

NORTH DAKOTA SCIENCE CONTENT STANDARDS

Draft – April 2014 – Draft

Performance Expectations by Grade: Kindergarten

Released for Public Comment



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North Dakota Science Content Standards, Draft: April 2014, Released for Public Comment is based on the Next Generation Science Standards.¹

¹ NGSS Lead States. 2013. **Next Generation Science Standards: For States, By States**. Washington, DC: The National Academies Press.

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North Dakota Science Content Standards

Performance Expectations by Grade

This document, released for public review, presents the North Dakota Science Content Standards in tables, which include individual Performance Expectations. Refer to the North Dakota *Introduction* for more information related to the layout of the document. A separate document presents the North Dakota Science Content Standards arranged in tables, which include groups of Performance Expectations arranged by Disciplinary Core Idea. Readers are invited to review both documents and provide feedback regarding preference for organizational format in the associated questionnaire.

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Kindergarten

The performance expectations in kindergarten help students formulate answers to questions such as: “What happens if you push or pull an object harder? Where do animals live and why do they live there? What is the weather like today and how is it different from yesterday?” Kindergarten performance expectations include PS2, PS3, LS1, ESS2, ESS3, and ETS1 Disciplinary Core Ideas from the NRC Framework. Students are expected to develop understanding of patterns and variations in local weather and the purpose of weather forecasting to prepare for, and respond to, severe weather. Students are able to apply an understanding of the effects of different strengths or different directions of pushes and pulls on the motion of an object to analyze a design solution. Students are also expected to develop understanding of what plants and animals (including humans) need to survive and the relationship between their needs and where they live. The crosscutting concepts of patterns; cause and effect; systems and system models; interdependence of science, engineering, and technology; and influence of engineering, technology, and science on society and the natural world are called out as organizing concepts for these disciplinary core ideas. In the kindergarten performance expectations, students are expected to demonstrate grade-appropriate proficiency in asking questions, developing and using models, planning and carrying out investigations, analyzing and interpreting data, designing solutions, engaging in argument from evidence, and obtaining, evaluating, and communicating information. Students are expected to use these practices to demonstrate understanding of the core ideas.

K-PS2 Motion and Stability: Forces and Interactions

K-PS2-1 Motion and Stability: Forces and Interactions

Students who demonstrate understanding can:

- K-PS2-1. Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.** [Clarification Statement: Examples of pushes or pulls could include a string attached to an object being pulled, a person pushing an object, a person stopping a rolling ball, and two objects colliding and pushing on each other.] [Assessment Boundary: Assessment is limited to different relative strengths or different directions, but not both at the same time. Assessment does not include non-contact pushes or pulls such as those produced by magnets.]

The performance expectation above was developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.

- With guidance, plan and conduct an investigation in collaboration with peers.

Connections to the Nature of Science Scientific Investigations Use a Variety of Methods

- Scientists use different ways to study the world.

Disciplinary Core Ideas

PS2.A: Forces and Motion

- Pushes and pulls can have different strengths and directions.
- Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it.

PS2.B: Types of Interactions

- When objects touch or collide, they push on one another and can change motion.

PS3.C: Relationship Between Energy and Forces

- A bigger push or pull makes things speed up or slow down more quickly. (*secondary*)

Crosscutting Concepts

Cause and Effect

- Simple tests can be designed to gather evidence to support or refute student ideas about causes.

Connections to other DCIs in kindergarten:

N/A

Articulation of DCIs across grade-levels:

3.PS2.A ; 3.PS2.B

Common Core State Standards Connections:

ELA/Literacy -

W.K.7 Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). (K-PS2-1)

Mathematics -

MP.2 Reason abstractly and quantitatively. (K-PS2-1)

K.MD.A.1 Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object. (K-PS2-1)

K.MD.A.2 Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference. (K-PS2-1)

K-PS2-2 Motion and Stability: Forces and Interactions

Students who demonstrate understanding can:

K-PS2-2. Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull. **[Clarification Statement: Examples of problems requiring a solution could include having a marble or other object move a certain distance, follow a particular path, and knock down other objects. Examples of solutions could include tools such as a ramp to increase the speed of the object and a structure that would cause an object such as a marble or ball to turn.] [Assessment Boundary: Assessment does not include friction as a mechanism for change in speed.]*

The performance expectation above was developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Analyzing and Interpreting Data

Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations.

- Analyze data from tests of an object or tool to determine if it works as intended.

Disciplinary Core Ideas

PS2.A: Forces and Motion

- Pushes and pulls can have different strengths and directions.
- Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it.

