in her care shapes every aspect of the teacher's role and guides the decisions a program makes about staffing. Because trusting relationships are so vital, programs make every effort to ensure that caregivers work in teams, with each team member responsible for a small group of children who remain in her care from one year to the next as long as they are enrolled in the program setting. The continuity of care that arises from this arrangement supports the growth of trusting relationships between child and caregiver, between caregiver and families, and between caregivers themselves. For specific continuity-of-care strategies and how they support infant and toddler development, see Chapters 2 and 3.

Key Developmental Indicators: What Infants and Toddlers Learn

When all the elements of active learning are in place — materials to explore bodily, with all the senses; opportunities to make choices; opportunities to communicate discoveries and feelings; and the ongoing, responsive support of trusted adults — what do infants and toddlers actually learn? To answer this question, caregivers and parents in HighScope settings turn to a set of guidelines called *key developmental indicators (KDIs),* which frame the content of early learning and development (see "HighScope Infant-Toddler Key Developmental Indicators" on p. 33).

Based on child observation, the HighScope KDIs for infants and toddlers provide a composite picture of what very young children do and what knowledge and abilities emerge from their actions. The six content areas that organize the KDIs parallel the dimensions of school readiness identified by the National Education Goals Panel (Kagan, Moore, & Bredekamp, 1995) and are also widely used as the basis for infant-toddler and preschool learning standards throughout the early childhood community. These six areas are **approaches to learning; social and emotional development; physical development and health; communication, language, and literacy; cognitive development;** and **creative arts.** Within these six content areas there are 42 KDIs that are appropriate and essential for infant and toddler learning.

The KDIs are also drawn from the same child development framework as COR Advantage (Epstein et al., 2014b), the birth-through-kindergarten child assessment tool that is used with the HighScope Curriculum and other developmentally appropriate infant-toddler programs.[3] A description of the KDIs and how teachers and caregivers use them follows. For more information on HighScope resources that support early learning of the KDIs in each content area, visit the HighScope online store at www.highscope.org.

Approaches to learning

Approaches to learning refers to how children go about acquiring knowledge

[3]Although there is not an exact correspondence, the infant-toddler KDIs described here are comparable to many of the COR Advantage assessment items.

HighScope Infant-Toddler Key Developmental Indicators

A. Approaches to Learning

1. **Initiative:** Children express initiative.
2. **Problem solving:** Children solve problems encountered in exploration and play.
3. **Self-help:** Children do things for themselves.

B. Social and Emotional Development

4. **Distinguishing self and others:** Children distinguish themselves from others.
5. **Attachment:** Children form an attachment to a primary caregiver.
6. **Relationships with adults:** Children build relationships with other adults.
7. **Relationships with peers:** Children build relationships with peers.
8. **Emotions:** Children express emotions.
9. **Empathy:** Children show empathy toward the feelings and needs of others.
10. **Playing with others:** Children play with others.
11. **Group participation:** Children participate in group routines.

C. Physical Development and Health

12. **Moving parts of the body:** Children move parts of the body (turning head, grasping, kicking).
13. **Moving the whole body:** Children move the whole body (rolling, crawling, cruising, walking, running, balancing).
14. **Moving with objects:** Children move with objects.
15. **Steady beat:** Children feel and experience steady beat.

D. Communication, Language, and Literacy

16. **Listening and responding:** Children listen and respond.
17. **Nonverbal communication:** Children communicate nonverbally.
18. **Two-way communication:** Children participate in two-way communication.
19. **Speaking:** Children speak.
20. **Exploring print:** Children explore picture books and magazines.
21. **Enjoying language:** Children enjoy stories, rhymes, and songs.

E. Cognitive Development

22. **Exploring objects:** Children explore objects with their hands, feet, mouth, eyes, ears, and nose.
23. **Object permanence:** Children discover object permanence.
24. **Exploring same and different:** Children explore and notice how things are the same or different.
25. **Exploring more:** Children experience "more."
26. **One-to-one correspondence:** Children experience one-to-one correspondence.
27. **Number:** Children experience the number of things.
28. **Locating objects:** Children explore and notice the location of objects.
29. **Filling and emptying:** Children fill and empty, put in and take out.
30. **Taking apart and putting together:** Children take things apart and fit them together.
31. **Seeing from different viewpoints:** Children observe people and things from various perspectives.
32. **Anticipating events:** Children anticipate familiar events.
33. **Time intervals:** Children notice the beginning and ending of time intervals.
34. **Speed:** Children experience "fast" and "slow."
35. **Cause and effect:** Children repeat an action to make something happen again, experience cause and effect.

F. Creative Arts

36. **Imitating and pretending:** Children imitate and pretend.
37. **Exploring art materials:** Children explore building and art materials.
38. **Identifying visual images:** Children respond to and identify pictures and photographs.
39. **Listening to music:** Children listen to music.
40. **Responding to music:** Children respond to music.
41. **Sounds:** Children explore and imitate sounds.
42. **Vocal pitch:** Children explore vocal pitch sounds.

and skills. Infants and toddlers approach learning in different ways, and each child brings a unique set of attitudes, habits, and preferences to his or her explorations. Caregivers must consider this individuality, along with the developmental trends of the entire group, to support early learning.

Infants and toddlers have an entire world to learn about. How they go about this process depends in part on innate temperamental differences (Chess & Thomas, 1996). Equally important is whether and how the adults who teach and care for them encourage their exploratory behavior. For example, to what extent do adults welcome children's independence and curiosity? How safe and inviting do they make their homes and child care settings? Culture also influences how young children express their innate motivation to learn. For example, does a culture value personal initiative or group cohesion? Does it regard shyness as a sign of academic competence or depression and withdrawal (Carlson, Feng, & Harwood, 2004)?

This toddler is doing something for herself as well as expressing initiative — by adding applesauce to her cornflakes!

