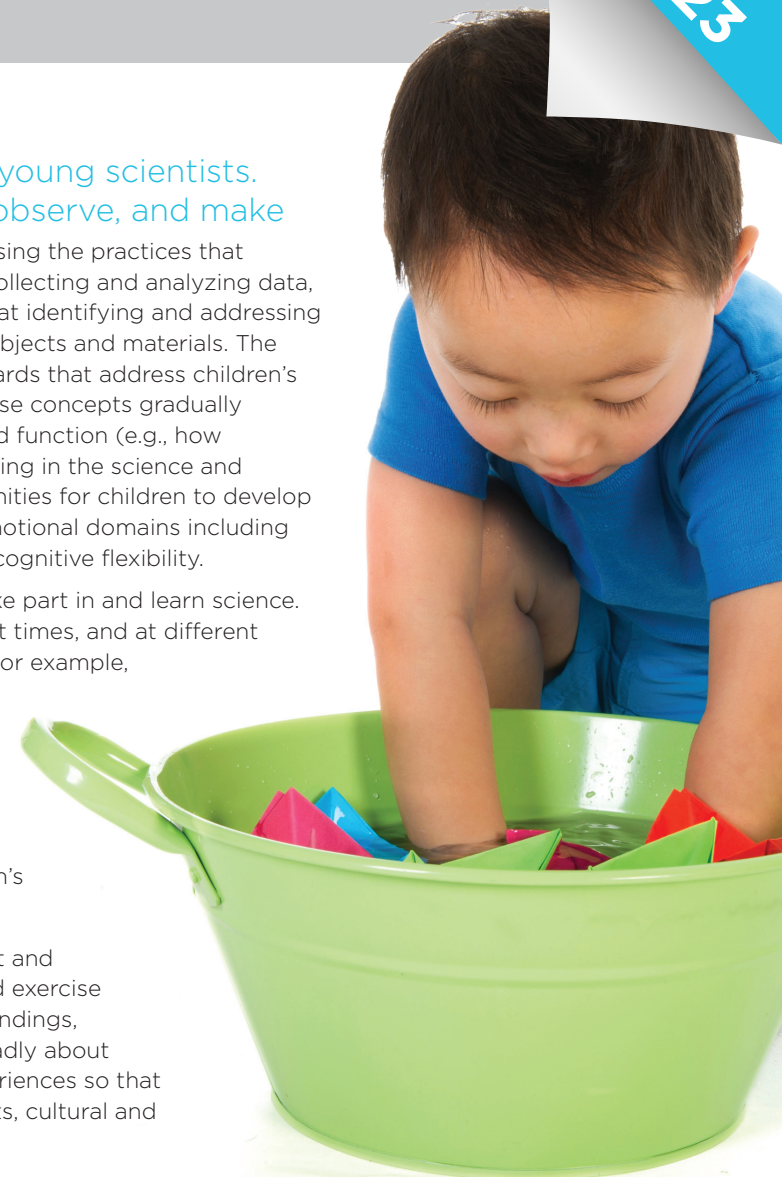




From the moment they are born, children share many of the characteristics of young scientists. They are curious and persistent explorers who use their senses to investigate, observe, and make sense of the world around them. As they grow and develop, they become increasingly adept at using the practices that scientists use to learn about the world—including asking questions, planning, and carrying out investigations, collecting and analyzing data, and constructing explanations based on evidence. Like young engineers, they also become increasingly skilled at identifying and addressing problems that arise in their play and designing and testing solutions, especially in their constructive play with objects and materials. The RIELDS science domain includes a standard focused on the science and engineering practices as well as standards that address children’s learning of basic concepts in physical, Earth/space and life science. Children deepen their understanding of these concepts gradually over time and many experiences. Crosscutting concepts, including cause and effect, patterns, and structure and function (e.g., how something is made relates to how it is used) are also incorporated and embedded within each standard. Engaging in the science and engineering practices in the service of building their understanding of science concepts creates many opportunities for children to develop mathematics knowledge and abilities as well as skills in the physical, language, literacy, cognitive, and social-emotional domains including essential, but less readily observable executive function skills such as working memory, attention to tasks, and cognitive flexibility.

