

First Grade Companion Document

1-Unit 1: Sorting By Properties

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Introduction to the K-7 Companion Document An Instructional Framework

Overview

The Michigan K-7 Grade Level Content Expectations for Science establish what every student is expected to know and be able to do by the end of Grade Seven as mandated by the legislation in the State of Michigan. The Science Content Expectations Documents have raised the bar for our students, teachers and educational systems.

In an effort to support these standards and help our elementary and middle school teachers develop rigorous and relevant curricula to assist students in mastery, the Michigan Science Leadership Academy, in collaboration with the Michigan Mathematics and Science Center Network and the Michigan Science Teachers Association, worked in partnership with Michigan Department of Education to develop these companion documents. Our goal is for each student to master the science content expectations as outlined in each grade level of the K-7 Grade Level Content Expectations.

This instructional framework is an effort to clarify possible units within the K-7 Science Grade Level Content Expectations. The Instructional Framework provides descriptions of instructional activities that are appropriate for inquiry science in the classroom and meet the instructional goals. Included are brief descriptions of multiple activities that provide the learner with opportunities for exploration and observation, planning and conducting investigations, presenting findings and expanding thinking beyond the classroom.

These companion documents are an effort to clarify and support the K-7 Science Content Expectations. Each grade level has been organized into four teachable units- organized around the big ideas and conceptual themes in earth, life and physical science. . The document is similar in format to the Science Assessment and Item Specifications for the 2009 National Assessment for Education Progress (NAEP). The companion documents are intended to provide boundaries to the content expectations. These boundaries are presented as “notes to teachers”, not comprehensive descriptions of the full range of science content; they do not stand alone, but rather, work in conjunction with the content expectations. The boundaries use seven categories of parameters:

- a. **Clarifications** refer to the restatement of the “key idea” or specific intent or elaboration of the content statements. They are not intended to denote a sense of content priority. The clarifications guide assessment.
- b. **Vocabulary** refers to the vocabulary for use and application of the science topics and principles that appear in the content statements and expectations. The terms in this section along with those presented

within the standard, content statement and content expectation comprise the assessable vocabulary.

- c. **Instruments, Measurements and Representations** refer to the instruments students are expected to use and the level of precision expected to measure, classify and interpret phenomena or measurement. This section contains assessable information.
- d. **Inquiry Instructional Examples** presented to assist the student in becoming engaged in the study of science through their natural curiosity in the subject matter that is of high interest. Students explore and begin to form ideas and try to make sense of the world around them. Students are guided in the process of scientific inquiry through purposeful observations, investigations and demonstrating understanding through a variety of experiences. Students observe, classify, predict, measure and identify and control variables while doing "hands-on" activities.
- e. **Assessment Examples** are presented to help clarify how the teacher can conduct formative assessments in the classroom to assess student progress and understanding
- f. **Enrichment and Intervention** is instructional examples the stretch the thinking beyond the instructional examples and provides ideas for reinforcement of challenging concepts.
- g. **Examples, Observations, Phenomena** are included as exemplars of different modes of instruction appropriate to the unit in which they are listed. These examples include reflection, a link to real world application, and elaboration beyond the classroom. These examples are intended for instructional guidance only and are not assessable.
- h. **Curricular Connections and Integrations** are offered to assist the teacher and curriculum administrator in aligning the science curriculum with other areas of the school curriculum. Ideas are presented that will assist the classroom instructor in making appropriate connections of science with other aspects of the total curriculum.

This Instructional Framework is NOT a step-by-step instructional manual but a guide developed to help teachers and curriculum developers design their own lesson plans, select useful portions of text, and create assessments that are aligned with the grade level science curriculum for the State of Michigan. It is not intended to be a curriculum, but ideas and suggestions for generating and implementing high quality K-7 instruction and inquiry activities to assist the classroom teacher in implementing these science content expectations in the classroom.

First Grade Unit: Sorting by Properties

Content Statements and Expectations

Background –

The first grade physical science unit is intended to develop the young learners' skills in using the senses to sort objects according to their observable physical attributes (color, shape, size, sinking, floating, texture and magnetic attraction). They explore the properties of water in its solid and liquid state.

