



# COGNITIVE DEVELOPMENT

Development in the domain of cognition involves the processes by which young children grow and change in their abilities to pay attention to and think about the world around them. Infants and young children rely on their senses and relationships with others; exploring objects and materials in different ways and interacting with adults both contribute to children’s cognitive development. Everyday experiences and interactions provide opportunities for young children to learn how to solve problems, differentiate between familiar and unfamiliar people, attend to things they find interesting even when distractions are present, and understand how their actions affect others. Research in child development has highlighted specific aspects of cognitive development that are particularly relevant for success in school and beyond. These aspects fall under a set of cognitive skills called executive function and consist of a child’s working memory, attention and inhibitory control, and cognitive flexibility. Together, these skills function like an “air traffic control system,” helping a child manage and respond to the vast body of the information and experiences he or she is exposed to daily. The components within this domain address logic and reasoning skills, memory and working memory, attention and inhibitory control, and cognitive flexibility.

Children with disabilities may demonstrate alternate ways of meeting the goals of cognitive development. In particular, children with a cognitive impairment may reach many of these same goals, but at a different pace, with a different degree of accomplishment, and in a different order than typically developing children. However, the goals for all children are the same, even though the path and the pace toward realizing the goals may be different. Principles of universal design for learning (UDL) offer the least restrictive and most inclusive approach to developing environments and curricula that best support the cognitive development of all children.

**Remember:** While this domain represents general expectations for cognitive development, each child will reach the individual learning goals at his or her own pace and in his or her own way.

- CD 1: Logic and Reasoning
- CD 2: Memory and Working Memory
- CD 3: Attention and Inhibitory Control
- CD 4: Cognitive Flexibility





# COGNITIVE DEVELOPMENT

## Component 1: Logic and Reasoning

**Learning Goal 1.a:** Children apply strategies and draw upon past knowledge and experiences to meet goals and solve problems.

By the following ages, most children will:

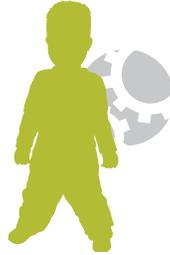
9m



18m



24m



36m



48m



60m



- › Explore objects and materials in different ways (e.g., mouthing, reaching for, or hitting, banging, and squeezing them)
- › Bang a block (or other object) on the floor repeatedly to hear the sound that it makes
- › Combine learning schemes to learn more about an object (e.g., mouthing and then shaking a rattle)
- › Demonstrate an understanding of simple cause-and-effect relationships (e.g., looking toward the sky when they hear an airplane)

- › Explore small openings and look for items to put in the openings, including their fingers
- › Solve simple problems independently (e.g., by climbing to retrieve an out-of-reach object)
- › Demonstrate recognition of cause-and-effect relationships (e.g., pushing on a toy truck and watching it roll away)
- › Use visual comparisons to compare quantities (e.g., which pile of crackers has more)
- › Stack and then knock down “towers” and then stack them up again

- › Explore the properties of objects by grabbing, pushing, pulling, turning over, and throwing them
- › Make simple decisions, take action, and observe the effect of their actions on others (e.g., pushing a toy truck toward an adult, watching it hit the adult, and observing how the adult reacts)
- › Treat objects differently as they begin to understand similarity and difference (e.g., squeezing stuffed animals and throwing balls)
- › Separate objects by a single feature (e.g., color)
- › Match simple geometric forms (e.g., circle, square, triangle) that have the same size and orientation
- › Develop learning schemes related to people and actions (e.g., saying “goodbye” and then leaving, or asking for music and then dancing to it)

- › Make plans before attempting to solve some simple problems
- › Explore cause-and-effect relationships by intentionally repeating an action and observing the reaction (e.g., rolling a car down a ramp repeatedly and observing the distance the car traveled)
- › Engage in pretend play and games requiring several sequential actions (e.g., playing kickball, which requires kicking a ball, running, and then stopping at a base)