All children come to a school or community-based setting with a variety of prior experiences in science can take part in and learn science. In relation to the standards, each child will express their development and learning in different ways, at different times, and at different paces. Children with disabilities may demonstrate alternate ways of meeting the goals of the science domain. For example, a child with a cognitive delay may require additional hands-on-learning opportunities to generalize science content and a child with an expressive language delay may require pictures or photographs to contribute observations and predictions after classroom-based investigations. Children with disabilities may reach many of these same goals, but at a different pace, with a different degree of accomplishment, and in a different order than their peers. 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, adopting curricula, and facilitating children’s experiences in ways that best support science learning for all children.

Remember: The practices of science incorporate a wide range of skills across the domains of development and learning. For example, the practices include multiple opportunities for children to engage in productive talk and exercise language and literacy skills as they formulate questions, explore and describe observable phenomena, record findings, and discuss their emerging ideas with others. As you plan science experiences it will be important to think broadly about children’s levels of development and learning and consider their day-to-day family, home, and community experiences so that you implement and facilitate science experiences that are meaningful and responsive to children’s lives, interests, cultural and linguistic backgrounds, and leverage their strengths, and support areas for growth in context.



S 1: Scientific Practices and Application

S 2: Physical Science

S 3: Earth and Space Science

S 4: Life Science



Component 1: Scientific Practices and Application

Standard 1.a: Children are increasingly able to engage with the inquiry process by developing questions, planning and carrying out investigations, collecting and analyzing data, generating and sharing findings and ideas, and using and applying new knowledge to solve problems.

By the following age ranges, children typically, for example:



0-9m

- › Express curiosity about the world around them and attend to novel objects, living things, and events in their immediate environment
- › Reach for and explore objects within their grasp (e.g., bang a block to make noise; shake keys)
- › Move toward favorite objects and adults for play
- › Exhibit behaviors and act on objects to get specific results (e.g., cry for attention; kick a mobile to observe its movement and sound; drop a toy to see if an adult will pick it up)

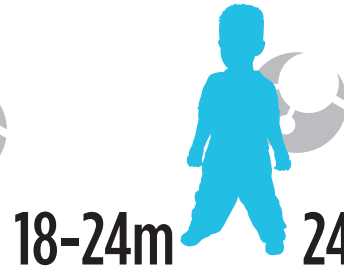
Continued



9-18m

- › Express their wondering using language, gestures, signs, and facial expressions and show surprise when familiar objects, living things, or events don't appear or happen as anticipated
- › Extend explorations, indoors and out, using all their senses
- › Seek out hidden objects to explore (e.g., open cabinets to get pots and pans)
- › Use tools for eating, drinking, and playing (e.g., toy tools)

Continued



18-24m

- › Ask simple questions about the objects, materials, living things, and events in their immediate environment
- › Investigate a variety of objects during play (e.g., take things apart and put them together; stack and knock down blocks) and vary their actions to observe results (e.g., push a ball gently and hard)
- › Use tools for exploration and problem-solving (e.g., spoons and buckets for digging; a stick to get an out-of-reach object) and imitate how others explore and use tools (e.g., a rock as a hammer)

Continued



24-36m

- › Communicate a range of questions verbally and non-verbally (e.g., ask how a toy works; repeat actions to observe if results are same or different)
- › Use all their senses to explore the objects, materials, living things, and events that occur in their immediate environment
- › Notice and explore direct cause and effect relationships (e.g., laugh at how their block tower falls when they kick it; place a stick in the path of an ant to observe what happens)