ETS1.A: Defining Engineering Problems

- A situation that people want to change or create can be approached as a problem to be solved through engineering. Such problems may have many acceptable solutions. *(secondary)*

Crosscutting Concepts

Cause and Effect

- Simple tests can be designed to gather evidence to support or refute student ideas about causes.

Connections to other DCIs in kindergarten:

K.ETS1.A ; K.ETS1.B

Articulation of DCIs across grade-levels:

2.ETS1.B ; 3.PS2.A ; 4.PS3.A ; 4.EST1.A

Common Core State Standards Connections:

ELA/Literacy -

RI.K.1 With prompting and support, ask and answer questions about key details in a text. *(K-PS2-2)*

SL.K.3 Ask and answer questions in order to seek help, get information, or clarify something that is not understood. *(K-PS2-2)*

* The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

K-PS3 Energy

K-PS3-1 Energy

Students who demonstrate understanding can:

K-PS3-1. Make observations to determine the effect of sunlight on Earth's surface. [Clarification Statement: Examples of Earth's surface could include sand, soil, rocks, and water] [Assessment Boundary: Assessment of temperature is limited to relative measures such as warmer/cooler.]

The performance expectation above was developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.

- Make observations (firsthand or from media) to collect data that can be used to make comparisons.

Connections to Nature of Science

Scientific Investigations Use a Variety of Methods

- Scientists use different ways to study the world.

Disciplinary Core Ideas

PS3.B: Conservation of Energy and Energy Transfer

- Sunlight warms Earth's surface.

Crosscutting Concepts

Cause and Effect

- Events have causes that generate observable patterns.

Connections to other DCIs in kindergarten:

N/A

Articulation of DCIs across grade-levels:

1.PS4.B ; 3.ESS2.D

Common Core State Standards Connections:

ELA/Literacy -

W.K.7 Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). (K-PS3-1)

Mathematics -

K.MD.A.2 Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference. (K-PS3-1)

K-PS3-2 Energy

Students who demonstrate understanding can:

K-PS3-2. Use tools and materials provided to design and build a structure that will reduce the warming effect of sunlight on Earth's surface.* [Clarification Statement: Examples of structures could include umbrellas, canopies, and tents that minimize the warming effect of the sun.]

The performance expectation above was developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.

- Use tools and materials provided to design and build a device that solves a specific problem or a solution to a specific problem.

Disciplinary Core Ideas

PS3.B: Conservation of Energy and Energy Transfer

- Sunlight warms Earth's surface.

Crosscutting Concepts

Cause and Effect

- Events have causes that generate observable patterns.

Connections to other DCIs in kindergarten:

K.ETS1.A ; K.ETS1.B

Articulation of DCIs across grade-levels:

1.PS4.B ; 2.ETS1.B ; 4.ETS1.A

Common Core State Standards Connections:

ELA/Literacy -

W.K.7 Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). (*K-PS3-2*)

Mathematics -

K.MD.A.2 Directly compare two objects with a measurable attribute in common, to see which object has “more of”/“less of” the attribute, and describe the difference. (*K-PS3-2*)

* The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea

K-LS1 From Molecules to Organisms: Structures and Processes

K-LS1-1 From Molecules to Organisms: Structures and Processes		
<p>Students who demonstrate understanding can:</p> <p>K-LS1-1. Use observations to describe patterns of what plants and animals (including humans) need to survive. [Clarification Statement: Examples of patterns could include that animals need to take in food but plants do not; the different kinds of food needed by different types of animals; the requirement of plants to have light; and, that all living things need water.]</p>		
<p>The performance expectation above was developed using the following elements from the NRC document <i>A Framework for K-12 Science Education</i>.</p>		
Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p>Analyzing and Interpreting Data Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations.</p> <ul style="list-style-type: none"> Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. <hr style="border-top: 1px dashed #ccc;"/> <p>Connections to Nature of Science Scientific Knowledge is Based on Empirical Evidence</p> <ul style="list-style-type: none"> Scientists look for patterns and order when making observations about the world. 	<p>LS1.C: Organization for Matter and Energy Flow in Organisms</p> <ul style="list-style-type: none"> All animals need food in order to live and grow. They obtain their food from plants or from other animals. Plants need water and light to live and grow. 	<p>Patterns</p> <ul style="list-style-type: none"> Patterns in the natural and human designed world can be observed and used as evidence.
<p><i>Connections to other DCIs in kindergarten: N/A</i></p>		
<p><i>Articulation of DCIs across grade-levels:</i> 1.LS1.A ; 2.LS2.A ; 3.LS2.C ; 3.LS4.B ; 5.LS1.C ; 5.LS2.A</p>		
<p><i>Common Core State Standards Connections:</i></p> <p><i>ELA/Literacy -</i> W.K.7 Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). (K-LS1-1)</p> <p><i>Mathematics -</i> K.MD.A.2 Directly compare two objects with a measurable attribute in common, to see which object has “more of”/“less of” the attribute, and describe the difference. (K-LS1-1)</p>		

K-ESS2 Earth's Systems

K-ESS2-1 Earth's Systems

Students who demonstrate understanding can:

K-ESS2-1. Use and share observations of local weather conditions to describe patterns over time.

