CHAPTER 1

LEARNING IN THE EARLY YEARS

This brief is a summary of the chapter of the same name written by Elizabeth Spelke and Kristin Shutts, in Bendini, Magdalena, and Amanda E. Devercelli, editors. 2022. *Quality Early Learning: Nurturing Children's Potential.* Human Development Perspectives. Washington, DC: World Bank.

Strong foundations for life-long learning

Quality Early Childhood Education (ECE) has the potential to set children on a trajectory to a lifetime of learning, but in order to maximize children's learning, ECE programs need to be informed by what science tells us about how children learn during the early years and what skills are most critical to support through quality ECE. Children are born to learn. They learn fast, flexibly and are able to generalize their learning to new situations far more effectively than the smartest products of contemporary computer science.[1] Children are biologically predisposed to learn by exploring the world and by engaging with others and have incredible capacities for exploration and discovery. These capacities set young children up for a lifetime of gaining and using knowledge – which are critical skills for successful and productive lives in all contemporary countries and cultures.

Children have an inherent interest in exploring and learning both from and about their environment and these tendencies continue into childhood and beyond. Learning is possible at all ages, and every child can benefit from a good education, but older children will advance more easily in later grades if they achieve a firm foundation for learning during the early years. The basic science of young children's learning sheds light on the conditions that allow all children to build that foundation, regardless of their nationality, culture, or material and social advantages or disadvantages. The science of young children's learning does not directly translate into recipes for school curricula, but is a rich source of ideas for improving early childhood education worldwide.

Developing knowledge systems for life-long learning

Children possess core cognitive and brain systems that help them identify and think about specific aspects of the world. These core knowledge systems function throughout life and are common to people living in diverse cultures, with each core knowledge area activated in specific regions of the cerebral cortex. The five core knowledge systems include learning about (i) *places,* (ii) *numbers,* (iii) *objects,* (iv) *people's actions and goals and social interactions,* (v) *communications and language.*

Learnings about places. Beginning in infancy, children are sensitive to the structure of the places that surround them. Toddlers use that structure to learn about the environments that they explore and the paths that will take them from one place to another. Both in school and out, children also use that structure to learn the diverse spatial symbols—from pictures to maps to written texts—that introduce children to worlds beyond their immediate experience.[2] These early spatial abilities are malleable, and activities that exercise them have been shown to enhance children's learning in school. For example, when a child practices locating objects in relation to oneself (e.g. in front of or behind), they build spatial abilities for word order that leads to future writing skills. When children exercise these abilities in contexts that encourage learning of mathematical language and symbols, children show both immediate and enduring gains in school learning.[3] Young children's biologically based spatial abilities should be nourished over the preschool and early school years, both to enhance their intuitive understanding of the world and to enhance their readiness for learning in school.

Learning about numbers. Infants and children are sensitive to numbers, such as the relative magnitudes of different sets of objects or the relative frequencies of different events. Building on this sensitivity, children learn both to choose among sets of objects, to predict the outcomes of events and to decipher the operations at the center of primary school mathematics. This system is often used in children's learning of the statistical properties of the environment, learning that is critical for predicting future events.[4] For example, children can compare two visuals of dot arrays and estimate which has greater numerosity. Activities exercising intuitive, approximate number abilities produce short-term enhancement in symbolic arithmetic, and can produce more enduring enhancements to children's school math learning.[5]

Learning about objects. At birth, children detect objects and follow their motions. Newborn infants are prepared to learn how objects move when they are and are not stably supported, and what happens when objects fall, collide or disappear behind other objects. From these beginnings, infants rapidly learn about specific kinds of objects and their behavior through their active exploration.[6] Over early childhood, they learn to manipulate, plan multi-step actions and infer the hidden properties of an object, such as its weight, from its interactions with other objects. Preschool children also use their abilities to categorize objects by their forms and functions to extend their number concepts and develop an intuitive understanding of exact arithmetic.[7]

Learning about people's actions and goals. By three months of age, infants are sensitive to people's actions and goals, which serves as a foundation for the development of their own motor skills and for their understanding of people's intentions and their mental states. They come to view other people as capable of action, which is developed hand in hand with their understanding of the actions and mental states.[8] Children's deepening understanding of their own and other people's actions and intentions helps children relate to others and prepares them for school.