Continued



36-48m

- › Ask and wonder about increasingly complex questions to find out more information or to figure out a solution to a problem (e.g., ask or wonder "Why is the sky blue?" or "How can I make a house for a bug with these sticks?")
- › Use standard and non-standard tools for exploration and data collection (e.g., use a hand lens to look at an insect; use different sized containers for measuring more and less)
- › Participate in a range of investigations from more playful (e.g., collaboratively build a bridge for toy cars using a variety of materials) to more structured (e.g., contribute predictions, observations, and ideas to a group sink and float investigation)

Continued



48-60m

- › With support, contribute questions, observations, and ideas to a group discussion on a topic of shared interest (e.g., share questions about what worms eat and ideas for what a worm habitat should include and why) and begin to demonstrate curiosity about the world outside of their immediate environment (e.g., question why animals live in the rainforest or arctic or why severe weather events occur in other locations)
- › With support, use a variety of standard and nonstandard tools for data collection and recording (e.g., to measure the height of a tower, count the number of blocks or use a ruler; make rain gauges and windsocks to collect weather data)

Continued



Component 1: Scientific Practices and Application

Standard 1.a: Children are increasingly able to engage with the inquiry process by developing questions, planning and carrying out investigations, collecting and analyzing data, generating and sharing findings and ideas, and using and applying new knowledge to solve problems.

Continued from previous:

0-9m

Continued from previous

- › Communicate interest and willingness to explore using sounds, gestures, signs, and/or facial expressions

9-18m

Continued from previous

- › Begin to explore and identify relationships during their play and in the natural world (e.g., repeatedly push buttons on a phone or other device and listen for the corresponding sounds; anticipate that lightning and thunder will occur together)
- › Reach out to trusted adults and children to indicate curiosity and desire to explore (e.g., pull an adult's hand to go outside)

18-24m

Continued from previous

- › Apply knowledge about patterns in daily routines to anticipate and make predictions about future events (e.g., get a book to read before naptime, look for boots before going outside on a rainy day)
- › Draw the attention of others to what they are doing, observing, and wondering using emerging language, gestures, and/or signs, and imitate how adults respond to exploring natural phenomena (e.g., have confidence when exploring insects or be nervous about getting dirty or wet)

24-36m

Continued from previous

- › Compare objects and notice similarities and differences (e.g., sort leaves based on one characteristic, such as color or size)
- › With support, record and represent observations in multiple ways (e.g., wiggle their body; make a curvy line on paper to show how a worm moves)
- › Make inferences and predictions based on previous experience and relationships they have identified (e.g., cry when they see dark clouds in anticipation of thunder)
- › Identify and address mathematical situations that arise in their constructive or exploratory play (e.g., rearrange blocks in different ways to make them balance; try to make a sinking object float)

36-48m

Continued from previous

- › Compare and sort objects based on one property at a time (e.g., sort blocks by color, size, shape, or texture)
- › With support, record and represent their observations in a variety of ways (e.g., use their body, art and writing materials, or photos to share their observations of a plant; dictate a description of their plant to the teacher)
- › Generate explanations about how or why things happen (which may or may not be scientifically correct) based on evidence from their own experience (e.g., heavy things sink because rocks sink; snails will like pizza because I like pizza)

48-60m

Continued from previous

- › Plan and carry out simple investigations independently or in a small group to answer a cause-and-effect question, test a prediction, or solve a problem (e.g., blow on different objects to find out if or how each one moves; with encouragement, place plants in different conditions and observe, measure, and record their growth)
- › Identify increasingly complex relationships in the designed and natural worlds (e.g., explain why a spoon and fork are made differently based on how they are used; describe how a familiar animal's body parts help it move about and find food)
- › Use demonstration, drawings, photos, and models, to record, represent, and communicate their experiences and ideas with others in group discussions
- › Increasingly be able to make inferences and construct explanations (which may or may not be scientifically correct) based on a wider range of experiences (e.g., make a drawing that shows where they think rain comes from; talk about what they think a worm's home looks like and why they think so)





Component 2: Physical Science

Standard 2.a: Children gain increasing knowledge of basic concepts related to the properties of objects and materials, forces and motion, and energy (light and sound).