Code	Statements & Expectations	Page
P.PM.E.1	Physical Properties – All objects and substances have physical properties that can be measured.	1
P.PM.01.11	Demonstrate the ability to sort objects according to observable properties such as color, shape, size, sinking and floating.	1
P.PM.E.2	States of Matter – Matter exists in several different states solids, liquids, and gases. Each state of matter has unique physical properties. Gases are easily compressed but liquids and solids do not compress easily. Solids have their own particular shapes, but liquids and gases take the shape of the container.	2
P.PM.01.21	Demonstrate that water as a solid keeps its own shape (ice).	2
P.PM.01.22	Demonstrate that water as a liquid takes on the shape of various containers	2
P.PM.E.3	Magnets – Magnets can repel or attract other magnets. Magnets can also attract magnetic objects. Magnets can attract and repel at a distance.	2-3
P.PM.01.31	Identify materials that are attracted by magnets.	2
P.PM.01.32	Observe that like poles of a magnet repel and unlike poles of a magnet attract.	3

1 – Unit 1: Sorting by Properties

Big Ideas (Key Concepts)

- Objects and substances can be sorted by their observable properties.
- The physical properties of water as a solid and as a liquid are different.
- Magnets can attract and repel other magnets and attract magnetic objects.

Clarification of Content Expectations

Standard: Properties of Matter

Content Statement - P.PM.E.1

Physical Properties – All objects and substances have physical properties that can be measured.

Content Expectation

P.PM.01.11: Demonstrate the ability to sort objects according to observable properties such as color, shape, size, sinking and floating.

Instructional Clarifications

1. Demonstrate is to show through manipulation of materials the sorting of objects according to observable properties.
2. Observable properties at this level are limited to observations using the appropriate senses and non-standard measurements of size.
3. Size descriptions include large, small, medium and larger and smaller and measurements in non-standard units of measurement.
4. Color descriptions include basic colors, such as, red, blue, yellow, green, orange, white, black, and purple.
5. Shape descriptions include, circle, square, rectangle, and triangle.
6. Sinking or floating is limited to trial and error investigations of objects that sink and objects that float in water.

Assessment Clarifications

1. Observable properties at this level are limited to observations using the appropriate senses and non-standard measurements of size.
2. Size descriptions include large, small, medium and larger and smaller and measurements in non-standard units of measurement.
3. Color descriptions include basic colors, such as, red, blue, yellow, green, orange, white, black, and purple.
4. Shape descriptions include, circle, square, rectangle, and triangle.

5. Sinking or floating is limited to trial and error investigations of objects that sink and objects that float in water.

Content Statement - P.PM.E.2

States of Matter – Matter exists in several different states: solids, liquids and gases. Each state of matter has unique physical properties. Gases are easily compressed but liquids and solids do not compress easily. Solids have their own particular shapes, but liquids and gases take the shape of the container.

Content Expectations

P.PM.01.21: Demonstrate that water as a solid keeps its own shape (ice).

Instructional Clarifications

1. Water as ice, snow, sleet, is described as a solid or in its solid state.
2. Solid objects, including ice, keep their own shape.
3. Water becomes a solid at temperatures that are below freezing.

Assessment Clarifications

1. Solid objects, including ice, keep their own shape.

P.PM.01.22 Demonstrate that water as a liquid takes on the shape of various containers.

Instructional Clarifications

1. Water as a liquid will take on the shape of the container that holds it.
2. Water as a liquid will spread out until it fills the container.
3. Water as a liquid can be poured from one container to another.

Assessment Clarifications:

1. Water as a liquid will take on the shape of the container that holds it.

Content Statement - P.PM.E.3

Magnets – Magnets can repel or attract other magnets. Magnets can also attract magnetic objects. Magnets can attract and repel at a distance.

Content Expectations

P.PM.01.31: Identify materials that are attracted by magnets.

Instructional Clarification

1. Identify means to recognize or point out materials that are attracted (pulled) to magnets from trial and error investigations.
2. Materials that are attracted to magnets are limited to trial and error investigations of objects that may or may not be attracted to magnets.

Assessment Clarification

1. Materials that are attracted to magnets are limited to trial and error investigations of objects that may or may not be attracted to magnets.

P.PM.01.32 Observe that like poles of a magnet repel and unlike poles of a magnet attract.