The combined interaction of past and present "nature" (biology and temperament) and "nurture" (interactive experiences) in turn determines how young children are likely to approach learning in the future. The attitudes and behaviors they establish early on will affect their learning throughout their school years and into adulthood. A supportive active learning setting enables infants and toddlers to develop constructive approaches to learning. In such settings, adults share children's excitement about their own discoveries and initiatives as children explore and solve problems with increasing understanding and flexibility. In the process, children develop traits associated with "executive function," the higher-order abilities that will eventually allow them to successfully organize and complete tasks (Diamond, 2006). With adult support, infants and toddlers begin to construct an image of themselves as capable people who can both influence and respond to

their immediate world, as demonstrated in the following KDIs.

1. **Initiative**: *Children express initiative.* For example, over the course of her development, Makiko turns toward or away from her caregiver or an object; initiates or avoids physical contact with a caregiver or child; selects or rejects a particular toy or object to explore; moves with persistence until reaching a chosen person or object; says "No!" to some choices or proposals from others; and expresses her choice or intention in words ("Me, kitty!" "Uppy, uppy!" "Me do it!").

2. **Problem solving**: *Children solve problems encountered in exploration and play.* For example, over the course of her development, Kelly moves her eyes, head, or hand to better see or touch a desired object; repeats an action to make something happen again; moves herself or an object to find someone or something that has disappeared from sight; makes varied attempts to solve a simple problem; and verbally identifies a problem before attempting to solve it ("Wagon stuck!").

3. **Self-help**: *Children do things for themselves.* For example, over the course of his development, Dante cries to express a need; holds his bottle or a clean diaper to assist in feeding or diapering; uses his fingers for eating; attempts a simple self-help task, such as drinking from a cup or putting on an article of clothing; and does some part or all of a task, such as washing his hands, using the toilet or potty, or dressing.

Social and emotional development

Social-emotional development begins at birth and continues into adulthood. By observing how they orient themselves to see or hear, we know that babies are interested in one another from as early as two months of age. Young infants get excited by the sight of other babies and, given the opportunity, stare avidly at one another. In the middle of the first year of life, infants monitor the emotional expressions of significant others and change their behavior accordingly (e.g., approaching a smiling caregiver or turning away from one who is frowning). These early signs of *social referencing* are a precursor of the empathy that appears soon after in toddlerhood and have their roots in both genetic factors (the social dispositions infants are born with) and environmental experiences (children's first social encounters with the world) (Emde, 1998).

Attachments to parents and other caregivers determine how young children see and feel about themselves (see the section on trusting relationships, p. 28). Their early self-image, in turn, determines how they approach learning and human relationships throughout their school years and the rest of their lives. In other words, children's inner emotional well-being affects their outward-directed social selves. Early childhood researchers Lilian Katz and

A key factor in a young's child social-emotional development is attachment to the adults who care for him or her.

Diane McClellan (1997) note that "socially competent young children are those who engage in satisfying interactions and activities with adults and peers and through such interactions further improve their own competence" (p. 1).

Social-emotional growth in the early years affects, and is affected by, virtually every other aspect of children's development. Infants are born with innate temperaments and individual dispositions that affect how they approach and deal with interpersonal and educational experiences. Toddlers' expanding use of language helps them express their wishes to others. They struggle with the competition between the "me" of their personal desires and the wish to be part of the "we" of the group. While very young children still focus primarily on their own needs, they are also increasingly sensitive to the needs and feelings of others. In fact, research shows infants and toddlers are more capable of empathy than scientists originally thought (Zahn-Waxler, Radke-Yarrow, Wagner, & Chapman, 1992).

In recent years, an emphasis on academic learning has overtaken a recognition of the importance of social and emotional development in young children. Fortunately, this imbalance is being corrected by landmark reports (such as *From Neurons to Neighborhoods* [National Research Council, 2000]) and position statements from organizations such as the American Academy of Pediatrics (AAP; Ginsburg, 2007). The AAP advises its members that "as parents choose child care and early education programs for their children, pediatricians can reinforce the importance of choosing settings that offer more than 'academic preparedness.' They should be guided to also pay attention to the social and emotional development needs of the children" (p. 188).

The importance of play is also undergoing a revival, led by such groups as the Alliance for Childhood (Miller &

Almon, 2009), who decry its disappearance from early childhood settings in favor of instruction time. While this trend is more pronounced in preschool than in infant-toddler settings, the emphasis on ever-earlier stimulation to teach children letters and numbers is a cause for alarm. As psychologists Edward Zigler and Sandra Bishop-Josef (2009) point out, "the recent attack on play contradicts sound developmental theory" (p. 8).

Through playful interactions with adults and peers, children practice and extend the limits of their abilities, thereby developing a wide range of cognitive skills. As they master new tasks and initiate and respond to overtures with others, they gain a sense of themselves as social beings. In these ways, play promotes the social-emotional skills that underlie and facilitate learning across all developmental domains.

The first step in social and emotional development is differentiating oneself from others, that is, knowing that there is a "me" apart from "you" and "we." An infant or toddler, through actions with objects and interactions with trusted caregivers, gradually begins to understand that he or she exists as a separate and individual being — *There's me and not me, my hand and Mommy's hand, my skin and the diaper, my foot kicking the squeaker toy, me crying and other babies crying.* With this physical self-awareness comes a child's sense of him- or herself as an independent actor and initiator — *I can do it,* and, later, *I can do it myself!*

Infants and toddlers learn how human beings act and treat one another through their day-to-day interactions with parents, other family members, caregivers, peers, and other adults. When they grow up surrounded by parents and caregivers who care for them in a warm, respectful manner, children learn to trust themselves and others, to be curious, and to explore new learning challenges and adventures. These early social relationships influence their approach to people in later life. Infants and toddlers who are treated well, for example, see themselves and others as "friend-worthy"; they remember and build on their affirming social experiences as they make friends throughout their school years and in adult life — even as they form relationships with their own children.