By the following age ranges, children typically, for example:



0-9m

- › Explore the properties of objects and materials placed in their hands (e.g., handle a small toy and bring it to their mouth)
- › Notice, observe, and explore movement of objects (e.g., drop food from highchair; kick mobiles; open and close things)
- › Respond to sounds in their immediate environment (e.g., startle to loud noises; quietly attend to familiar voices; turn toward new sounds; make and repeat some sounds; shake arms to music)

Continued



9-18m

- › Explore the properties of liquids and solids (e.g., squeeze, pat, and push on playdough; dump containers of water and sand)
- › Act on objects in different ways to make them move (e.g., experiment with push and pull toys; stack, knock down, and restack two or three blocks)
- › Choose items for play and routines based on their physical properties (e.g., choose a soft blanket or toy for rest-time)
- › Attend to music and move their whole bodies or sway to musical sounds



18-24m

- › Express interest in how properties of objects and materials change and can be changed (e.g., notice ice melting, puddles forming and disappearing, bread changing to toast)
- › Describe properties of objects and materials using one or two words (e.g., wet, cold, soft, big)
- › Explore motion and how objects with different properties move (e.g., fill a wagon and try to pull it; roll balls; pull toy trains)
- › Experiment with making different sounds using their voices (e.g., louder and softer sounds; higher and lower sounds)

Continued



24-36m

- › Demonstrate beginning understanding that different objects have properties that make them useful for different purposes (e.g., choose markers vs. pencils for different scribbling and drawing activities; choose hard vs. soft blocks for different building activities)
- › Imitate using familiar objects and tools for specific functions (e.g., use toy telephones for talking, play food for cooking play, blocks for building and hammering)
- › Demonstrate beginning understanding of ways in which the motion of objects can be changed (e.g., push a rolling toy with different degrees of force; pedal a tricycle harder to make it go faster)

Continued



36-48m

- › Make and describe observations of properties using words to describe color, size, shape, color, weight, texture.
- › Sort a variety of objects into groups according to their physical properties or functions (e.g., sort by color, shape, size, use, or whether a material is natural or human-designed)
- › Choose objects for play based on one salient property (e.g., choose the tallest block to represent a tower; choose the fastest ball based on color)

Continued



48-60m

- › Make, describe, and compare increasingly detailed observations of objects' properties (e.g., color, size, shape, texture, odor, material, features, use, sound, natural, or human-designed)
- › Consider multiple object properties when making predictions and doing investigations (e.g., explain that a wiffle ball will sink because it has holes that will let in the water; predict that the smallest, lightest ball will win the race)

Continued



Component 2: Physical Science

Standard 2.a: Children gain increasing knowledge of basic concepts related to the properties of objects and materials, forces and motion, and energy (light and sound).

Continued from previous:

0-9m

Continued from previous

- › Notice and attend to lights and objects that move and/or have light/dark contrasts (e.g., young infants may stare at ceiling fans; older infants may express fear of the dark)

9-18m

See previous

18-24m

Continued from previous

- › Attend to environmental sounds and identify the sources of familiar sounds (e.g., a dog barking, rain falling)
- › Notice and begin to explore their own shadows (e.g., move their bodies in different ways to see what their shadow does; may express fear of their shadows)

24-36m

Continued from previous

- › Play with objects in different ways to explore the characteristics of the sounds that can be made with them (e.g., bang on containers and drums; shake sound canisters harder or softer; yell or whisper into cardboard tubes)
- › Explore shadows and reflections with increasing intentionality (e.g., move a flashlight in different ways to make a shadow dance or to change its size and shape; move a small mirror around to observe how their reflection changes)

36-48m

Continued from previous

- › Explore motion of objects with increasing planning and intentionality (e.g., put objects on different inclines to observe how they roll, slide, or stay put; test different objects in water to find out if they sink or float)
- › Demonstrate increasing understanding of how shadows change, and when and where they appear (e.g., represent differences between themselves and their shadows; observe how their shadows change size, shape, and position at different times of day)
- › With support, gain awareness of the characteristics of sound (e.g., demonstrate differences between loud and soft sounds and high and low sounds using musical instruments or their voices)

48-60m

Continued from previous

- › Demonstrate increased understanding of structure and function in the natural and designed world (e.g., describe why spoons and forks are made differently based on their uses; design their block buildings differently depending on how people use the building)
- › Demonstrate understanding that properties of objects and materials may change when they are heated, cooled, or mixed (e.g., explain how a new color is made by mixing two other colors; predict that water will freeze at a colder temperature)
- › Demonstrate understanding that applied and natural forces cause things to move or change speed or direction (e.g., place walls along their ramps so toy cars won't roll off; explain that the wind causes leaves to shake)





Component 3: Earth and Space Science

Standard 3.a: Children gain increasing knowledge of the features of earth and space, the components of weather, and how all living things depend on natural resources to survive.

By the following age ranges, children typically, for example:



0-9m

- › Use all of their senses to explore natural items placed in their hands



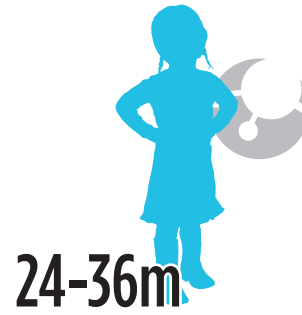
9-18m

- › Explore Earth's natural materials when outdoors using multiple senses (e.g., feel the textures of sand, grass, and dirt; sniff plants; notice feel of wind; pick up rocks and fallen branches)
- › Attend to and explore weather-related phenomena (e.g., demonstrate feeling hot or cold, dig in sand, splash in puddles, put snow in their mouths)



18-24m

- › Explore properties of Earth's materials through play (e.g., pile rocks, shells, cones, and sticks; look for puddles to splash in)
- › Notice and point out objects in the sky (e.g., clouds, airplanes, birds, sun, and moon)
- › Begin to associate different types of animals with the parts of the environment where they can be found (e.g., birds are in trees; ants are on the sidewalk)
- › Name and describe properties of natural items (e.g., heavy, sticky, small, pretty)



24-36m

- › Observe characteristics of natural objects and materials noticing similarities and differences (e.g., express preferences for different sizes, shapes, and colors of leaves)
- › Begin to understand that weather includes different components (e.g., identify presence of sun, wind, rain, and clouds on a given day)
- › Demonstrate an understanding that different weather requires different clothing (e.g., seeing newly fallen snow outside and getting boots and mittens)
- › Demonstrate beginning understanding that different animals make their homes in different parts of the environment (e.g., worms live underground; birds and squirrels live in trees)



36-48m

- › Begin to intentionally incorporate natural objects and materials into play (e.g., build a home for a real or imaginary creature using natural materials; pretend a pile of rocks is a campfire or stove)
- › Begin to understand that different components of weather can be measured (e.g., rainfall, temperature) and that weather can be predicted (e.g., dark clouds mean rain)
- › Demonstrate increasing awareness of objects in the sky and how they appear (e.g., including sun and clouds in representations)

Continued



48-60m

- › Use increasingly complex vocabulary to describe natural elements
- › Demonstrate a beginning understanding that designed objects are made from natural materials (e.g., wooden tables and toys are made from trees)
- › Describe changes that occur in the natural environment over increasingly long periods of time (e.g., seasonal changes in temperature, rain, or snowfall across the year)

Continued



SCIENCE

Component 3: Earth and Space Science

Standard 3.a: Children gain increasing knowledge of the features of earth and space, the components of weather, and how all living things depend on natural resources to survive.

Continued from previous:

0-9m

See previous

9-18m

See previous

18-24m

See previous

24-36m

See previous

36-48m

Continued from previous

- › Identify places where natural resources (e.g., water) can be found in their local environment and different ways people and other animals use it (e.g., drinking, bathing, swimming)

48-60m

Continued from previous

- › Demonstrate a beginning understanding that the sky and objects in it appear to change over time (e.g., the moon appears to change shape on subsequent nights; the sun seems to move in the sky during the day)
- › Demonstrate a beginning understanding that all plants and animals depend on the environment to survive (e.g., describe the needs of different animals for food, water, and a specific place to live)





Component 4: Life Science

Standard 4.a: Children begin to learn about the characteristics, needs, and life cycles of living things and how they get their needs met within a particular environment.

By the following age ranges, children typically, for example:



0-9m

- › Notice and investigate their own body parts (e.g., play with their fingers or toes)
- › Express their own needs and seek to get them met by crying, lifting their arms, and/or other attention-seeking behaviors



9-18m

- › Explore the characteristics of living things (e.g., petting a cat or dog and feeling its soft fur)
- › Begin to identify animals based on salient characteristics (e.g., call all animals with fur and four legs a “doggy”)
- › Begin to understand that they have different body parts that can be named (e.g., point to eyes, nose, and mouth when asked to do so)



18-24m

- › Observe and respond to animals outdoors (e.g., when outside, follow a butterfly or insect to see where it goes)
- › Begin to distinguish different types of animals based on more specific characteristics and behaviors (e.g., pigs are pink, cows are big and say moo, dogs bark)
- › Begin to demonstrate an awareness of the needs of living things (e.g., imitating caretaking behaviors with a doll or stuffed animal)
- › Begin to distinguish between things that are alive and not alive (e.g., interact differently with a real dog and a toy dog)



24-36m

- › Make increasingly detailed observations of the characteristics and behaviors of living things (e.g., representations of people begin to include eyes, mouths, and stick arms and legs)
- › Begin to understand that baby animals often resemble their parents (e.g., match photos of adult animals with their babies)
- › Begin to recognize diversity and variation in living things (e.g., notice that children in the classroom have different colors of skin, hair, and eyes)
- › Begin to associate specific animals with the environments in which they get their needs met (e.g., match pictures of familiar animals with their homes)



36-48m

- › Group animals based on their characteristics and/or where they can be found (e.g., sort animals into categories such as animals with fur or animals that live in the water)
- › Identify ways in which specific living things grow and develop over time and what they need to live (e.g., describe a plant’s growth and that it needs water and sun)
- › Demonstrate an increasing understanding of diversity and variation (e.g., describe or represent similarities and differences among animals’ characteristics, needs, and homes with increasing detail)



48-60m

- › Describe the characteristics that define living things
- › Compare, contrast, and/or categorize different types of plants and animals
- › Begin to distinguish between wants and needs of living things
- › Generate ideas about needs that living things and/or all animals share and how their specific needs may be different (e.g., all animals need food, but they eat different foods)
- › Ask and answer questions about changes in the appearance, behavior, and habitats of living things

Continued

Continued

Continued





SCIENCE

Component 4: Life Science

Standard 4.a: Children begin to learn about the characteristics, needs, and life cycles of living things and how they get their needs met within a particular environment.

Continued from previous:

0-9m

See previous

9-18m

See previous

18-24m

See previous

24-36m

Continued from previous

› Begin to express an awareness that living things grow and develop (e.g., express an interest and pride in how they are physically growing and developing new skills)

36-48m

Continued from previous

› Demonstrate an increasing understanding of the difference between living and nonliving things (e.g., describe that living things eat, breathe, move, and play or that they need beds and families)

48-60m

Continued from previous

› Wonder and think about how animals adapt to different weather conditions and where they go when not found in the environment
› Make inferences about why specific plants or animals live where they do and how they get their needs met in that place