Instructional Clarifications

1. Observe is to look closely at the magnetic attraction and repulsion of the ends of magnets through trial and error investigations.
2. Magnet shapes include bar magnets, horseshoe magnets or disc magnets.
3. Students describe a push (repel) and pull (attract) as exhibited by each pole (end/side) of a magnet.
4. Students explore an introduction into magnetic poles through observation of the attraction and repulsion of a variety of magnets.

Assessment Clarifications

1. Demonstrate how some ends of magnets attract (pull) to each other and others repel (push) away from each other.

**Inquiry Process, Inquiry Analysis and Communication,
Reflection and Social Implications.**

Inquiry Processes
S.IP.01.11 Make purposeful observations of the properties of a variety of objects, sink and float objects, and objects that are attracted to magnets using the appropriate senses.
S.IP.01.12 Generate questions regarding objects attracted to a magnet and objects that sink and float based on observations.
S.IP.01.13 Plan and conduct simple investigations into objects that sink and float and objects that are attracted to magnets.
S.IP.01.14 Manipulate simple tools (hand lens) that aids in observation of properties of matter.
S.IP.01.16 Construct simple charts from data and observations regarding objects that sink and float and objects that are attracted to magnets.
Inquiry Analysis and communication
S.IA.01.12 Share ideas about properties of objects, sink and float investigations, and magnetism investigations through purposeful conversation.
S.IA.01.13 Communicate and present findings of observations of properties of objects; sink and float investigations, and magnetism investigations.
S.IA.01.14 Develop strategies for information gathering (ask an expert, use a book, make observations, conduct simple investigations) about properties of objects, sink and float objects, and objects that are attracted to a magnet.
Reflection and Communication
S.RS.01.11 Demonstrate scientific concepts through various illustrations, performances, models, exhibits, and activities about describing objects by their properties, sink and float investigations, water as a solid and as a liquid, and objects that are attracted to magnets.

Vocabulary

Critically Important – State Assessable	Instructionally Useful
Sort Properties Poles Solid Liquid Magnet Push Pull Attract Repel	Bar magnet Rod magnet Horseshoe magnet Disc magnet (ring magnet)

Instruments, Measurements, and Representations

Properties:	Size	Shape	Color	Sink and Float
	large small medium	circle round square rectangle oval triangle diamond cylinder	red orange blue yellow white black brown purple	

Instructional Framework

The following Instructional Framework is an effort to clarify possible units within the K-7 Science Grade Level Content Expectations. The Instructional Framework provides descriptions of instructional activities that are appropriate for inquiry science in the classroom and meet the instructional goals. Included are brief descriptions of multiple activities that provide the learner with opportunities for exploration and observation, planning and conducting investigations, presenting findings, and expanding thinking beyond the classroom. The Instructional Framework is NOT a step-by-step instructional manual, but a guide intended to help teachers and curriculum developers design their own lesson plans, select useful and appropriate resources and create assessments that are aligned with the grade level science curriculum for the State of Michigan.

Instructional Examples

Physical Properties: P.PM.01.11

States of Matter: P.PM.01.21, P.PM.01.22

Magnets: P.PM.01.31, P.PM.01.32

Objectives

- Sort objects according to observable properties, such as color, shape, size, texture, sinking or floating.
- Sort materials that can be attracted to a magnet.
- Identify characteristics of water as a solid and a liquid.

Explore and Engage

- Provide a variety of objects for students to observe and describe according to their own criteria. Give students the opportunity to attach their own language to describing objects before introducing the properties of objects.
- Have students describe objects to one another and have their partner guess what the object is by the student's description.
- Add objects to the students' exploration that have a new property to describe, such as objects that are squishy, fuzzy, or wet (cotton balls, wet sponge, cup of water) to increase their observation and vocabulary skills
- Play the game "I'm Thinking of Something..." and describe a common object in the room that by its properties. Have students try to guess what object you are describing. Have students list the different properties you used to describe the object.

- Explore how puddles are formed and how the shape and size of a puddle is determined by the pooling of water that takes the shape of the land.
- Explore, through observation and their own simple trial and error investigations, magnets with a variety of materials that are attracted and not attracted to magnets.
- Explore, through observation and their own simple trial and error investigations, how the ends of magnets can push away from each other or attract to each other.