Infants and toddlers express their sense of themselves and their understanding of social relationships through the following KDIs:

4. **Distinguishing self and others**: *Children distinguish themselves from others.* For example, over the course of his development, Alec puts his own fingers, thumb, or toes in his mouth; smiles, coos, babbles at, or touches his image in a mirror; plays with his own hands and feet; claims something or someone as "mine"; and spontaneously identifies himself in a photograph or mirror.
5. **Attachment**: *Children form an attachment to a primary caregiver.* For example, over the course of his development, Ricardo snuggles and

cuddles in his caregiver's arms; gazes at the caregiver and exchanges smiles, tongue-clicks, coos, strokes, and pats with her; seeks the comfort of her lap or touch; engages with her in playful give and take; and summons her by name or tells her what's on his mind ("Mimi! Read book!").

6. **Relationships with adults**: *Children build relationships with other adults.* For example, over the course of her development, Tamara, in the presence of a trusted teacher, responds to the sounds or gestures of another adult; plays peekaboo or simple games with another adult; initiates contact with another adult; and brings her toy to or starts a conversation with another adult.

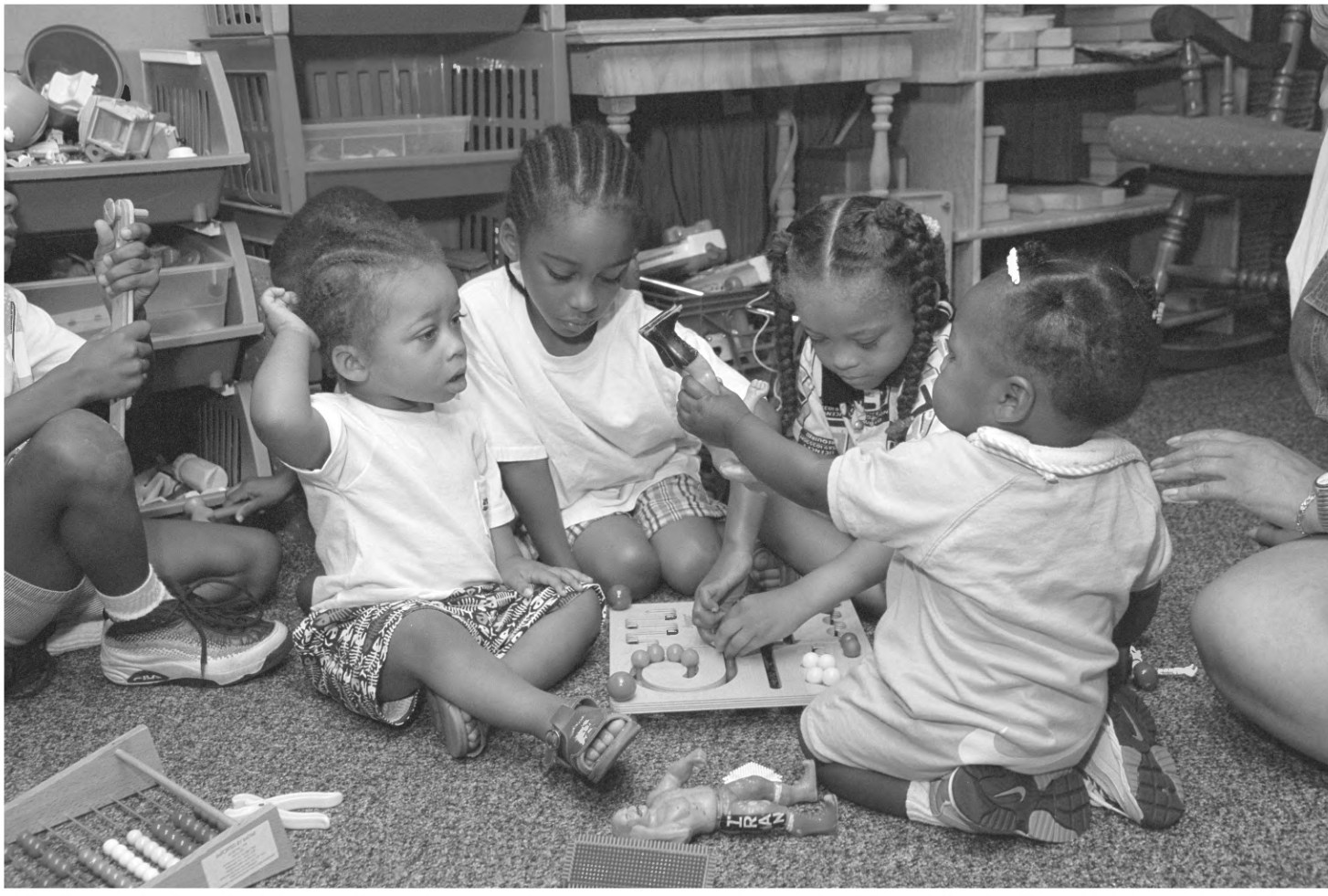
7. **Relationships with peers**: *Children build relationships with peers.* For example, over the course of his development, Nathan watches another child; exchanges sounds or gestures with a peer; physically seeks the company of a peer; pats, hugs, or brings his toy to a peer; and addresses a peer by name or talks to a peer.

8. **Emotions**: *Children express emotions.* For example, over the course of her development, Emily cries, smiles, frowns, wiggles all over with pleasure; stiffens or turns away from something or someone; laughs at, clings to, pushes away, or hugs someone or something; shows pleasure at being able to make something work or complete an activity or solve a problem; shows frustration with a problem; and names her emotion ("I sad!").

9. **Empathy**: *Children show empathy toward the feelings and needs of others.* For example, over the course of his development, Leon smiles when his caregiver smiles or tenses when the caregiver tenses; cries at hearing another child cry; seeks comforting (by sucking his thumb or seeking a caregiver's attention) when another child is in distress; brings a comfort item (blanket, stuffed animal) to a child who is in distress; hugs Rochelle who is crying because her mom has left; and talks about an emotion displayed by another child ("Baby cry").

10. **Playing with others**: *Children play with others.* For example, over the course of her development, Olivia watches another child play; shows pleasure in playing peekaboo, "This little piggy…," and other simple social games; seeks the company of a peer and plays alongside; plays hide-and-find the teddy bear; chases or is chased by another person; and watches and joins the play of another child by engaging in similar actions or using similar materials.

