

Nebraska Early Learning Guidelines for Ages 3 to 5



Science

Scientific Skills and Methods S.01

Scientific Knowledge S.02

Science fosters curiosity and motivation to learn. Young children are natural scientists. They easily become fascinated by everyday happenings. Through varied and repeated opportunities to observe, manipulate, listen to, reflect, and respond to open-ended questions, preschoolers make decisions and become higher-level thinkers.

Science activities require a balance of content and process, using multi-sensory experiences. In addition to science inquiry skills, preschoolers can begin to acquire a foundation of scientific concepts and knowledge on which they can build a clear understanding of their world.

Early childhood teachers and caregivers should look for opportunities to explore scientific concepts in all content areas throughout the day. Adults need to feel comfortable with allowing children the opportunity to explore what they think, know, and want to know. Even if adults know the answer, a better response is to ask, “What do you think? Let’s find out together.”



Scientific Skills & Methods (s.01)

Widely Held Expectations

- Child develops scientific skills and methods
 - Makes observations, collects information, and describes objects and processes
 - Begins to make comparisons between objects that have been observed
 - Begins to look for answers to questions through active investigation
- Child uses sentences that include two or more ideas with descriptive details
- Child uses senses, materials, tools, technology, events in nature, and the environment to investigate and expand knowledge

Learning in Action: Examples

The Child:

- Explores various materials to learn about characteristics of objects, plants, animals, and various phenomena, such as weight, shape, size, color, temperature
- Uses a variety of tools and objects to explore the world and how things work in the world (uses magnets to pick up metal, observes through a microscope and magnifying glasses)
- Makes observations, asks questions, predicts, draws conclusions, explains, and tries things out to see what will happen
- Collects, describes and records information through discussions, drawings, maps, and charts

The Adult:

- Models the scientific process by asking questions that allow children to explain, predict, and draw conclusions:
 - What is the question we want answered? (State question or problem)
 - What might the answer be? What may happen? (Predict the answer)
 - How can we find out? (Conduct experiments)
 - What happened? (Observe results)
 - Was our guess right? Why? Why not? (Make conclusions)
- Documents the process to share with others
- Encourages children to ask questions and find answers through active exploration and reflection on what they learn
- Observes nature and discusses the life cycles of animals (butterflies, frogs)
- Provides pictures of steps to perform “experiments” or complete projects
- Explicitly models and explains how to use the tools and materials (magnets, magnifying glasses, microscope, tongs, and mirrors)

The Environment Includes:

- Natural objects that are placed at different levels (floor, tables, shelves) to be accessible throughout the day for observation, exploration and manipulation
- Magnets, magnifying glasses, balance scales, gears, pulleys, mirrors, measuring devices, etc.
- Lamps or flashlights to enable children to inspect materials under direct light
- Items placed on high contrast materials, such as light colored material on a dark surface or dark colored items on white
- Resources to support and pictures to show naturally occurring events, such as seed growth

Strategies to Support Scientific Skills and Methods

Teaching with Intent Throughout the Day:

- To develop critical thinking skills, ask child if a random item will fit in their collection or sequence that they're creating. Ask "why" or "why not" and "how did you decide?"
- Challenge children to question their own thinking and conclusions to promote further learning. For example, while discussing how to build and dress a snowman in the cold, the adult incorporates children's ideas and comments. The adult asks questions about why boots are needed outside or whether you can put on socks on after you put on shoes.
- Document changes that occur in experiments by photographing the steps/changes. Later, children can sequence the picture as they discuss the process and the effect of their experiment.

Supporting Children with a Wide Range of Abilities:

- Use special or adaptive tools to increase a child's level of participation: a picture communication board to allow children to make choices, ask questions and comment.
- Encourage hands-on and sensory experiences, such as touching, holding, exploring, tasting, smelling and manipulating.
- Provide physical guidance/support in using science tools when needed.
- Break the scientific process down into simple steps and demonstrate actions.
- Use pictures and simple words to describe the action and show process.
- Adapt items such as scoops, tongs and magnifier handles with ping-pong or tennis balls to make them easier to grasp.
- Ensure that outdoor explorations and field trips are accessible for ALL children.

Supporting English Language Learners:

- Pre-teach new science vocabulary words before a lesson using those words and provide developmentally appropriate definitions.
- Work with children in small group settings to help promote language development and understanding of the scientific process and skills.
- Use pictures and simple words to describe the action and show process.

Supporting Children from a Variety of Cultures:

- Include science materials and visuals that accurately reflect the cultures and language of children and families, such as books that include authentic photographs, illustrations that accurately reflect the cultures of the children involved in science activities.