Explain and Define

- Classify and record terms commonly used by students in their initial descriptions of properties of a variety of objects. Ask students what property they are using when they describe the object as red, or green, etc.
- Ask students to sort a variety of objects according to common properties that they observed using their own sorting process.
- Have students share their sorting procedure with the rest of the class. As a class discuss the difference in different sorting techniques.
- Make a list of basic properties for students to use in their sorting process, color, shape, size, and texture.
- Make a chart of properties and list objects on the chart that can be described with the list of properties.
- Have students repeat the describing and guessing exercise using the properties of color, size, shape, texture, hard or soft, and special markings or features.
- Explain and describe observations with magnets in own terms.

Elaborate and Apply

- Elaborate on the sorting by properties by introducing magnet and magnetic and non-magnetic material. Have students sort objects by their ability to be attracted by a magnet.
- Have students make pictographs of objects that are attracted and not attracted to magnets.
- Give students the opportunity to explore the polarity of magnets and experience the “push” and “pull” of like and unlike poles.
- Further the exploration into properties of objects by introducing objects that are solids and liquids. Have students describe solids by their properties and liquids by their properties.
- Make observations of a variety of shapes of ice and describe ice as a solid that keeps its shape. Make observations of liquid water and

describe liquid water that takes the shape of its container and can be poured from one container to another.

- Sinking and floating is another way of sorting objects by their properties. Give students a variety of objects to test for sinking and floating. Have students predict which objects will float and which objects will sink.
- Take this opportunity for students to create a simple chart to record their observation and make a statement about the objects regarding the objects that sank and the objects that floated.

Evaluate Student Understanding

Imbedded Assessment

- Use the student presentations and discussion to assess the students' ability to describe objects by their properties.
- Use student's descriptions to assess their use of vocabulary that includes color, size, shape, and texture.
- Use students' descriptions of their exploration of magnets and magnetic material to assess their ability to describe observations.

Summative Assessment

- Circle the objects that have the same shape.
- Choose the terms that best describe the object in the diagram.
- Choose the terms that best describe texture of objects.
- Draw a picture of an object that floats.
- Draw a picture of an object that sinks.

Enrichment

- Introduce measurement tools and units for students to measure different sizes of objects, such as weight, length, width, volume, etc.
- Introduce a variety of uncommon shapes and have students describe the shapes and compare them to common shapes.
- Investigate how magnets can move objects when the object is on the other side of different materials.
- Measure the temperature of water as a liquid and water as a solid. Investigate the freezing point of water.
- Investigate the path of liquid water down slopes and over material.

Intervention

- Use matching cards for reinforce the color, size, shape and texture words and color, size, shape and texture of a variety of objects.
- Sort objects by their color, shape, size, and texture.

Examples, Observations, and Phenomena (Real World Context)

Sorting objects, such as toys, food items, and crayons is a natural activity for young learners. Children make observations and comparisons of objects they see every day and on outings. The act of sorting objects by their properties is the first introduction into the properties of matter.

Sorting objects using magnets is used in factories and industry. Food packaging companies use large magnets to remove any iron debris from machinery that may have contaminated food, such as cereals and grains. Magnets are also used to sort and transport object in a junkyard and at the recycling center. At this age, students are engaged in a high interest activity that will lay a foundation for exploration, questioning, and interaction with peers.

Students are familiar with water as a liquid and water as a solid. The introduction of solids and liquids attaches language to observations and provides the opportunity to attach common weather related phenomena (snow, ice, and sleet) to activities in the classroom.

Literacy Integration

Reading

R.WS.01.10 in context, determine the meaning of words and phrases including objects, actions, concepts, content vocabulary, and literary terms, using strategies and resources including context clues, mental pictures, and questioning.

R.IT.01.02 discuss informational text patterns including descriptive, sequential, and enumerative.

R.IT.01.04 respond to individual and multiple texts by finding evidence, discussing, illustrating, and/or writing to reflect, make connections, take a position, and/or show understanding.

R.CM.01.01 make text-to-self and text-to-text connections and comparisons by activating prior knowledge and connecting personal knowledge and experience to ideas in text through oral and written responses.

R.CM.01.04 apply significant knowledge from grade-level science, social studies, and mathematics texts.