[Clarification Statement: Examples of qualitative observations could include descriptions of the weather (such as sunny, cloudy, rainy, and warm); examples of quantitative observations could include numbers of sunny, windy, and rainy days in a month. Examples of patterns could include that it is usually cooler in the morning than in the afternoon and the number of sunny days versus cloudy days in different months.] [Assessment Boundary: Assessment of quantitative observations limited to whole numbers and relative measures such as warmer/cooler.]

The performance expectation above was developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p>Analyzing and Interpreting Data Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations.</p> <ul style="list-style-type: none"> Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. <p>-----</p> <p>Connections to Nature of Science Science Knowledge is Based on Empirical Evidence</p> <ul style="list-style-type: none"> Scientists look for patterns and order when making observations about the world. 	<p>ESS2.D: Weather and Climate</p> <ul style="list-style-type: none"> Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region at a particular time. People measure these conditions to describe and record the weather and to notice patterns over time. 	<p>Patterns</p> <ul style="list-style-type: none"> Patterns in the natural world can be observed, used to describe phenomena, and used as evidence.
<p><i>Connections to other DCIs in kindergarten: N/A</i></p> <p><i>Articulation of DCIs across grade-levels:</i> 2.ESS2.A ; 3.ESS2.D ; 4.ESS2.A</p> <p><i>Common Core State Standards Connections:</i></p> <p><i>ELA/Literacy -</i></p> <p>W.K.7 Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). (K-ESS2-1)</p> <p><i>Mathematics -</i></p> <p>MP.2 Reason abstractly and quantitatively. (K-ESS2-1)</p> <p>MP.4 Model with mathematics. (K-ESS2-1)</p> <p>K.CC.A Know number names and the count sequence. (K-ESS2-1)</p> <p>K.MD.A.1 Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object. (K-ESS2-1)</p> <p>K.MD.B.3 Classify objects into given categories; count the number of objects in each category and sort the categories by count. (K-ESS2-1)</p>		

K-ESS2-2 Earth's Systems

Students who demonstrate understanding can:

K-ESS2-2. Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs. [Clarification Statement: Examples of plants and animals changing their environment could include a squirrel digs in the ground to hide its food and tree roots can break concrete.]

The performance expectation above was developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Engaging in Argument from Evidence

Engaging in argument from evidence in K–2 builds on prior experiences and progresses to comparing ideas and representations about the natural and designed world(s).

- Construct an argument with evidence to support a claim.

Disciplinary Core Ideas

ESS2.E: Biogeology

- Plants and animals can change their environment.

ESS3.C: Human Impacts on Earth Systems

- Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things. *(secondary)*

Crosscutting Concepts

Systems and System Models

- Systems in the natural and designed world have parts that work together.

Connections to other DCIs in kindergarten: N/A

Articulation of DCIs across grade-levels:

4.ESS2.E ; 5.ESS2.A

Common Core State Standards Connections:

ELA/Literacy -

- R.K.1** With prompting and support, ask and answer questions about key details in a text. (K-ESS2-2)
- W.K.1** Use a combination of drawing, dictating, and writing to compose opinion pieces in which they tell a reader the topic or the name of the book they are writing about and state an opinion or preference about the topic or book. (K-ESS2-2)
- W.K.2** Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic. (K-ESS2-2)

K-ESS3 Earth and Human Activity

K-ESS3-1 Earth and Human Activity		
<p>Students who demonstrate understanding can:</p> <p>K-ESS3-1. Use a model to represent the relationship between the needs of different plants and animals (including humans) and the places they live. [Clarification Statement: Examples of relationships could include that deer eat buds and leaves, therefore, they usually live in forested areas; and, grasses need sunlight so they often grow in meadows. Plants, animals, and their surroundings make up a system.]</p>		
<p>The performance expectation above was developed using the following elements from the NRC document <i>A Framework for K-12 Science Education</i>:</p>		
Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p>Developing and Using Models Analyzing Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, storyboard) that represent concrete events or design solutions.</p> <ul style="list-style-type: none"> Use a model to represent relationships in the natural world. 	<p>ESS3.A: Natural Resources</p> <ul style="list-style-type: none"> Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do. 	<p>Systems and System Models</p> <ul style="list-style-type: none"> Systems in the natural and designed world have parts that work together.
<p><i>Connections to other DCIs in kindergarten: N/A</i></p>		
<p><i>Articulation of DCIs across grade-levels:</i> 1.LS1.A ; 5.LS2.A ; 5.ESS2.A</p>		
<p><i>Common Core State Standards Connections:</i></p> <p><i>ELA/Literacy -</i> SL.K.5 Add drawings or other visual displays to descriptions as desired to provide additional detail. <i>(K-ESS3-1)</i></p> <p><i>Mathematics -</i> MP.2 Reason abstractly and quantitatively. <i>(K-ESS3-1)</i> MP.4 Model with mathematics. <i>(K-ESS3-1)</i> K.CC Counting and Cardinality <i>(K-ESS3-1)</i></p>		

