The Investor's Case: Early STEM

What Science and Research Tell Us…

- Counter to long-held assumptions about young children's cognitive capacity, we now know that Science, Technology, Engineering, and Math (STEM) thinking begins in infancy!
- Before their first birthdays, children make inferences, draw conclusions about cause and effect, and reason about probability—the roots of future analytical and computational abilities. As early as 2 and 3, children have the potential to learn sophisticated math.
- Early STEM learning is essential to develop children's inherent tendencies into lifelong skills. It's not about the rote memorization of numbers; it's about hands-on, self-directed play that lets children explore their surroundings and solve problems.
- Positive early STEM experiences also build growth mindsets, helping diverse children see themselves as competent STEM learners and improving future academic performance.

Why It Matters…

- The tech revolution requires children to be fluent in STEM. Asking questions, developing and testing hypotheses, using algorithms, and analyzing data are critical skills to navigate the 21st century economy.
- Children's school-entry math ability is the also single strongest predictor of their later academic achievement—more so than reading or attention skills.
- And yet, gaps in STEM attitudes and abilities by income, race, and gender emerge early. Parents of 2 year olds speak to boys 2-3x as often about numbers as girls, who internalize implicit biases by preschool. Black, Latino, and Native American children lag behind their White and Asian peers in math by several months at kindergarten entry.
- These disparities only widen with age, resulting in the underrepresentation of minorities in STEM fields and a devastating squandering of human potential.

What "Good" Would Look Like…

- Our goal is to ensure that all children develop healthy STEM skills from birth. For babies, this means understanding basic cause and effect (e.g., shaking a rattle makes noise) and quantities (e.g., "more!"); for toddlers, recognizing shapes and sorting toys by color; and for preschoolers, counting to 20 and using maps to find hidden treasures.
- To achieve this goal, we must educate and equip the adults in young children's lives. Key steps include building adults' own growth mindsets toward STEM, strengthening their capacity to foster developmentally appropriate STEM learning, and guaranteeing access to culturally relevant materials.

Strategies for Scaled Impact….

Initiatives that promote families' involvement in young children's STEM education, leveraging both analog and digital tools	Approaches that disrupt stereotypes about STEM aptitude, fostering confidence and growth mindsets in adults and kids alike	Revamped pre- and in-service STEM training, accreditation, and supports for early childhood educators

Dig Deeper: Early STEM

Key Terms
- **Computational thinking**: the thought processes involved in solving problems, including pattern recognition and breaking complex issues into smaller steps
- **Constructive play**: hands-on, goal-oriented play using physical materials to make things
- **Scaffolding**: temporary supports that adults provide to help children develop skills and grow increasingly independent overtime

Key Research Studies
- Importance of early math, engineering, and science abilities for later academic achievement
- Why it's never too early to engage babies and toddlers in STEM
- How attitudes affect STEM achievement, and what adults can do to foster healthy mindsets in diverse children

Field Leaders
- Joan Ganz Cooney Center at Sesame Workshop promotes early STEM learning and digital wellbeing
- Stanford's DREME Network advances early math research to improve children's learning opportunities
- University of Chicago's Early Childhood STEM Working Group synthesizes knowledge about early STEM skill development and makes actionable recommendations

Promising Innovators
- MathTalk develops tools (from printed books to apps) that equip adults to engage children in early math learning
- codeSpark teaches children to create and express themselves through age-appropriate coding activities
- Learning Beautiful develops children's computational thinking without computers
- GoldieBlox makes engineering toys to boost girls' confidence in STEM
- *Visit our Venture Index for more innovators in this space!*

Key Funders
- Heising-Simons Foundation
- Carnegie Corporation
- National Science Foundation
- *To learn more, check out this national database of early STEM funders!*

Sample Metrics & Tools

METRICS
- Knowledge of numbers & counting
- Ability to identify shapes & spatial relationships
- Use of measurable attributes (e.g., size, length) to make comparisons

ASSESSMENT TOOLS
- Test of Early Mathematics Ability (TEMA-3)
- Early Learning Scale, Math/Science Domain

Want to learn more? Check out Promise's full resource library!
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