Examples of trade books available for learning about the life cycles of animals and animal characteristics:

How Many Snails? Author, Year

It Could Still Be Water, Author, Year

Magnets, Author, Year

Writing

W.GN.01.03 write an informational piece that addresses a focus question using descriptive, enumerative, or sequence patterns that may include headings, titles, labels, photographs, or illustrations to enhance the understanding of central ideas.

W.GN.01.04 use a teacher-selected topic to write one research question; locate and begin to gather information from teacher-selected resources; organize the information and use the writing process to develop a project.

W.PR.01.01 with teacher support, set a purpose, consider audience, and incorporate literary language when writing a narrative or informational piece; begin to use specific strategies including graphic organizers when planning.

- Students role-play and write a list of properties using the game, “I’m Thinking of Something” and exchange writing with another student to read and locate the object as described by properties.
- Students measure and include and refer to a chart of their measurements in their writing.
- Students read about magnets and write about an investigation into different materials that are attracted to magnets and materials that are not attracted to magnets. Students include and refer to a chart of their data in their writing.

Speaking

S.CN.01.02 explore and use language to communicate with a variety of audiences and for different purposes including making requests, solving problems, looking for solutions, constructing relationships, and expressing courtesies.

S.DS.01.01 engage in substantive conversations, remaining focused on subject matter, with interchanges building on prior responses in literature discussions, paired conversations, or other interactions.

S.DS.01.03 respond to multiple text types by reflecting, making meaning, and making connections.

- Students present and report findings orally.
- Students exchange ideas for magnetic and non-magnetic material.
- Students engage in conversation about the readings from the suggested books and explain the connections they are making between the classroom activities and the readings.

Mathematics Integration

M.UN.01.01 Measure the lengths of objects in non-standard units to the nearest whole units.

M.UN.01.02 Compare measured lengths using the words shorter, shortest, longer, longest, taller, tallest, etc.

D.RE.01.01 Collect and organize data to use in pictographs.

D.RE.01.02 Read and interpret pictographs.

- Measurement is used in describing and elaborating on the size of objects. Size is a property used in describing objects.

First Grade Companion Document

1-Unit 2: Animal Life

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First Grade Unit: Sorting by Properties

Content Statements and Expectations

Background –

The first grade live science curriculum builds on the students' prior knowledge of living and nonliving things and the basic needs of all living things. Students explore the development of animals through the basic life cycle: egg, young, and adult and egg, larva, pupa, and adult. They make connections between young and adult and recognize characteristics that are passed from parent to young.

Code	Statements & Expectations	Page
L.OL.E.1	Life Requirements – Organisms have basic needs. Animals and plants need air, water, and food. Plants also require light. Plants and animals use food as a source of energy for growth and repair.	1
L.OL.01.13	Identify the needs of animals.	1
L.OL.E.2	Life Cycles – Plants and animals have life cycles. Both plants and animals begin life and develop into adults, reproduce, and eventually die. The details of this life cycle are different for different organisms.	1
L.OL.01.21	Describe the life cycle of animals including the following stages: egg, young, adult; egg, larva, pupa, adult	1-2
L.HE.E.1	Observable Characteristics – Plants and animals share many, but not all, characteristics of their parents.	2
L.HE.01.11	Identify characteristics (for example: body coverings, beak shape, number of legs, body parts) that are passed from parents to young.	2
L.HE.01.12	Classify young animals based on characteristics that are passed on from parents (dogs/puppies, cats/kittens, cows/calves, chickens/chicks).	2

1 – Unit 2: Animal Life

Big Ideas (Key Concepts)

- Animals have needs for life (air, water, food, and space).
- Animals have a life cycle that includes egg, young (larva, pupa) and adult.
- Animals share some, but not all characteristics of their parents.

Clarification of Content Expectations

Standard: Organization of Living Things

Content Statement - L.OL.E.1

Life Requirements - Organisms have basic needs. Animals and plants need air, water, and food. Plants also require light. Plants and animals use food as a source of energy and as a source of building material for growth and repair.

Content Expectation

L.OL.01.13 Identify the needs of animals.

Instructional Clarifications

1. Identify means recognize the things that animals need to stay alive.
2. Animals need air, water, and food to survive.
3. Animals need space to survive.

Assessment Clarification

1. Animals need air, water, and food to survive.

Content Statement - L.OL.E.2

Life Cycles – Plants and animals have life cycles. Both plants and animals begin life and develop into adults, reproduce, and eventually die. The details of this life cycle are different for different organisms.