11. **Group participation**: *Children participate in group routines.* For example, over the course of his development, Jesse kicks his legs at a mobile above his head while his caregiver changes



In this child care home, toddlers have the opportunity to make friends with children of different ages.

his diaper; squeezes and pats play dough at choice time; eats lunch at a low table with other toddlers and puts his dish in a tub when he is finished; and sways and claps his hands to the music at group time.

Physical development and health

For sensory-motor infants and toddlers, physical movement plays a major role in all learning:

> *Babies learn through movement. As they move their arms, legs, and other body parts and encounter the world through touching and being touched, babies become more aware of how their bodies move and feel. They soon discover that they can change what they see, hear, or feel through their own actions — how delightful to kick, to see the mobile move, and be able to do it again! (Zero to Three, 2009, p. 55)*

Physical development and health are considered dimensions of school readiness because of the strong associations found between maternal and child health and subsequent school performance (Kagan et al., 1995). Factors such as prenatal care and early nutrition affect brain development, which affects every other area of growth and learning. Maintaining good health and developing physical skills have many benefits for very young children. Using their bodies to create effects — at first by accident and later with intention — is both gratifying and instructive. Through their actions, infants and toddlers learn what their bodies are capable of. They also explore simple laws of physics (e.g., *If I let go of something I'm holding, it falls down*). As they maneuver themselves and objects through space, they develop an understanding of the spatial relationships that underlie basic principles of geometry (see Cognitive development on p. 46).

The proposition that young children need to be "taught" to develop physically may seem odd. We assume this type of growth happens on its own, provided children have adequate nutrition and ample room to move in a safe environment. However, there is more to physical development than natural maturation. Professor Stephen Sanders (2002), a leader in the development of early childhood movement curricula, notes that "movement programs enhance play, and play provides children with the opportunity to practice movement skills in a variety of contexts. Play alone, however, is not a substitute for helping children develop physical skills.…Some structuring of physical activity is necessary to help children maximize their movement experiences" (p. 31).

Research shows that young children who develop appropriate large- and fine-motor skills, such as balance and hand-eye coordination, do better in school than those who are less physically adept (Pica, 1997). Connecting movement to sound — for example, moving to the steady beat of music — may be related to the sense of "timing" — the tempo or natural flow of words — observed in fluent readers (Weikart, 2000). Physically competent children are also more likely to be socially accepted and given further opportunities to hone their skills through interactions, such as movement games.

By contrast, a lack of physical skills can lead to a general lack of confidence and may make children less willing to undertake academic and social challenges. Even toddlers and preschoolers are sensitive to "clumsiness" in peers and may reject them (Sanders, 2002). The degree to which individuals accept and care for their bodies and respect and appreciate their physical capabilities, thus, begins in infancy and has implications for self-esteem and overall functioning throughout their lives. Parents and teachers play a critical role in starting young children on a path that follows a healthy rather than problematic trajectory.

Children's emerging sense of themselves as independent actors and doers is strongly connected to their ability

to control their motions, communicate through the language of gesture and action, handle objects with ease, and move at will from place to place. The importance of providing infants and toddlers with safe and ample space in which to exercise their inherent desire to move cannot be overstated. When infants and toddlers have the space and freedom to move without constraint (e.g., not confined in seats, swings, cribs, and stationary play centers), they can learn their own physical strengths and limits and practice movement patterns until mastery propels them to the next physical challenge — *I'm really good at standing up and holding on. Now I'm going to try it without any hands!*

Because movement is so central to sensory-motor learning, a young child's success exploring the physical world sets the stage for later explorations with people, objects, actions, and ideas. Here are the KDIs teachers will see infants and toddlers mastering as they explore with their bodies:

12. **Moving parts of the body**: *Children move parts of the body (turning head, grasping, kicking).* For example, over the course of his development, Juan lies on his back and turns his head, waves his arms, reaches or grasps or kicks; holds an object with his hands and feet; holds an object and passes it from one hand to another; rolls or throws a ball toward an object or person; kicks a ball; and uses small objects with precise coordination (pulls up a zipper, strings large wooden beads).

This young infant is moving parts of her body: First, she lifts her legs; then grabs her feet; and, finally, tastes her toes!

Young children gain phonological awareness (recognizing the sounds of language) by repeatedly hearing familiar nursery rhymes. Phonological awareness is important for later literacy development.

13. **Moving the whole body**: *Children move the whole body (rolling, crawling, cruising, walking, running, balancing).* For example, over the course of her development, Allison wiggles and squirms; rolls over; sits up unassisted; creeps, crawls, scoots, and pulls up to a standing position; cruises by holding on to furniture and pulling herself along; balances and walks unassisted; and runs, walks down stairs, and climbs down a climber by herself.

14. **Moving with objects**: *Children move with objects.* For example, over the course of his development, Lukas sets an object in motion by kicking or batting; shakes, bangs, drops, and rolls things; moves an object along while creeping, crawling, scooting, or cruising; carries, pushes, or pulls an object while walking unassisted; and propels himself on a wheeled toy.

15. **Steady beat**: *Children feel and experience steady beat.* For example, over the course of her development, Fiona

steadily shakes a rattle; pounds on the table with a spoon; bounces on her bottom while her caregiver sings a song; and pats or sways to the steady beat of a familiar chant.

Communication, language, and literacy

Infants communicate with movement and sound from birth. Parents, family members, caregivers, and teachers cuddle, coo, and play with infants and also talk, sing, and read to them. Within this interactive social milieu, infants and toddlers learn to talk and lay the foundation for learning to read.

According to the National Reading Panel (2000), successful literacy development depends on four factors: *comprehension* (deriving meaning from action, speech, and text), *phonological awareness* (recognizing the sounds of language), *alphabetic knowledge* (understanding the relationship between letters and their sounds), and *concepts about print* (knowing how books and other printed materials work). Early childhood specialist Rebecca Parlakian (2004) admits that "when one imagines an infant or toddler, it is often difficult to conceptualize what early literacy 'looks like' for such young children" (p. 37). Observing their behavior can help us to understand.