Scientific Knowledge (s.02)



Widely Held Expectations

- Child shows interest in active investigations by observing, describing, and discussing
- Child describes or represents a series of events in the correct sequence
- Child demonstrates understanding of natural processes and simple cause and effect
- Child shows interest in measurement of time, length, distance, and weight
- Child develops increased ability to observe and discuss things that are similar and different
- Child can differentiate between living and nonliving organisms

Learning in Action: Examples

The Child:

- Compares the properties of objects that float in water with objects that sink
- Compares the properties of objects that go fast or slow on ramps (force and motion)
- Examines senses we use when we do things: playing with a ball, seeing clouds in the sky
- Compares own handprint to those of others
- Compares characteristics between living and nonliving organisms
- Participates in caring for living things, such as plants and animals
- Uses an eye dropper to drop color in glasses of water

The Adult:

- Encourages children to discuss objects and events that they observed
- Provides opportunities to observe nature and make predictions about natural events
- Provides opportunities for observation and comparison, such as comparing vegetables that grow above or below ground
- Provides information about specific scientific concepts, such as properties of objects, living things vs. nonliving things, characteristics of animals, plants, and insects, and natural events
- Explicitly guides children's investigation while providing them with time for exploration

The Environment Includes:

- A variety of living and non-living materials from the natural world: plants, animals, rocks
- Photos taken during walks to retell story or the events experienced during the walk
- Materials to encourage curiosity and exploration (sand, water, ant farms, tadpoles, blocks, and balls)
- Field trips to observe different environments (farm, aquarium, zoo, nursery)
- Informational, non-fiction books with photos and simple explanation

Strategies to Support Scientific Knowledge

Teaching with Intent Throughout the Day:

- Ask children to predict how much two or three items weigh. Then weigh them and chart how close their guess was with the actual weight, using words like more, less, and same.
- Ensure children participate, meaningfully, during experiments and are given opportunities to reflect on their investigation. For example, during a demonstration of a volcano, each student gets to pour vinegar, a liquid that causes the volcano to erupt, and is asked why.
- When there are not real life opportunities, spend time connecting abstract ideas. For example, when an adult in Nebraska reads a book about oceans and the adult recognizes that most children have not seen an ocean, take time to talk with them about where they might see an ocean, what it feels like, what lives in the ocean, and so forth. Have children who have seen an ocean share their experiences.

Supporting Children with a Wide Range of Abilities:

- Adapt tools to increase a child's level of participation, For example, make adaptations to watering cans and other items used in exploration and the caring of living things.
- Ensure all children have inside and outside, hands-on and sensory experiences (touching, holding, exploring, tasting, smelling, and manipulating).
- Provide physical guidance/support in using science tools when needed.
- Break the scientific process down into simple steps and demonstrate actions.
- Picture communication board to allow children to make choices, answer questions, and express observations.

Supporting English Language Learners:

- Pair up English language learners with English-speaking children to help children learn science concepts.
- Teach scientific concepts to children in small groups to ensure students understand and participate.
- Break processes down into simple steps and demonstrate actions using simple words.
- Use pictures that help demonstrate the descriptive words you are teaching children. Have them point to the picture that describes the comparison they are investigating, such as photos of celery absorbing colored water in different stages of the experiment when teaching how every plant uses water to carry nutrients through the plant bodies.

Supporting Children from a Variety of Cultures:

- Invite community members who reflect the cultures of the children into the class/group to participate in activities that use the scientific process.
- Ensure cultural beliefs are integrated into science learning. For example, incorporate the Native American culture of using only what is needed so as not to be wasteful, or thanking Mother Earth for providing plants.