Content Expectation

L.OL.01.21: Describe the life cycle of animals including the following stages: egg, young, adult; egg, larva, pupa, adult.

Instructional Clarifications

1. Describe is to tell or depict in spoken or written words how the life cycle of animals can include various stages.

2. All animals have a life cycle.
3. Life cycle of animals include egg -> young -> adult.
4. Some animals, such as the butterfly, have a life cycle that includes egg -> larva -> pupa -> adult
5. The duration of the stages of the life cycle differ in different species.

Assessment Clarifications

1. All animals have a life cycle.
2. Common Life cycles of animals include egg -> young -> adult.
3. Some animals, such as the butterfly, have a life cycle that includes egg -> larva -> pupa -> adult

Standard: Heredity

Content Statement: L.HE.E.1

Observable Characteristics-Plants and animals share many, but not all, characteristics of their parents.

Content Expectations

L.HE.01.11 Identify characteristics (for example: body coverings, beak shape, number of legs, body parts) that are passed on from parents to young.

Instructional Clarifications

1. Identify means recognize the observable physical features of animals that are passed from parent to young.
2. Characteristics are the observable physical features of animals.
3. At this stage, students compare young animals to their parents and identify the physical features that the adult animals pass on to their young.
4. Common features that pass from parent to young include type of body covering, fur/hair/feather, coloring, beak shape, and eye color.

Assessment Clarifications

1. Characteristics are observable features of animals.
2. Parents pass some physical features to their young.

L.HE.01.12 Classify young animals based on characteristics that are passed on from parents (dogs/puppies, cats/kittens, cows/calves, chicken/chicks).

Instructional Clarifications

1. Classify means to arrange animals based on resemblances and /or differences that are passed on from their parents.
2. Students match common adult and baby animals of the same species.

Assessment Clarifications

1. Students match common adult and baby animals of the same species.

**Inquiry Process, Inquiry Analysis and Communication,
Reflection, and Social Implications**

Inquiry Process
S.IP.01.11 Make purposeful observations of the life cycle of an animal and/or characteristics of animals using the appropriate senses.
S.IP.01.12 Generate questions about the life cycle of organisms based on observations.
S.IP.01.13 Plan and conduct simple investigations into the needs of animals in the classroom habitat.
S.IP.01.14 Manipulate the hand lens, pencils, rulers, that aid observation of animals.
S.IP.01.15 Make accurate measurements of the growth of different plants and animals in a classroom habitat.
S.IP.01.16 Construct simple growth charts from observations and data of plants and animals in the classroom habitat.
Inquiry Analysis and Communication
S.IA.01.12 Share ideas about animals the their offspring through purposeful conversation.
S.IA.01.13 Communicate and present findings of observations of life cycles and growth of animals in the classroom habitat.
S.IA.01.14 Develop strategies for information gathering (ask an expert, use a book, make observations, conduct simple investigations, and watch a video) about the life cycle of different animals
Reflection and Social Implications
S.RS.01.11 Demonstrate the life cycle of an animal through various illustrations, performances, models, exhibits, and activities.

Vocabulary

Critically Important-State Assessable	Instructionally Useful
needs of animals life cycle egg young adult larva pupa characteristics parents air water food beak shape body coverings: feathers, fur, skin, hair, scales	

Instruments, Measurements, Representations

Instrument	Measurement/Observation	Representation
Metric ruler	Growth of animals	Centimeters
Hand lens	Characteristics of animals	Numbers, shapes and outstanding features

Instructional Framework

The following Instructional Framework is an effort to clarify possible units within the K-7 Science Grade Level Content Expectations. The Instructional Framework provides descriptions of instructional activities that are appropriate for inquiry science in the classroom and meet the instructional goals. Included are brief descriptions of multiple activities that provide the learner with opportunities for exploration and observation, planning and conducting investigations, presenting findings, and expanding thinking beyond the classroom. The Instructional Framework is NOT a step-by-step instructional manual, but a guide intended to help teachers and curriculum developers design their own lesson plans, select useful and appropriate resources and create assessments that are aligned with the grade level science curriculum for the State of Michigan.