K-ESS3-2 Earth and Human Activity

Students who demonstrate understanding can:

K-ESS3-2. Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather.* [Clarification Statement: Emphasis is on local forms of severe weather.]

The performance expectation above was developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p>Asking Questions and Defining Problems Asking questions and defining problems in grades K–2 builds on prior experiences and progresses to simple descriptive questions that can be tested.</p> <ul style="list-style-type: none"> Ask questions based on observations to find more information about the designed world. <p>Obtaining, Evaluating, and Communicating Information Obtaining, evaluating, and communicating information in K–2 builds on prior experiences and uses observations and texts to communicate new information.</p> <ul style="list-style-type: none"> Read grade-appropriate texts and/or use media to obtain scientific information to describe patterns in the natural world. 	<p>ESS3.B: Natural Hazards</p> <ul style="list-style-type: none"> Some kinds of severe weather are more likely than others in a given region. Weather scientists forecast severe weather so that the communities can prepare for and respond to these events. <p>ETS1.A: Defining and Delimiting an Engineering Problem</p> <ul style="list-style-type: none"> Asking questions, making observations, and gathering information are helpful in thinking about problems. (<i>secondary</i>) 	<p>Cause and Effect</p> <ul style="list-style-type: none"> Events have causes that generate observable patterns. <p>-----</p> <p>Connections to Engineering, Technology, and Applications of Science</p> <p>Interdependence of Science, Engineering, and Technology</p> <ul style="list-style-type: none"> People encounter questions about the natural world every day. <p>Influence of Engineering, Technology, and Science on Society and the Natural World</p> <ul style="list-style-type: none"> People depend on various technologies in their lives; human life would be very different without technology.
<p><i>Connections to other DCIs in kindergarten:</i> K.ETS1.A</p>		
<p><i>Articulation of DCIs across grade-levels:</i> 2.ESS1.C ; 3.ESS3.B ; 4.ESS3.B</p>		
<p><i>Common Core State Standards Connections:</i></p> <p><i>ELA/Literacy -</i></p> <p>RI.K.1 With prompting and support, ask and answer questions about key details in a text. (K-ESS3-2)</p> <p>SL.K.3 Ask and answer questions in order to seek help, get information, or clarify something that is not understood. (K-ESS3-2)</p> <p><i>Mathematics -</i></p> <p>MP.4 Model with mathematics. (K-ESS3-2)</p> <p>K.CC Counting and Cardinality (K-ESS3-2)</p>		

* The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea

K-ESS3-3 Earth and Human Activity

Students who demonstrate understanding can:

K-ESS3-3. Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.* [Clarification Statement: Examples of human impact on the land could include cutting trees to produce paper and using resources to produce bottles. Examples of solutions could include reusing paper and recycling cans and bottles.]

The performance expectation above was developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p>Obtaining, Evaluating, and Communicating Information Obtaining, evaluating, and communicating information in K–2 builds on prior experiences and uses observations and texts to communicate new information.</p> <ul style="list-style-type: none"> Communicate solutions with others in oral and/or written forms using models and/or drawings that provide detail about scientific ideas. 	<p>ESS3.C: Human Impacts on Earth Systems</p> <ul style="list-style-type: none"> Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things. <p>ETS1.B: Developing Possible Solutions</p> <ul style="list-style-type: none"> Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. <i>(secondary)</i> 	<p>Cause and Effect</p> <ul style="list-style-type: none"> Events have causes that generate observable patterns.
<p><i>Connections to other DCIs in kindergarten:</i> K.ETS1.A</p>		
<p><i>Articulation of DCIs across grade-levels:</i> 2.ETS1.B ; 4.ESS3.A ; 5.ESS3.C</p>		
<p><i>Common Core State Standards Connections:</i> <i>ELA/Literacy -</i> W.K.2 Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic. <i>(K-ESS3-3)</i></p>		

* The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea