. Teachers can foster children's self-regulation abilities when they have developmentally appropriate expectations for children and support them through predictable routines, by guiding and scaffolding, especially through daily activities designed to give children time to practice these skills.

The report describes other learning skills and dispositions including persistence, curiosity, self-confidence, self-control, and time perspective. These skills are not simply traits of the child, but can be shaped and supported by intentional caregiving and instructional practices. While the capacity for engaged learning is evident in early life, learning skills develop throughout early childhood, often at different rates. For example, a child may bring attention and curiosity to a task, but may not yet have developed other skills like persistence to follow through on that task.

How children view themselves as learners, and the way they are viewed by teachers, are both important to how children learn. The way young children think about their learning develops early based upon their families' and later their teachers' evaluation and expectation. High expectations for success from parents and teachers is associated with later



school success, especially among children who are academically at-risk. The way families and teachers express these expectations affects how children come to view their successes and failures. Educators and families who promote and reward persistence increase children's motivation to learn. On the other hand, if children hear that their success is due to a trait, like intelligence, they avoid challenge and do not pursue difficult tasks. Over time, children who believe that they can learn if they work hard have better achievement in school.

### Socioemotional development

Early learning is a social activity. Socioemotional competence is important for young children's early school adjustment. Children with delays in socioemotional development, including the development of challenging behaviors, experience problems socially and academically.

Socioemotional competence furthers children's relationships with families, teachers, and peers. Securely attached children develop social skills with adults, social and emotional understanding of others, and have a positive self-concept. Having a secure attachment is also linked with cognitive and language skills. Teachers are important sources of secure attachments. Growing research shows that children with secure relationships with teachers, or whose teachers show the same kinds of socioemotional support as their families, tend to do better in school socially and academically.

"Secure and responsive relationships with adults (and with other children), coupled with high quality, positive learning interactions and environments, are foundational for the healthy development of young children." (IOM & NRC, 2015)

Starting in infancy, children understand that people's behavior is associated with their mental states and emotions. Researchers call this "theory of mind," and it supports children's developing social and emotional skills for interacting with teachers and peers. Experiences with teachers and peers help children's socioemotional skills develop further as they learn perspective taking,



cooperation, conflict management, and emotional understanding.

While children are developing their understanding of others, they are also becoming more self-aware. Children are sensitive to how adults evaluate them. Indeed, feedback from trusted adults shape how children view themselves. Children receive feedback often—sometimes it is generic and tied to a trait (e.g., "You are a good drawer"); other times it is specific, pointing to the situation (e.g., "You did a good job drawing"). Children show greater persistence when they receive specific feedback about a skill or behavior they control.

Social experience provides emotional security that contributes to children's development in other areas as well. Through social interaction, adults provide children with necessary stimulation to drive children's intellectual capacity.

### Physical development and health

As the report describes, "Physical development goes hand-in-hand with cognitive development in young children, and progress in one domain often relies on progress in the other." (Institute of Medicine (IOM) and National Research Council (NRC), 2015). Studies have shown the positive relationships between motor development, cognitive development, and school readiness skills. Healthy children are better able to learn. In fact, research shows that poor physical health can contribute to poor academic and social skills. There is broad agreement that increased physical activity and fitness contribute to academic performance. Such activity can be built into children's days through recess, access to physical education, and opportunities for active play throughout the

day. As the report argues, support from family and friends encourages physical activity among children, but school policies also affect children's activity. The report calls for early childhood programs to offer children 30 minutes per day of physical education.

Education and health systems can work together to include physical and developmental screening to identify children with specific needs, and completing health checks and inventories to ensure access to health care and immunizations. Schools and early education programs can also use coordinated approaches to ensure access to healthy food through meals programs. They may encourage healthy habits through age appropriate health education programs for children, as well as programs that engage families and communities.

## **EFFECTS OF CHRONIC STRESS AND ADVERSITY**

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The report closes its discussion about child development and early learning by noting the profound effect that chronic adversity and stress can have on the brain. While all children can experience some degree of challenge during development, exposure to stress and adversity is closely linked with family socioeconomic status and income. But adversity also comes through child experience of maltreatment and family violence.

The multifaceted nature of poverty and risk of poverty, however, also means that some children experience some protections from the associated stress. Children with secure attachments to adults, and those with adults who respond to them with warmth maybe less negatively affected by the adversity they are facing. In addition, there is evidence that these factors not only counter the negative potential of stress, but also contribute to the child's developing self-regulation and well-being. A range of interventions shows the resilience of the brain and the degree to which the risk of adversity may be reduced or eliminated. Still, the success of intervention efforts is affected by the degree of adversity and depends upon characteristics of the child and family.

Children learn most readily in circumstances of social support, where adults can encourage developing skills and competencies and instill

curiosity and self-confidence. Children living in adversity lack these supports. Such disadvantage is apparent very early and can persist throughout development. Under chronic stress, children's brains are awash in stress hormones that negatively affect multiple brain regions, including those critical for cognitive and emotional control. Children may develop social, emotional, and behavior problems as a result. Children's behavior may become challenging, leading to the potential for expulsion from early childhood programs or schools. They may suffer from anxiety or depression. The effectiveness of protections such as secure attachment and responsive caregiving are due in part to adults' capacities to provide support and care to children. Adults' socioemotional well-being and abilities to effectively respond to chronic stress and adversity often affects the way they support children.

## **CONCLUSION**

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The Institute of Medicine (IOM) and National Research Council's (NRC) report *Transforming the Workforce for Children Birth to Eight* lays out expectations for what teachers of young children should know and be able to do to effectively support all children's learning and development. These expectations are based upon a wealth of research on the science of child development and learning. This report presents this research base in chapters 3 and 4 of the report. This brief provides only a summary of these extensive chapters. Readers are encouraged to continue learning from these chapters in full.

## **REFERENCE**

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Institute of Medicine (IOM) and National Research Council (NRC). 2015. *Transforming the workforce for children birth through age 8: A unifying foundation*. Washington, DC: The National Academies Press. <http://www.nationalacademies.org/hmd/Reports/2015/Birth-To-Eight.aspx>.

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