

# Illinois' STEM Workforce Starts with Early Education

Building a Foundation for Jobs in Science, Technology, Engineering and Mathematics



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## Acknowledgements

**ReadyNation** is the nation's preeminent business leader organization, working to strengthen business through effective policies for children and youth. It operates under the umbrella of the non-profit Council For A Strong America. Our more than 1,400 members educate policymakers and the public about effective investments that will help businesses compete in today's global marketplace by helping children get on the right track to succeed in school and in life. Our members have contributed to victories for children at the federal level and in dozens of states.

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## Summary

Career opportunities in STEM fields (science, technology, engineering and math) are growing rapidly. Nationwide, STEM jobs are projected to grow 13 percent from 2012 to 2022, faster than the average job-growth rate of 11 percent. Within individual STEM fields, growth rates are projected to be as high as 20 to 37 percent.<sup>1</sup> Jobs in health care, which also require STEM skills, will grow by 26 percent.<sup>2</sup> The situation is similar in Illinois, with a 16 percent increase in STEM jobs and a 22 percent increase in health care jobs predicted from 2010-2020.<sup>3</sup> Moreover, STEM jobs are typically higher paying than jobs in many other fields, with some boasting salaries more than double the median salary for all workers.<sup>4</sup> And this salary boost holds despite the fact that many STEM jobs do not require four-year college degrees.<sup>5</sup>

However, data also indicate that we might not have the skilled workforce necessary to meet the increasing demand for STEM workers. According to the “Nation’s Report Card” — the National Assessment of Educational Progress — only 32 percent of Illinois 8th graders are proficient in math and only 26 percent are proficient in science.<sup>6</sup> Furthermore, nearly half of students who graduated high school in 2013 and went on to attend Illinois community colleges were enrolled in remedial courses, 41 percent of them in remedial math.<sup>7</sup>

We must redouble our efforts to build the STEM pipeline for the future. A growing body of research suggests that developing STEM proficiency starts much earlier than high school, middle school or even elementary school. According to the Wall Street Journal, “Evidence is mounting about the importance of teaching math in pre-school and kindergarten...if children don’t have good instruction and effective teachers in early grades, they are more likely to struggle later when they face more complicated concepts.”<sup>8</sup>

To meet this challenge, business leaders increasingly call for protecting and strengthening key investments in young children’s learning and development.

This report outlines several of those investments, as well as four key, related facts about the importance of early



**“A growing ‘skills gap’ is leaving too many Illinois jobs without fully qualified workers—an average of 15,000 positions every year, STEM and otherwise.”**

— Lisa Savegnago,  
President, Nameplate & Panel  
Technology, Carol Stream

**“We need to ensure more kids have access to early science and math programs—even before they hit kindergarten—and we’ll be laying the groundwork for some great STEM careers.”**

– Rudy Valdez,  
Vice President, South West  
Ideas for Today & Tomorrow  
(SWIFTT), Rockford

learning to future STEM success:

1. The math achievement gap starts early, even before kindergarten.
2. High-quality early education includes math and science content.
3. Early math instruction improves later abilities.
4. Early learning also helps build the behavior traits—such as perseverance, problem-solving, patience—that STEM employees need.

To enhance the success of our youngest citizens and build the STEM workforce of the future, Illinois must support high-quality early learning efforts that include math and science.

### **STEM Jobs are Growing and Lucrative**

Career opportunities in the STEM fields are among the most rapidly growing nationwide. From 2012 to 2022, STEM jobs are projected to grow 13 percent, faster than the average job-growth rate of 11 percent.<sup>9</sup> For some STEM jobs, growth rates are projected to be even higher: 20 to 37 percent. Health care positions, which also require STEM skills, will grow by 26 percent.<sup>10</sup> Similarly, from 2010-2020 in Illinois, STEM jobs are predicted to have increased by 16 percent and health care jobs by 22 percent.<sup>11</sup> This represents nearly 37,000 job openings in STEM and more than 62,000 openings in health care over the decade. Further, STEM jobs are typically higher paying than jobs in many other fields, with some having salaries more than double the median salary for all workers.<sup>12</sup> STEM jobs fall in a variety of categories, but half are in the manufacturing, construction, or health care industries.<sup>13</sup> Many of these jobs do not require a four-year college degree.<sup>14</sup>

### **Illinois May Not Have the Future STEM Workforce We Need**

Our state is midway through a decade that will see at least 150,000 positions—within and outside of STEM fields—that cannot be filled with well-qualified Illinois employees who have the educational credentials their employers seek.<sup>15</sup> This creates costs for employers who have to either pay to recruit skilled workers from out of state, or to train-up their in-

state hires. Given their projected growth, STEM and health care jobs will drive many of these costs.