Learning about social interactions, communication and language. Children are sensitive to people's social relationships, communication, language and mental states, the foundation for socially guided learning that is central to the development of children's knowledge, skills and values, both at home and in school. As early as three months of age, infants learn by observing the actions of the people around them.[9] These changes usher in a period in which children rapidly gain competence at learning from others by evaluating their social appropriateness as informers. Research in developmental cognitive neuroscience reveals rich interactions between social cognitive development, language development, learning to use symbols, and learning to read.[10] Stimulating environments promote language and literacy development, which are key for school readiness and enhance learning across all areas of knowledge.

Learning skills and tools for life-long learning

Children's learning in all areas of core knowledge depends on an arsenal of general learning skills and tools that support children's engagement with and learning about the world. Quality early childhood education can help children develop these skills and tools, which will form the foundations of their future success. Children's learning depends on the following skills: (i) *executive functions*, which regulate their attention and action planning; (ii) powers of *imagination*, which guide their play and their stimulation of actual or possible events; (iii) capacity for *metacognition*, especially children's understanding of what they and others do and do not know and how their knowledge and skills can grow; (iv) *motivation* to learn. These skills and tools can be enhanced by the experiences that homes and preschools can provide.

Executive Functions: focusing attention, planning and memory. Executive functions are critical for children to learn effectively and accomplish goals. Children need to be able to focus their attention, plan, remember what has gone before and switch flexibly from one activity to the next, from performing mental calculations to writing a paragraph. Better executive function skills are positively related to school readiness and school performance, as well as later life outcomes such as career success.[11]

Imagination: supporting insight, discovery, and creativity in children. Research on mental stimulation underscores the importance of play and other activities that stimulate children's imagination in ECE. Mental simulations support children's insights, discoveries and creativity. They play a vital role in children's learning because they allow children to manipulate and rehearse ideas that have been introduced to them, thereby enhancing learning and memory for material.[12] Pretending provides children the opportunity to practice expressing themselves and communicating with others.[13] Further, the intensity, quality and complexity of children's pretense is correlated with children's perspective-taking abilities.[14]

Metacognition: learning to learn. Knowing what you know, what you do not know and how to extend your knowledge and use it more effectively are critical tools for learning at all ages.[15] These metacognitive abilities can motivate learners to return to or explore material they have not mastered, and to move on from material they have already mastered and build on their knowledge in productive ways. Metacognition supports children's success in school and can be improved through direct skills training.[16]

Motivation: a key driver for learning. Children are naturally curious and ready to learn both on their own and from other people, but individual differences in motivation to learn are also evident in childhood. Children's motivation to learn varies depending on their level of interest and persistence, as well as the trust between teachers and learners. High levels of interest and persistence predict better academic and social achievement in school and both interest and persistence are correlated with parental behaviors.[17] Children learn best from competent, knowledgeable, and confident adults. They tend to trust adults whose language, culture, and interest are similar to those of the people in the child's social world.[18]

Ensuring early childhood education supports children's learning in core areas of knowledge to develop key skills

Cognitive capacities emerge in infancy and function throughout life. They are possessed by all children, and they can be harnessed to foster children's learning in all countries and cultures. To realize this promise, however, ECE must be sensitive to children's current level of understanding, take place in settings that address children's needs for food, rest and a safe, predictable environment and that engender children's trust in those who teach them. We know that young children explore and learn rapidly and spontaneously by building on five core areas of knowledge learning about places, numbers, objects, people and relationships. We can support their predisposition to learn by enhancing the development of four key sets of skills, from executive functions and imagination to metacognition and motivation to learn. Together, this knowledge can be harnessed to establish solid foundations for quality early learning for children everywhere.

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