Print Resources

- Bugs, Bugs, Bugs! 21 Songs and Over 250 Activities for Young Children*, Pam Schiller (2006).
- Building Structures with Young Children* (DVD also available), Ingrid Chalufour and Karen Worth (2004).
- Discovering Nature with Young Children*, Ingrid Chalufour & Karen Worth (2003).
- Exploring Water with Young Children* (DVD also available), Ingrid Chalufour and Karen Worth (2005).
- The Everything Kids' Science Experiments Book*, Tom Robinson (2001).
- Greening School Grounds: Creating Habitats for Learning*, Tim Grand and Gail Littlejohn (2001).
- Incredible Edible Science: Recipes for Developing Science and Literacy Skills*, Liz Plaster and Rick Krustchinsky (2010).
- Kitchen Science*, Shar Levine and Leslie Johnstone (2003).
- Learning with Nature Idea Book*, National Arbor Day Foundation and Dimensions Educational Research Foundation (2007).
- My Big World of Wonder*, Sherri Griffin (2004).
- Natural Playscapes: Creating Outdoor Play Environments for the Soul*, Rusty Keeler (2008).
- Nebraska Early Learning Guidelines: Connecting Children to Nature* (2008),
http://www.education.ne.gov/oec/pubs/ELG/nature_education.pdf.
- Picture Science: Using Digital Photography to Teach Young Children*, Carla Newmann-Hinds (2007).
- The Potential of a Puddle*, Clair Warden (2005).
- The Preschool Scientist: Using Learning Centers to Discover and Explore Science*, Robert Williams (2010).
- Preschool Pathways to Science: Facilitating Scientific Ways of Thinking, Talking, Doing, and Understanding*, Rochel Gelman (2010).
- Science Experiences for the Early Childhood Years: An Integrated Approach (10th ed.)*, Jean D. Harlan and Mary S. Rivkin (2011).
- Science in Early Childhood Education DVD Designing Curriculum to Meet Standards with Evidence-Based Practices DVD*, Arlitt Instructional Media, University of Cincinnati (2008).
- Spotlight on Young Children Exploring Nature*, Amy Shillady (2013).
- Teaching STEM in the Early Years: Activities for Integrating Science, Technology, Engineering, and Mathematics*, Sally Moomaw (2013).
- Worms, Shadows and Whirlpools: Science in the Early Childhood Classroom*, Sharon Grollman and Karen Worth (2003).
- These resources, and many others, may be available for Nebraska residents to borrow from the Early Childhood Training Center's Media Center by visiting <http://www.education.ne.gov/oec/mediactr.html> or by calling 1-402-557-6885 or 1-800-9CHILD.

Online Resources

Annotated Bibliographies (click on link below for a description of topical resources available through the Early Childhood Training Center's Media Center):

Science, created on 5/2/12

Clover Kid Corner Play and Activities <http://liferaydemo.unl.edu/web/child/cloverkid>.

Ladybug: a magazine for young children featuring seasonal articles and poems that include science concepts www.ladybugmagkids.com.

Science Kids Fun Science and Technology for Kids www.sciencekids.co.nz/experiments.html.

National Education Goals Panel, Essential Domains of School Readiness	Revised Nebraska Early Learning Guidelines Ages 3-5 Domains & Key Elements	Teaching Strategies GOLD® Objectives, Dimensions, and Indicators	Head Start Child Development & Early Learning Framework Domains & Elements	NE K-12 Standards	NE Rule 11 Regs.	NE Child Care Licensing Standards
Cognition & General Knowledge	Science: Scientific Skills & Methods (S.01)	Science & Technology 24.	Science Knowledge & Skills: Conceptual Knowledge of the Natural & Physical World	SC 2.1.1.a SC 2.1.1.b SC 2.1.1.c SC 2.1.1.e	004.05A3 004.05A6 004.06C 004.06D 004.06E	Not Applicable
		Science & Technology 25.				
		Science & Technology 26.				
		Science & Technology 27.				
		Science & Technology 28.				
	Science: Scientific Knowledge (S.02)	Science & Technology 24.	Science Knowledge & Skills: Scientific Skills & Method	SC 2.1.1.f SC 2.2.1.a SC 2.2.1.b SC 2.3.1.a	004.05A3 004.05A6 004.06C 004.06D 004.06E	
		Science & Technology 28.				
		Cognitive 13.6.				
		Mathematics 22.6.				

Sources: Teaching Strategies, Inc.: www.TeachingStrategies.com. Revised Head Start Child Development and Early Learning Framework: [http://eclkc.ohs.acf.hhs.gov/hslc/tta-system/teaching/eecd/Assessment/Child%20Outcomes/HS_Revised_Child_Outcomes_Framework\(rev-Sept2011\).pdf](http://eclkc.ohs.acf.hhs.gov/hslc/tta-system/teaching/eecd/Assessment/Child%20Outcomes/HS_Revised_Child_Outcomes_Framework(rev-Sept2011).pdf). Nebraska Department of Health and Human Services Title 391- Children's Services Licensing: http://dhhs.ne.gov/publichealth/Pages/crl_childcare_childcareindex.aspx. Nebraska K-12 Academic Standards: <http://www.education.ne.gov/academicstandards/>. Nebraska Rule 11 Regulations: <http://www.education.ne.gov/legal/webrulespdf/CLEANrule112007.pdf>.