Further, evidence of the shortcomings in our workforce appears long before employers encounter them: According to the “Nation’s Report Card”—the National Assessment of Educational Progress—only 32 percent of Illinois 8th graders are proficient in math, and only 26 percent are proficient in science.<sup>16</sup> Moreover, nearly half of students who graduated high school in 2013 and went on to attend Illinois community colleges were enrolled in remedial courses, 41 percent of them in remedial math.<sup>17</sup>

It’s clear we need to start much earlier in students’ lives, to help them build the skills they’ll need later in school—and on the job.

## STEM and Early Childhood—When Skills Take Root

### 1. The math achievement gap starts early, even before kindergarten

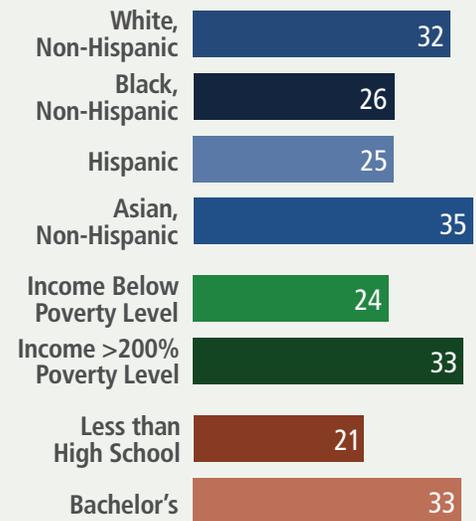
The first three to five years of life are a unique period of growth for a child’s brain. Every second, young children’s brains develop 700 synapses, the neural connections that support learning and skills.<sup>18</sup> Disadvantaged children can already be 18 months behind their peers when they start kindergarten.<sup>19</sup> This gap is as pronounced for math skills as for literacy abilities.<sup>20</sup> U.S. Department of Education data show that math scores for kindergarteners were already higher for children who: were white or Asian (rather than African-American or Hispanic); whose families had higher incomes; and whose parents were more highly educated (figure 1).<sup>21</sup>

### 2. High-quality early education teaches real math and science

Young children can learn more math and science than we may realize. Good early learning curricula include a wide range of math and science topics (see box<sup>22</sup>) that are both instructive and fun. Children should experience this content through enjoyable, play-based activities appropriate for their age. The Illinois Early Learning and Development Standards include extensive math and science content, with topics such as “sense of numbers,” and “demonstrating curiosity about the world.”<sup>23</sup>

## Achievement Gaps in Math Start Early and Are Highly Dependent on Social Factors

Math scores for children coming from disadvantaged homes were significantly lower than their peers when entering kindergarten for the first time in 2010.



Note: Scores range from 0-75. Skills assessed include counting, geometry, identification of patterns, and identification of shapes.

Source: U.S. Department of Education, Early Childhood Longitudinal Study math assessment, 2010-2011.

## Preschool Math Topics

- Clocks and calendars
- Data and chance
- Geometry
- Measurement
- Money
- Numeration
- Operations
- Patterns

## Preschool Science Topics

- Balancing/scales
- Beginning measurement
- Earth and environment
- Five senses
- Insects and spiders
- Magnet exploration
- Magnification
- Sea life
- Seasons and weather
- Space and science

### 3. Early math affects later abilities

While it is a long road from preKindergarten to Ph.D., a growing body of research shows that early exposure to math is linked to later abilities in not only math but other subjects.

For example:

- A 2010 Canadian study found that “[K]indergarten skills in math significantly predicted second grade math, reading, and general achievement.”<sup>24</sup>
- According to Prof. Greg Duncan of the University of California, Irvine, “Early math concepts, such as knowledge of numbers and ordinality [sequences like 1, 2, 3], were the most powerful predictors of later learning,” and “school-entry reading and math skills are almost always statistically significant predictors of later reading and math achievement...[and] rudimentary math skills appear to matter the most.”<sup>26</sup>
- Children with “persistent” problems in math at ages 6, 8 and 10 were 13 percentage points less likely to graduate from high school and 29 percentage points less likely to attend college.<sup>27</sup>
- An article in Science magazine concludes, “Preschool children’s knowledge of mathematics predicts their later school success into elementary and even high school. Further, it predicts later reading achievement even better than early reading skills.”<sup>29</sup>

### 4. Early learning builds the behavioral traits that STEM employees need

The development of children’s brains not only supports cognitive abilities, but social and emotional skills such as focusing, persevering and working well with others. These are important for all employees, including those in the STEM field.

According to Prof. James Heckman, the 2000 Nobel Laureate in economics, “[M]ore than smarts is required for success in life...the empirical literature shows high economic returns for remedial investments in young disadvantaged children...[that affect] a range of cognitive and non-cognitive skills, schooling achievement, job performance, and social behaviors, long after the interventions ended.”



## Policy Recommendations for Helping Strengthen Illinois' STEM Workforce

Reflecting the lessons of this research, we must better train our sights on the development of our very youngest learners. There are a number of key ways we can do this—such as by improving access to and quality of:

- **Preschool:** Illinois has an opportunity to greatly increase the number of children attending voluntary early education programs, as well as boost program quality. With the help of a new federal Preschool Development Grant, we are extending preKindergarten access to nearly 30,000 more young children in communities of need statewide by 2020. However, those federal dollars hinge largely upon our success in committing additional state dollars to preK, per our federal grant agreement. Such state resources, in turn, also would help us restore a series of deep cuts and ultimately return to our statutory goal of bolstering early learning opportunities for thousands of young children whose parents still seek it, continuing to

**“Success in such fields as finance hinges on many factors, and one of the most fundamental is a solid foundation in math skills and reasoning.”**

— James Oliff, Chairman, CME Group Foundation, Chicago

**“If we want a vibrant business community, with the fullest possible employment in STEM positions and other good jobs, we should use every available, proven tool for the challenge. Early learning initiatives [help] kids establish a foundation for achievement in school and beyond.”**

– Kaili Harding,  
President, Schaumburg  
Business Association

prioritize services for kids most in need of help.

- **Birth-to-3 services:** “Two-generation” efforts at strengthening parent engagement are important for helping to foster the cognitive, physical, and emotional development of at-risk infants and toddlers. Such programs help parents—especially new mothers and fathers—to become the best parents they can be, and that they want to be. Prevention Initiatives are funded through the Illinois State Board of Education, including several home-visiting programs that support “parent-coaching” efforts; many other examples of these programs are administered through the Illinois Department of Human Services. Yet such initiatives—such as Healthy Families, Parents Too Soon, and Nurse Family Partnership—historically have struggled to reach even a fraction of children who could benefit. The same is true of Early Intervention services for children, birth to age 3, who have developmental delays or disabilities, or significant risks of such challenges.
- **Child care assistance:** These services are essential to helping low-income, working parents find and maintain work, and thus crucial to workplace stability and productivity. However, child care also forms a vital part of Illinois’ early learning system, with a half-day of services often fitting together with half-day preK classes to provide a full day of services during parents’ working hours. It’s important that we not only protect families’ access to services, but strengthen the quality of those services—aims that were set-back in recent cuts and program changes.

In addition, many areas of Illinois already boast one or more middle and high school educational efforts focused on the development of a skilled workforce for STEM employment. These include:

- Career & Technical Education programs that introduce students to high-skill, high-demand occupations, many within STEM fields of work. Our state investments in such services help maintain critical federal support for them.
- The Illinois Pathways series of public-private educational partnerships that empower students to explore STEM careers, aided with STEM Learning Exchanges that draw-

together schools, industries, nonprofits and state government.

- “Career academies” and other innovative high school models taking a “deeper learning” approach, focusing students’ attention on particular subjects and career skills, often including STEM-specific options.

These and similar initiatives merit greater investment to help them better meet the needs of both students and employers in our 21st-century economy.

## Conclusion

*Finding skilled workers will be a constant challenge for American businesses as they compete in an increasingly global marketplace. To keep our Illinois STEM workforce vibrant and thriving, we need to better-develop young learners who—one day—will be able to start the innovative companies and make the scientific breakthroughs that our country needs.*

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