- › Use previous experiences to make plans before attempting to solve some problems (e.g., using a wagon to gather toys into one spot rather than trying to carry them all by hand)
- › Solve simple problems without trying every possibility (e.g., putting big blocks at the base of a tower and smaller blocks on top to make a tower that doesn’t topple)
- › Explore cause-and-effect relationships by intentionally varying the action to change the reaction (e.g., rolling two different cars down a ramp and observing the different distances traveled)
- › Sort objects and then count and compare the groups formed

- › Solve complex problems by planning and carrying out a sequence of actions
- › Analyze the result of an attempted solution and use the new information to solve a problem (e.g., trying to staple pieces of paper after unsuccessfully trying to tape them together)
- › Explain their reasoning behind a strategy or choice and why it worked or didn’t work



# COGNITIVE DEVELOPMENT

## Component 2: Memory and Working Memory

**Learning Goal 2.a:** Children hold information in their mind and manipulate it to perform tasks.

By the following ages, most children will:

9m



18m



24m



36m



48m



60m



- › Respond to familiar people and objects in a way that is different from the way they respond to unfamiliar people or objects
- › After repeated experiences with the same objects and persons, sometimes remember that unseen objects are still there (e.g., remembering that a ball is under the blanket)
- › Attend to unexpected events

- › Point to, or in some other way indicate, familiar people and objects when they are named
- › Remember the location of objects that are meaningful to them
- › Demonstrate an understanding of object permanence, such as reaching under a blanket to retrieve a stuffed animal

- › Demonstrate a solid understanding of object permanence (e.g., looking for a car after it enters a tunnel, finding play dough that has been put away in a cupboard)
- › Purposefully put two actions together in sequence (e.g., grabbing a large ball and rolling it)

- › Remember and communicate what happened earlier in the day; recall basic components of recent events (e.g., are able to follow a daily routine)
- › Know where things are kept in familiar environments and can retrieve them when needed
- › Successfully follow two-step directions

- › Communicate with some detail about events that happened in the past
- › With support, retell or reenact familiar stories, including such details as characters, phrases, and events
- › Put several objects or groups in order by a quantitative attributes (number, length, etc.)
- › Solve simple word problems with totals of five or fewer items (e.g., concluding that they have a total of four pencils if they already have three and are given one more)
- › Successfully follow three-step directions

- › Accurately recount past experiences in the correct order and include relevant details
- › Retell a familiar story in the proper sequence, including such details as characters, phrases, and events
- › Remember more and more minute details from a story and are able to answer questions accurately (e.g., "How did the peddler feel when the monkeys didn't give him back his caps?")
- › Place four or more objects or groups in order of a quantitative attribute (number, length, etc.)
- › Solve simple word problems with totals of 10 or fewer items (e.g., concluding that they have nine grapes if they have seven and are given two more)
- › Successfully follow detailed, multi-step directions



Play is an indispensable element in child development. It is the child's natural process of learning and development and, consequently, a critical ingredient in the educative process.

- Frost





# COGNITIVE DEVELOPMENT

## Component 3: Attention and Inhibitory Control

**Learning Goal 3.a:** Children’s skills increase in filtering impulses and sustaining attention on a task.

By the following ages, most children will:

9m



- › Pause or stop when an adult says “stop” or tells them not to do something
- › Demonstrate caution around new or unusual people or events
- › Explore objects by holding, mouthing, dropping, etc.

18m



- › Inhibit themselves from reaching for a visible but inaccessible object or reward (e.g., a toy on the other side of a window or out of reach)
- › Attend to a short, familiar storybook but may not want to follow the book page by page

24m



- › Have a general understanding of the passing of time and the meaning of phrases like “not now” and “after lunch”
- › Comply with simple two-part requests that involve waiting (e.g., “Eat your breakfast and then we’ll play with the blocks.”)