In infants and toddlers, communication, language, and literacy are intertwined. Emerging literacy skills depend on language, and language, in turn, is driven by the child's need to communicate. Speaking, reading aloud, and singing to infants and toddlers stimulates their *comprehension* of and use of language. Although children, on average, begin to speak at around 18 months, they understand what people are saying to them long before that (Bardige, 2009). The more language addressed directly to them they hear, the more words they understand and use themselves when they do talk.

Studies repeatedly demonstrate the importance of a child's oral language — especially the number and variety of vocabulary words he or she knows — in learning how to read. Researchers Betty Hart and Todd Risley (1999) found that the more parents talked with their children, the more rapidly their children's vocabulary grew; the larger a child's vocabulary at kindergarten entry, the better his or her literacy skills later in school. Of particular value was "non-business" talk, that is, conversations that were not specifically aimed at getting a child to "do" something.

The first words babies typically learn to say are nouns (e.g., "ma" or "da"). Recent studies by neuroscientists at Carnegie Mellon University on how the brain encodes nouns offers some provocative findings on one of the ways infants may be hard-wired to acquire such vocabulary (Just, Cherkassky, Aryal, & Mitchell, 2010). The research team discovered that the adult brain's "dictionary" organizes nouns using three fundamental human factors: how you physically interact with it, how it is related to eating, and how it is related to shelter. Given that infants learn about the world through action and often explore

things by putting them in their mouths, one might speculate that mouthing objects contributes to early language acquisition at the neural level. Research is needed to confirm this connection between these early learning behaviors and the formation of the brain structures needed for language, but it is an intriguing hypothesis for neuropsychologists to investigate.

In addition to developing vocabulary, participating in conversation also promotes *phonological awareness,* that is, recognition of the distinct sounds of language, the smallest of which is the phoneme (e.g., the /b/ sound in the word *ball* or the /p/ sound in the word *lip*). As infants and toddlers engage in conversation (using the gestures, sounds, and words at their disposal), they hear the sounds that make up their home language. In fact, when they hear lots of words and begin to use some themselves, they mentally organize these words based on their initial sound. For example, they store all the words that start with the /b/ sound together, all the words that start with the /c/ sound together, and so forth. This mental lexicon helps them call forth the word "dog" when they see the family dog and "da" when they see daddy (Walley, 1993). As they hear nursery rhymes over and over and begin to join in saying them, infants and toddlers hear and repeat words that rhyme like *cat* and *hat* that end in the same /at/ sound.

Later on, infants and toddlers who have heard lots of language and stored lots of words by sound are more likely to gain phonological awareness rapidly and with greater ease than children who have heard so few words from birth to school age that they have had not needed to sort them by sound into a mental dictionary. Because phonemes are represented by the letters of the alphabet, an awareness of phonemes is key to understanding the *alphabetic principle,* which is the idea that words are made of letters and each letter or letter combination has its own sound. This understanding of letter-sound relationships is the foundation of learning how to read. Research shows phonemic awareness and alphabetic knowledge predict whether a child will learn to read during the first two years of school (National Reading Panel, 2000).

The last factor that determines later reading success is *print knowledge,* recognizing the many uses of printed words and how print works (e.g., in English, print is read from top to bottom and left to right, books are read front to back, etc.). For infants and toddlers, print knowledge begins with exploring books and seeing print used in everyday activities (e.g., parents writing a grocery list). Toddlers also begin to incorporate other print props (such as newspapers and writing tools) in their play.

Recognizing environmental print on signs, labels, household products, and play items further contributes to a young child's emerging literacy skills. Toddlers, for example, can read familiar symbols and logos on restaurant signs or supermarket shelves. Infants and toddlers establish these foundations for later literacy when

they handle books, look at and recognize pictures in books, connect pictures and stories, are read to, and pretend to read books themselves (Schickedanz, 1999).

Social beings from birth, babies want to connect with other human beings to create a context of meaning and belonging. This motivation fuels the development of language and literacy skills. Infants and toddlers communicate their feelings and desires through an increasingly complex system of cries, motions, gestures, and sounds and are acutely attuned to the body language and the warm, gentle voices of parents and caregivers. Infants and toddlers listen and respond to the organized sounds of language. They initiate social interaction with trusted caregivers and peers and, in the process, construct a set of useful ideas: that communication is a give-and-take process; that you don't need words to convey and understand safety, acceptance, approval, and respect; that there are lots of ways to make your point; and that trusted people are interested in what you have to communicate and say.

In short, infants and toddlers, like all human beings, are "meaning makers" (Wells, 1986). They weave gesturing, making sounds, speaking, watching, and listening into a two-way communication system that draws them into the social community and enables them to participate as contributing members. Evidence that they are learning to communicate is shown by their engaging in the KDIs described here:

Conversations with infants and toddlers are often nonverbal. This toddler and his caregiver communicate their mutual interest and regard through their closeness, expressions, and gestures.

16. **Listening and responding**: *Children listen and respond.* For example, over the course of his development, Mario turns toward a voice; establishes eye contact and smiles in response to a caregiver's voice; imitates a vocal sound or gesture; turns around when his name is spoken; and acts on a request or a statement (e.g., goes to the coat rack when the caregiver says, "It's outside time!").
17. **Nonverbal communication**: *Children communicate nonverbally.* For example, over the course of her development, Katelynn watches, initiates physical contact with, or points to a person, animal, or object; shows

an object to a caregiver or child; and guides a caregiver to an object, a place, or another person.

18. **Two-way communication**: *Children participate in two-way communication.* For example, over the course of his development, Taylor looks directly at a person's face and coos or smiles; takes turns exchanging sounds or gestures with another person; uses babbling and words to participate in a conversation-like exchange with another person; uses words to make a request or ask a question; and sustains a verbal interchange with another person by taking turns talking.
19. **Speaking**: *Children speak.* For example, over the course of her development, Zongping makes cooing sounds; babbles; gestures by signing; uses a word or phrase to refer to a person, animal, object, or action; and utters simple sentences.
20. **Exploring print**: *Children explore picture books and magazines.* For example, over the course of his development, Matthew gazes at a picture book; touches, grasps, or mouths a book; turns the pages of a book; and points to or names what is pictured in a book.
21. **Enjoying language**: *Children enjoy stories, rhymes, and songs.* For example, over the course of her development, Luan becomes still, vocalizes, or bounces upon hearing a story, rhyme, or song or upon being rocked or patted to the steady beat of a rhyme or song; participates in pat-a-cake or a similar word game, fingerplay, or singing game; asks to hear a story, song, or rhyme; and sings or joins in on a story, song, or rhyme.