Instructional Examples

Life Requirements: L.OL.01.13

Life Cycles: L.OL.01.21

Heredity: L.HE.01.11

Objectives

- Make observations of animals and their interactions within habitats.
- Focus on the needs of each and how they help the organism survive.
- Make observations on the patterns animals follow from being born to growing up and getting old.
- Make observations on parental and young characteristics.
- Compare the physical characteristics of offspring and parent.

Engage and Explore

- Students will study a live animal from egg to egg. L.OL.01.21, S.IP.01.11, S.IP.01.12, S.IA.01.12, S.IA.01.13
- Teacher will read a life cycle book about an animal with the student question - how do animals change. Then lead a discussion on what stages of growth the animal experienced. Characteristics can be used to describe the animal in its various stages of growth. L.OL.01.21, S.IP.01.11, S.IP.01.12, S.IA.01.12, S.IA.01.13, S.IA.01.14

Explain and Define

- Teacher will put on chart paper the student ideas about the growth stages of the organism. L.OL.01.21
- Students identify the needs of living things using evidence. L.OL.01.13,
- Students should be able to talk about characteristics passed from parent to offspring. L.HE.01.11, S.IP.01.11, S.IP.01.12, S.IA.01.12, S.IA.01.13, S.IA.01.14

Elaborate and Apply

- Multiple examples of passed characteristics and life cycles should be shared with the students. L.OL.01.21, L.HE.01.11, S.RS.01.11, S.RS.01.12, S.RS.01.11, S.RS.01.12

Evaluate Student Understanding

Formative Assessment Examples

- Check student observation/picture journal to determine if observations are appropriate/applicable. L.OL.01.21
- Student conversations in their groups can be used as basis for monitoring understanding. L.OL.01.21

Summative Assessment Examples

- Circle the living things. L.OL.01.13
- Circle the needs of living things. L.OL.01.13
- Draw a picture of an animal and its baby. L.HE.01.11,
- Circle the characteristic that is shared by these two animals. L.HE.01.11,
- Draw the next stage of life for this organism. L.OL.01.21

Enrichment

- Students study/research an animal of their choice to share (or turn in) by drawing the life cycle, characteristics passed from parent to offspring, life needs and habitat should be incorporated for their chosen animal.

Intervention

- Break students into research groups that focus on one aspect of the life cycle e.g. Egg group, Adult group, young group, old group, and have students cycle through each of these groups studying many different animals. Students will then rotate through the other groups to experience all of them.

Examples, Observations, and Phenomena (Real World Context)

Most young children, at one time have asked for a box or jar to capture an animal from the outdoors to bring home and watch for hours. The natural curiosity about living things has led young children to make observations, inferences, and establish ideas of their own. For example, students may not relate the caterpillar to the adult animal or a stage in an animal's life.

Through their outdoor experiences and observations, students have an understanding that animals eat specific foods and not others. They recognize that the diet of a squirrel includes acorns and other seeds and nuts and does not usually include lettuce leaves or a ham sandwich. It is through their real world experiences that students transfer what they have observed to the classroom models and observations. Young learners build understanding of life science concepts through direct experience with living things, their life cycles, habitats, and long-term observations.

Literacy Integration

Reading

R.WS.01.10 in context, determine the meaning of words and phrases including objects, actions, concepts, content vocabulary, and literary terms, using strategies and resources including context clues, mental pictures, and questioning.

R.IT.01.02 discuss informational text patterns including descriptive, sequential, and enumerative.

R.IT.01.04 respond to individual and multiple texts by finding evidence, discussing, illustrating, and/or writing to reflect, make connections, take a position, and/or show understanding.

R.CM.01.01 make text-to-self and text-to-text connections and comparisons by activating prior knowledge and connecting personal knowledge and experience to ideas in text through oral and written responses.

R.CM.01.04 apply significant knowledge from grade-level science, social studies, and mathematics texts.

Examples of trade books available for learning about the life cycles of animals and animal characteristics:

Life Cycles, Donna Schaffer, 1999

In the Woods: Who's Been Here? Lindsay Barrett George, 1995

Whose Baby is This? Wayne Lynch, 2000

An Earthworm's Life, John Himmelman, 2000

Under One Rock, Anthony Fredericks, 2001

Writing

W.GN.01.03 write an informational piece that addresses a focus question using descriptive, enumerative, or sequence patterns that may include headings, titles, labels, photographs, or illustrations to enhance the understanding of central ideas.

