

A photograph of a man and a baby. The man, on the right, is wearing glasses and a yellow shirt, looking upwards with a joyful expression. The baby, on the left, is wearing an orange shirt and camouflage shorts, smiling broadly. The background is a blurred outdoor setting with a building and greenery.

# The Science of Success

Why neuroscience and public policy matter to the future of Nebraska's youngest citizens.

We can't know exactly how young Nebraskans will choose to meet the social and economic challenges ahead.

But the science of early childhood development can give us a pretty good idea of how prepared they will be.

*Learning is a lifelong process. Day by day, we are expected to assimilate information, cultivate skills and make appropriate decisions about how to function productively as members of our families, as workers, and as citizens.*

*But the ability to learn and function efficiently and productively is not something that just begins when a child enters Kindergarten and grade school. Our capacity for personal, professional and civic competence is built upon **a neurological foundation that begins to take shape even before a child is born and is largely in place by five years of age.***

*The quality of a child's earliest experiences, interactions and relationships is physically written into the neural architecture of the developing brain during the first five years. The strength of that architecture is what makes growth and the acquisition of a lifetime's worth of skills possible.*

*This is why Nebraska's legislators and business leaders are looking increasingly to the science of early childhood as a barometer for our state's social and economic strength in years to come.*

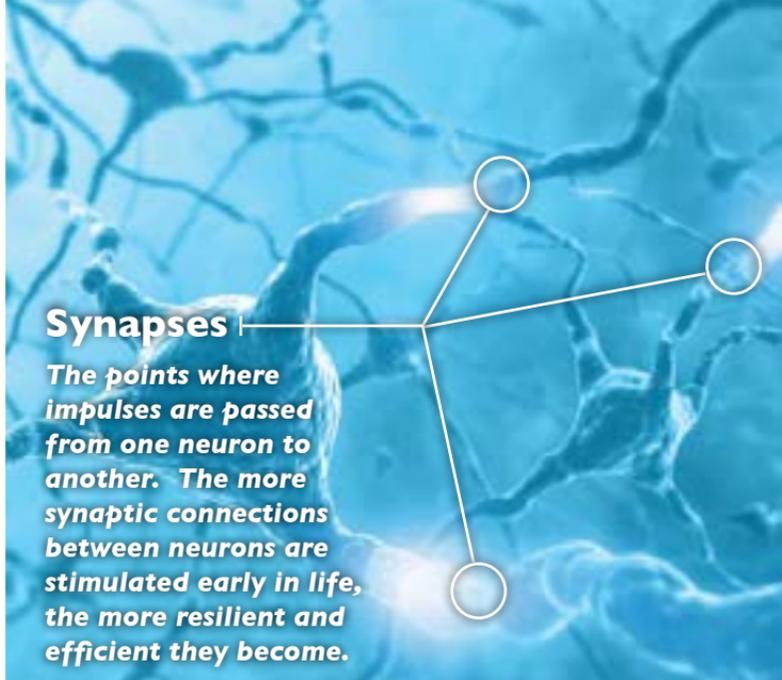
## Building on a Solid Foundation

In many ways, the human brain is not unlike other complex structures such as a house or building. The strength, functionality and resiliency of that structure depends upon the effort that goes into laying a strong foundation at the very beginning of the building process.

By the time a child is born, his or her brain already contains about 100 billion **neurons**, the basic building blocks of the nervous system. These neurons are connected to one another by **synapses** that carry electrochemical signals in response to stimuli experienced by children even while they are still in the womb.<sup>1</sup>

The more that certain synaptic connections are stimulated during the earliest years of a child's life, the more resilient they become and the more efficiently they conduct signals to and from various parts of the brain.<sup>2</sup>

The ease with which the neural architecture of the brain changes as it learns (called **neuroplasticity**) begins to decrease even before children arrive at school.<sup>3</sup> The more **positive stimulation** children receive before this threshold, the more prepared they will be for the acquisition of more complex skills as they grow older.<sup>4</sup>



### Synapses

*The points where impulses are passed from one neuron to another. The more synaptic connections between neurons are stimulated early in life, the more resilient and efficient they become.*

*A child's brain produces new synapses at an astonishing rate during the first few years of life. Synapses that are used less frequently will gradually fade away through a natural process called **pruning** beginning when a child is about 3 years old.<sup>5</sup> The remaining synapses will form the long-term neural foundation for ongoing social, emotional and cognitive development.*