Cognitive development

Early cognitive development encompasses many areas of learning. Young children explore objects to discover their basic physical properties and investigate concepts that will later form the foundations of mathematical thinking in quantity, space, and time. Each of these areas of cognitive development, and their associated KDIs, are described below.

Exploration

Everything in the world is new for infants and toddlers. Driven by what child psychologist Selma Fraiberg (1959) called an intense hunger for sensory experience, infants and toddlers explore objects to find out what they are and what they do. Beginning with haphazard batting and kicking at things, they gradually expand their exploratory actions and organize their findings into basic working concepts: *That tastes good. This is too cold. That noise scares me. This blanket feels soft. Grass tickles my feet. Spoons make noise. Balls roll away. I can bang with a spoon, and I can bang with a rattle. I can carry stones in a bucket. The wagon moves, and the couch stays still. My blanket feels good in my mouth, and*

sand feels terrible in my mouth. Because their daily lives are caught up in exploration and discovery, infants and toddlers are like amateur scientists. In *The Scientist in the Crib,* authors Alison Gopnik, Andrew Meltzoff, and Patricia Kuhl (2001) refer to the infant as "the most powerful learning machine in the universe" (p. 1).

As infants and toddlers explore objects to discover their characteristics and how they behave, we can observe the following KDIs:

22. **Exploring objects**: *Children explore objects with their hands, feet, mouth, eyes, ears, and nose.* For example, over the course of his development, Aidan looks at objects and listens to things that make noise; reaches for and grasps objects; bats at, kicks at, holds, mouths, tastes, pats, waves, turns, drops, and carries objects; uses two objects together, one in each hand; and uses an object as a tool to complete a task (shoveling sand into a bucket, pounding dough with a mallet).
23. **Object permanence**: *Children discover object permanence.* For example, over the course of her development, Autumn turns toward a familiar object or person; visually follows an object as it drops, rolls, or moves away; searches for a hidden object; and initiates hiding and peekaboo games.
24. **Exploring same and different**: *Children explore and notice how things are the same or different.* For example, over the course of his development, Marwan shows preference for low rather than high voices, slow rather than fast music, or one pacifier rather than another; repeats a satisfying action or sound; selects like things from a group of toys or materials (all the long-handled objects) to mouth

Touching and mouthing are common ways for babies to explore and learn about objects.

and explore; selects like objects to use for some purpose (filling a bag with just plastic animals or just pine cones); uses the same word to name similar objects (e.g., calls all four-legged animals "dogs"); and gathers two or more similar objects from a variety of objects.

Quantity

The early explorations of infants and toddlers also lay the foundation for later discoveries about mathematics. Educational researcher Herbert Ginsburg and his colleagues were amazed at how much of very young children's spontaneous play involves mathematical activities and thinking (Ginsburg, Inoue, & Seo, 1999). Professor Art Baroody (2000) describes how young children build mathematical knowledge from their daily activities and the lessons they derive from them — watching the level of juice in the cup go up when more is "added" and go down when each sip is "taken away," seeing if the tower will still stand when "one more" block is added.

Although the National Council of Teachers of Mathematics (NCTM, 2000) has issued learning standards for children beginning in prekindergarten, mathematics knowledge and skills are rooted even earlier in a child's development. For example, there is evidence that rudimentary ideas about quantity, such as concepts of *oneness* (a single unit or quantity of one) and *invariance* (a quantity stays the same unless it is added to or subtracted from), appear in preverbal infants based on their direct experiences with these concepts (Brannon, 2002). Objects come singly or in groups of various sizes; materials come in various quantities. If there is a single object, or a little bit of something, there can also be "more!" Thus, young children have a sense of quantity when they point to the table and say "mo" for more grapes at snacktime. They experience the number of things when they count "One, doh, twee" while placing beans into a bottle one at a time. In these direct experiences with quantity, we see the following KDIs:

25. **Exploring more**: *Children experience "more."* For example, over the course of her development, Tierney prolongs exchanging smiles, coos, or gestures with someone; handles one object after another from a group of objects; selects one object (to put into her mouth or into a container), then another, and another; asks for "more" of something (cereal, juice, blocks); and gathers or hoards a number or quantity of something (filling her pockets with several small animals, pouring more and more sand into a bucket).
26. **One-to-one correspondence**: *Children experience one-to-one correspondence.* For example, over the course of his development, Daimon puts his thumb or pacifier into his mouth; holds one object in each hand; attempts to put on a hat, or to put a sock or shoe on each foot, or to put a mitten on each hand; and puts a toy person in each toy car or in each toy bed.

This young child is exploring one-to-one correspondence by putting one marker cap on each finger.

27. Number: *Children experience the number of things.* For example, over the course of her development, Shannon prolongs her gaze at a small collection of objects when the number of objects changes (from one ball to two or from three wooden spoons to two); anticipates seeing or finding the one, two, or three things that have recently disappeared (continues to search for the other shoe after finding one); and says a number name while pointing to each of several objects ("One, two, twee" or "One, two, seben") or in reference to objects ("Two doggies!").

Space

Young children are also laying the foundation for geometry when they explore shapes and space. They learn the properties of basic shapes (sides, corners, curves) by playing with wooden or felt circles, triangles, and rectangles. Seeing that the small wooden block fits inside the small plastic container — but the big wooden block doesn't — is the beginning of discovering rules about spatial relationships. Raising their hands to a caregiver and saying "Up!" shows young children have a preliminary sense of direction. Looking on

Climbing up steps on this play structure gives this young toddler a whole new view of her learning environment.

the shelf for their favorite book is evidence of a simple cognitive map in their heads with one or two familiar locations.

In their active learning journeys, infants and toddlers also gain direct bodily awareness of space. Babies inhabit the space immediately around them. With increasing activity and mobility, their sense of space expands as they learn to navigate on their own from one interesting place to another. They experience proximity (nestling in a caregiver's arms), separation (crawling across the room to the steps they want to climb), and enclosure (climbing into a sturdy box). They learn to orient themselves and objects in space so things are easier to see or handle. They attempt to solve the spatial problems they encounter in exploration and play: *I got into this box. Now I have to get out!* Through their own actions, and by actively exploring materials, young children thus begin to develop an understanding of the spatial concepts in these KDIs:

28. **Locating objects**: *Children explore and notice the location of objects.* For example, over the course of his

development, Steen watches a moving object; moves closer to a desired object; moves one object to gain access to another; locates a desired object for exploration or play; and retrieves an object he has not seen for a while (remembering and getting a sweater from his tub or personal storage area).

29. **Filling and emptying**: *Children fill and empty, put in and take out.* For example, over the course of his development, Jonathan drinks from a bottle; knocks over a cup of water or a tin of large wooden beads; takes toys off a shelf or out of a cupboard; dumps toys out of a can, box, or basket; puts objects into a box, bag, purse, or wagon; fills a cup with water; and fills and empties a container of sand, corks, and rocks.
30. **Taking apart and putting together**: *Children take things apart and fit them together.* For example, over the course of her development, Latrisha grasps and pulls on objects; waves, shakes, and bangs objects; opens books and doors; takes the tops off boxes; takes off an article of her clothing and attempts to put it back on; fits shapes into shape sorters, corks into bottles, and large pegs into pegboard holes; and puts together simple puzzles.
31. **Seeing from different viewpoints**: *Children observe people and things from various perspectives.* For example, over the course of her development, Charity observes people and things from a caregiver's arms, from the floor, from the couch, or while lying on her back, front, or side; observes as she sits on the floor or grass or on a pillow, chair, or carton; observes as she crawls across the floor or grass, under the table, into a carton, or up a ramp; and watches people and things from an upright position, from perches she has climbed onto, while swinging on a swing, or while bent over to look backward between her legs.

Time

Finally, over the course of repeated routines and explorations with materials, very young children begin to develop concepts about time. For infants and toddlers, time is now, this moment, the present. In a baby's sensory-motor experience, observed psychologist John Philips (1969), "time is limited to that which encompasses a single event, such as moving a hand from leg to face, feeling the nipple and beginning to suck, or hearing a sound and seeing its source" (p. 20). Babies' internal sensations shape what happens in the present. For example, hunger signals eating and drowsiness signals sleeping. Gradually, children learn to anticipate immediate events from external cues: The sound of running water signals bath time, the sound of Daddy's voice signals play time, and the jingling of keys means going somewhere in the car. Some older toddlers can begin to anticipate and express what they are going to do next: "Balls!" (Play with balls.) "Go ducks!" (Go see the

ducks.) As infants and toddlers tangle with basic notions of time, the following KDIs emerge:

32. **Anticipating events**: *Children anticipate familiar events.* For example, over the course of her development, Leila brightens, becomes still, or turns at hearing a familiar voice or sound; performs a particular action at the sight of a particular person or object (smacking her lips upon seeing food or a spoon or crying upon seeing Mom or a caregiver put on a coat); sees a familiar sight and says what will happen next (saying "Eat, eat!" upon seeing the lunch trays arrive); puts herself in position for the next event (going to the window and looking for Mom at the end of the day); and describes her immediate intentions in words ("Wash hands," "Play trucks").

33. **Time intervals**: *Children notice the beginning and ending of time intervals.* For example, over the course of his development, Abdul turns away at the end of a feeding; stops an action to attend to an interesting sound, smell, action, or sensation; uses words to indicate the end of an event ("Down!" "All gone!"); and uses a word to indicate a past event (looking out the window, remembering a dog from the day before, and saying "Doggy").

34. **Speed**: *Children experience "fast" and "slow."* For example, over the course of her development, Lydia rolls, bounces, rocks, bangs, and shakes things at various rates of speed and crawls, cruises, walks, and climbs at various rates of speed.

This child is experiencing speed. She is going down the slide faster, with a helpful push from a friend.

35. **Cause and effect**: *Children repeat an action to make something happen again, experience cause and effect.* For example, over the course of his development, Giles learns to suck; watches an object after accidentally setting it in motion; repeats a simple action to make it happen again; and repeats a simple sequence of actions to make something happen again (stacking several blocks, knocking them down, retrieving them, and beginning again).

Creative arts

From their ongoing sensory-motor explorations, infants and toddlers accumulate a critical body of direct experience. They begin to understand, for example, what a blanket is, how it feels, and how to wrap it around themselves for warmth and comfort, and they discover that it continues to exist even when they cannot see it. Gradually, with repeated blanket experiences, they begin to form a mental image of a blanket, that is, to see a blanket in their mind's eye when no actual blanket is in sight. This process of beginning to internalize, or mentally picture, something is the child's first experience with what is called *representation.*

The ability to represent allows the child to change a concrete experience into another form, to transform it. Written language is one type of transformation; that is, experiences can be represented in words. The creative arts are another form of representation because they allow us to transform experiences and ideas from one realm into another through painting, music, movement and dance, and dramatic role play.

Early development in the creative arts follows several trajectories. In their book *Supporting Young Artists,* Ann S. Epstein and Eli Trimis (2002) describe these developmental progressions:

- *From accidental or spontaneous representation to intentional representation* For example, the younger child makes a noise and decides it sounds like a dog. The older child pretends to be a dog and deliberately makes a "barking" sound.
- *From simple to elaborated models* For example, the younger child listens to music and creates a one-step movement. The older child creates a movement with two steps, in sequence.
- *From random actions to relationships* For example, the younger child makes marks on the page. The older child makes lines or shapes and considers how they "go together" on the page.