36m



- › Wait to be handed a desired object
- › Attend to specific features of objects and identify elements within a complex figure (e.g., looking at a picture of a farmyard and pointing to and naming the figures of a horse, a duck, a cat, etc.)
- › Follow adult directions when given simple guidance
- › Focus on topics or materials of interest despite distractions (e.g., can dump out and solve a favorite puzzle, even with other children playing in the background)

48m



- › With adult support, avoid imitating the negative behavior of another child
- › With adult reminders, wait to communicate information in a group
- › Focus on increasingly complex topics for longer periods of time
- › Return to complete a task if interrupted
- › Count only those objects in a group that have a specific attribute (e.g., all of the red cars in a picture)
- › Solve simple arithmetic problems
- › Build block buildings and include such structural features as arches and ramps

60m



- › Without adult reminders, wait to communicate information in a group
- › Maintain focus on a project for a sustained period of time and over several days
- › Return with focus to an activity or project after having been away from it for a period of time
- › Demonstrate an awareness of important activities that are “coming up” or “in the near future” (e.g., keeping track of the days until a birthday or vacation trip) as a strategy to control excitement
- › Combine shapes into patterns that make new shapes or complete puzzles (e.g., rearranging a collection of circles and variously sized rectangles to make the image of a person)
- › Build complex block buildings, intentionally maintaining such features as symmetry



Fantasy play provides the nourishing habitat for the growth of cognitive, narrative, and social connectivity in young children.

- Vivian Gussin Paley





# COGNITIVE DEVELOPMENT

## Component 4: Cognitive Flexibility

**Learning Goal 4.a:** Children’s skills increase at adjusting to changes in demands, priorities, and perspectives.

By the following ages, most children will:

9m



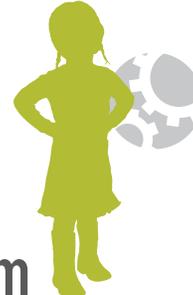
18m



24m



36m



48m



60m



- › Try new actions with a familiar object (e.g., dropping or throwing a rattle in addition to mouthing it)
- › Demonstrate an ability to self-soothe or calm (e.g., babbling or sucking on their thumb or fists)
- › Develop their own regular sleep-and-wake cycle
- › Begin to show an anticipation of familiar routines
- › Use their bodies as “tools” (i.e., as a means to an end: reaching out and grasping to get a rattle, for example)
- › Use basic items creatively (e.g., turning a pail over to use it as a drum)
- › Demonstrate comfort in familiar routines and activities
- › Engage in more complex play sequences based on an understanding of everyday events and routines (e.g., pretending to punch in numbers on a phone and then “talking” to grandpa after waiting for an answer)
- › Understand the use of people as “tools” for help (e.g., recognizing that an adult can reach an object for them on a high shelf)
- › View world from an egocentric perspective (e.g., crying when frustrated that things are not going their way)
- › Change their behavior in response to environmental cues (e.g., when an adult sits on the floor with a book, they put down their blocks and go over to the adult to listen to the adult read)
- › Change their behavior in response to their environment by using the “tools” around them (e.g., if a toy is on a towel, pulling the towel to bring the toy closer, rather than just going over to the toy)
- › Use objects in new ways to solve a problem or meet a goal (e.g., propping up a track with a piece of chalk so a toy train can pass underneath)
- › Transition from one activity to the next activity with adult support
- › Adjust when necessary to brief disruptions in routines (while still preferring consistent rules and routines)
- › Make use of their environment by adapting objects as “tools” (e.g., using a stick to reach something that is under a chair)
- › Require minimal adult support to transition from one activity to another (e.g., moving from computer to circle time)
- › Understand that different contexts may require different behaviors (e.g., taking off shoes when entering their house but leaving them on when entering the classroom)
- › Generate a new approach or change their plan of action if a better alternative is found or suggested (e.g., accepting a suggestion to secure a tower’s greater stability by building it on the floor rather than on a thick rug)
- › Continue to count when another item is added to a set
- › Understand that not all children want the same things
- › Quickly adjust and adhere to a new rule (e.g., lining up inside the building rather than outside when the weather gets colder or it rains)
- › Apply different rules in different contexts that require different behaviors (e.g., using indoor voices or feet versus outdoor voices or feet)
- › Reconstruct a pattern using different materials or modalities
- › Sort by more than one attribute (e.g., color and shape) into two or more groups
- › Correctly add an object to an existing series (e.g., of increasing lengths)