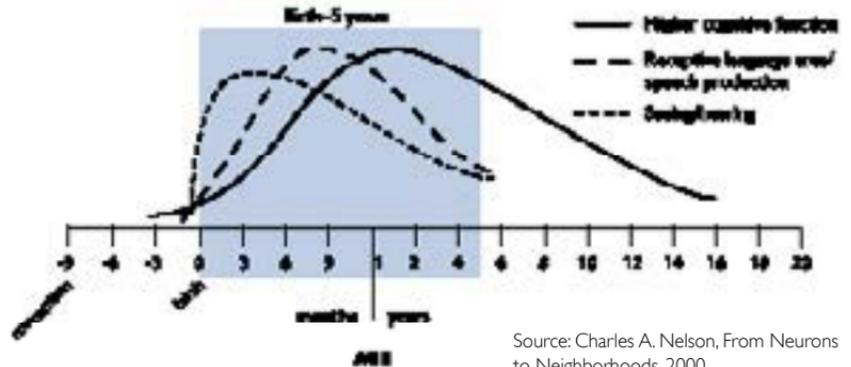
The quality of children's earliest learning experiences can become evident well before they reach school age.

The benefits of stimulating, positive experiences when the brain is at the peak of plasticity reveals themselves in the way young children acquire language, form healthy attachments with parents and caregivers, and engage with the world around them.

## More Than Just IQ: The Neurological Basis for Children's Success

While human beings retain the ability to build synaptic pathways throughout a lifetime of learning, the brain rapidly loses its neural plasticity after the first few years of life. Neural pathways begin to "harden" leaving more advanced, complex social, cognitive and emotional skills to be built upon the existing framework. The effort required to build new neural connections increases dramatically thereafter.

Synapse Formation in the Developing Brain



Source: Charles A. Nelson, From Neurons to Neighborhoods, 2000.

Healthy early neurological development in children reveals itself well before we begin tracking their progress through the K-12 system.

Children whose early care and learning experiences allow frequent parent-child interaction, language-rich environments, and safe, positive conditions for exploratory play are well on their way to developing the cadre of skills that will support all future learning.

This cadre of skills, often referred to as **executive function**, encompasses more than an arbitrary measure of IQ. It incorporates the emotional and behavioral assets that enable children to focus on tasks, follow directions, develop empathy, solve problems, moderate behavior and interact appropriately with those around them.<sup>6</sup>

Executive function assets are crucial to a child's success as he or she moves through the K-12 educational system, and ultimately become the basis for our viability as functioning, self-sufficient adults.

## What We Mean by “At Risk”

Factors such as chronic stress, low levels of parental education, maternal depression and child abuse are known to physiologically impede the growth and conditioning of healthy neurons in a child's brain.

In terms of schooling success alone, children at risk tend to **fall behind their peers rapidly in academic performance, often leading to school dropout.** But hazards to healthy early neurological development extend far beyond failing test scores. Ultimately, children at risk are more likely to:

- Enter the criminal justice system<sup>7</sup>
- Develop chronic and costly health problems<sup>8</sup>
- Experience higher rates of unemployment and earn less as working adults<sup>9</sup>

**As of 2011, approximately 60,000 children between the ages of 0 and 5 are classified “at risk” in Nebraska.<sup>10</sup>**

“During the prenatal period and through 3 years of age, approximately one million neurons are created each minute, forming and connecting different brain structures, creating the integrated, complex and dynamic system that is so critical for the acquisition of children’s language, cognition and social skills.”

Dennis Molfese, Ph.D.  
University of Nebraska-Lincoln  
Department of Psychology

## The Science of Early Childhood: A Solid Basis for Successful Policy

Neuroscience gives us a sound and quantifiable basis for building our investment in high quality early care and learning opportunities for Nebraska’s youngest citizens. The more we see healthy early beginnings for our children as crucial to the social and economic growth of our state, the more prepared future Nebraskans will be to meet the challenges ahead.

- **Encourage policies that increase parents’ and providers’ knowledge of early childhood development.** While it is not the job of government to take over the role of parents, it is the job of government to create the conditions for good parenting to occur. Finding ways to educate new parents and caregivers about the process of neurological development in young children is crucial, especially for those populations considered to be at high risk. Policies that are designed in such a way to present this information in a culturally and educationally appropriate manner are likely to yield the strongest results in terms of home environments, childcare selection, school performance and other outcomes.

■ **Improve school readiness and ready schools by expanding the availability of high quality early childhood programs between school districts and community child care providers.** Increase state investments to the Nebraska Department of Education to expand the number of high quality early childhood programs for children from birth to kindergarten-entrance age who are at risk of failure in school.

■ **Coordinate resources and encourage accountability.** Dwindling budgets and increased fiscal pressures mean that legislators must be more deliberate than ever in how public funds are utilized. Systems that serve parents of young children can yield the strongest outcomes when they are integrated, cost-effective and evaluated on the quality of their results.

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10. Based on 2010 U.S. Census Data. See <http://firstfivebraskas.org/why-it-matters-to-nebraska/content/children-at-risk-age-0-to-5-by-legislative-district/>



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