Engaging in extensive sensory-motor experience — acting on objects with their whole body and all their senses and repeating these actions at will — enables very young children to experience representation in many forms — to imitate the actions of others, interpret pictures and photographs of actions and objects they have experienced, and begin to use actions and materials to show or represent something they know about their world. Infants and toddlers build on their direct experiences and experiment with the beginnings of creative representation in the following KDIs:

36. **Imitating and pretending**: *Children imitate and pretend.* For example, over the course of his development, Nicholas watches and listens to another person; imitates the sounds, facial expressions, or gestures of other people; tries to imitate another person who is eating with a spoon or drinking from a cup; repeats the sounds or actions of another person, an animal,

This toddler paints his hand as well as his caregiver's hand while exploring finger paints.

or an object; and uses one or more objects to stand for something else (uses a basket for a "hat" or some blocks for "pieces of toast").

37. **Exploring art materials**: *Children explore building and art materials.* For example, over the course of her development, Mai Lee explores her own hands; reaches for and explores blocks, clay, dough, and paper; makes marks and scribbles; stacks several blocks; squeezes clay or dough; and labels an object she has built, made, or drawn (paints some blotches and lines on a paper, looks at them, and says "Doggie!").
38. **Identifying visual images**: *Children respond to and identify pictures and photographs.* For example, over the course of his development, Tristan gazes or babbles at a picture or photograph; gestures, points to, or makes the sound of a familiar person, animal, or object in a picture or photograph; selects a picture or photograph to hold or carry; and talks about a person, animal, or object in a picture or photograph.
39. **Listening to music**: *Children listen to music.* For example, over the course of his development, Eli turns his head toward music; looks to see where the sound is coming from when his teacher begins to sing; and points toward the music player to indicate to his caregiver that he wants her to play music.
40. **Responding to music**: *Children respond to music*. For example, over the course of her development, Tia sways or bounces in response to music; stands unassisted and moves her body to music; moves from one foot to the other; and pats, walks, turns, and jumps to music.
41. **Sounds**: *Children explore and imitate sounds.* For example, over the course of his development, Rocco plays with the sounds of his voice as he babbles and coos; plays a game with his caregiver

in which he initiates and then tries to copy the sounds she makes; and imitates the sounds made by his peers.

42. **Vocal pitch**: *Children explore vocal pitch sounds.* For example, over the course of her development, Sheri plays at sliding her voice up and down the scale; attempts to pitch her voice higher or lower to match the sounds of others; and joins in singing the melody of a simple song she has heard several times.

How Adults Use the KDIs to Support Early Learning

Teachers and caregivers can best know, understand, and support each child in their care through close attention, observation, and both physical and verbal interaction. The KDIs guide adults in this effort by broadly defining the actions and learning of sensory-motor children as they build an understanding of their world through direct experiences with people, objects, and daily routines.

The KDIs help caregivers organize, interpret, and act on what they see children doing. When Samantha, a young toddler, unties one of her caregiver's shoes and giggles, her caregiver, Ida, thinks of KDI 5. *Attachment: Children form an attachment to a primary caregiver* (under social and emotional development) and thus interprets Samantha's action as a bid for a relationship. Ida knows from her observations of children and from her understanding of child development that playful teasing is one way toddlers typically interact with trusted adults.

To let Samantha know that she will play the game Samantha has initiated and to encourage KDI 18. *Two-way communication: Children participate in two-way communication* (under communication, language, and literacy), Ida says to Samantha, in mock surprise, "Oh, dear, what happened to my shoe?" Taking this as her cue to continue, Samantha immediately unties Ida's other shoe. "Oh, dear," says Ida, taking her turn in the exchange, "what happened to my other shoe?" After Ida ties her shoes, Samantha starts the game again. In this fashion, Samantha learns both to trust herself to initiate interactions with her caregiver and to trust her caregiver to respond to her actions as playful rather than naughty.

The KDIs help caregivers to understand children's development and thus make decisions about what to do the next day, based on what they observed children doing today: "At lunchtime, I noticed Elron exploring and mushing his mashed potatoes with his hands," Ida says to Marta, her teammate. Ida is thinking about KDI 22. *Exploring objects: Children explore objects with their hands, feet, mouth, eyes, ears, and nose* (under cognitive development). "So," she asks Marta, "to extend Elron's mushing of gooey things with his hands, what do you think about using clay tomorrow at group time?"

The KDIs help caregivers to select materials and equipment to add to the

Active Learning and the KDIs: A Summary

KDIs: The Content Infants and Toddlers Learn

Caregivers are familiar with the key developmental indicators (KDIs) in these areas:

- ❑ **Approaches to learning:** Children show initiative in solving problems, doing things for themselves, and learning about their world.
- ❑ **Social and emotional development:** Children express their feelings, differentiate themselves from others, and form relationships with adults and peers.
- ❑ **Physical development and health:** Children explore the movements their bodies are capable of making and use their bodies to learn about the world.
- ❑ **Communication, language, and literacy:** Children communicate with gestures, sounds, and words to establish human connections and explore printed materials.
- ❑ **Cognitive development:** Children develop early ideas about quantity and number, navigate their environment, discover the attributes of objects, and develop ideas about time from the sequence of their daily activities.
- ❑ **Creative arts:** Children exercise curiosity and creativity by exploring art materials, pretending, and engaging with the sounds of music.

How caregivers use the KDIs

- ❑ Caregivers are familiar with the KDIs related to approaches to learning; social and emotional development; physical development and health; communication, language, and literacy; cognitive development; and creative arts.
- ❑ Caregivers observe children and interpret their actions in light of the KDIs.
- ❑ Caregivers use the KDIs to guide their interactions with children, to plan for activities that support children's learning and development, and to guide their selection of materials for children.

play space and to think of interactions and experiences that might support and build on children's actions, interests, and need for repetition during each part of the day.

Finally, the KDIs help caregivers to track children's growth and development, share and interpret children's actions to parents, and work together with parents to devise common strategies for supporting children's development — in approaches to learning; social and emotional development; physical development and health; communication, language, and literacy; cognitive development; and creative arts — at home and in their care setting. For more about using the KDIs to enhance teamwork on behalf of children and to assess and scaffold their learning, see Chapters 2 and 6, respectively.