W.GN.01.04 use a teacher-selected topic to write one research question; locate and begin to gather information from teacher-selected resources; organize the information and use the writing process to develop a project.

W.PR.01.01 with teacher support, set a purpose, consider audience, and incorporate literary language when writing a narrative or informational piece; begin to use specific strategies including graphic organizers when planning.

- Students use their research on an organism to write their own life cycle book on their organism.

Speaking

S.CN.01.02 explore and use language to communicate with a variety of audiences and for different purposes including making requests, solving problems, looking for solutions, constructing relationships, and expressing courtesies.

S.DS.01.01 engage in substantive conversations, remaining focused on subject matter, with interchanges building on prior responses in literature discussions, paired conversations, or other interactions.

S.DS.01.03 respond to multiple text types by reflecting, making meaning, and making connections.

- Students present report findings orally.
- Students exchange ideas for habitat set-up, observations, and inferences based on observations.
- Students engage in conversation about the readings from the suggested books and explain the connections they are making between the classroom habitat, observations, and activities and the readings.

Mathematics Integration

M.UN.01.01 Measure the lengths of objects in non-standard units to the nearest whole units.

M.UN.01.02 Compare measured lengths using the words shorter, shortest, longer, longest, taller, and tallest, etc.

D.RE.01.01 Collect and organize data to use in pictographs.

D.RE.01.02 Read and interpret pictographs.

- Sizes and growth of organisms are measured and graphed, also duration of stages such as insect pupas that are counted and graphed.

First Grade Companion Document

1-Unit 3: Weather

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Introduction to the K-7 Companion Document An Instructional Framework

Overview

The Michigan K-7 Grade Level Content Expectations for Science establish what every student is expected to know and be able to do by the end of Grade Seven as mandated by the legislation in the State of Michigan. The Science Content Expectations Documents have raised the bar for our students, teachers and educational systems.

In an effort to support these standards and help our elementary and middle school teachers develop rigorous and relevant curricula to assist students in mastery, the Michigan Science Leadership Academy, in collaboration with the Michigan Mathematics and Science Center Network and the Michigan Science Teachers Association, worked in partnership with Michigan Department of Education to develop these companion documents. Our goal is for each student to master the science content expectations as outlined in each grade level of the K-7 Grade Level Content Expectations.

This instructional framework is an effort to clarify possible units within the K-7 Science Grade Level Content Expectations. The Instructional Framework provides descriptions of instructional activities that are appropriate for inquiry science in the classroom and meet the instructional goals. Included are brief descriptions of multiple activities that provide the learner with opportunities for exploration and observation, planning and conducting investigations, presenting findings and expanding thinking beyond the classroom.

These companion documents are an effort to clarify and support the K-7 Science Content Expectations. Each grade level has been organized into four teachable units- organized around the big ideas and conceptual themes in earth, life and physical science. . The document is similar in format to the Science Assessment and Item Specifications for the 2009 National Assessment for Education Progress (NAEP). The companion documents are intended to provide boundaries to the content expectations. These boundaries are presented as “notes to teachers”, not comprehensive descriptions of the full range of science content; they do not stand alone, but rather, work in conjunction with the content expectations. The boundaries use seven categories of parameters:

- a. **Clarifications** refer to the restatement of the “key idea” or specific intent or elaboration of the content statements. They are not intended to denote a sense of content priority. The clarifications guide assessment.
- b. **Vocabulary** refers to the vocabulary for use and application of the science topics and principles that appear in the content statements and expectations. The terms in this section along with those presented

within the standard, content statement and content expectation comprise the assessable vocabulary.

- c. **Instruments, Measurements and Representations** refer to the instruments students are expected to use and the level of precision expected to measure, classify and interpret phenomena or measurement. This section contains assessable information.
- d. **Inquiry Instructional Examples** presented to assist the student in becoming engaged in the study of science through their natural curiosity in the subject matter that is of high interest. Students explore and begin to form ideas and try to make sense of the world around them. Students are guided in the process of scientific inquiry through purposeful observations, investigations and demonstrating understanding through a variety of experiences. Students observe, classify, predict, measure and identify and control variables while doing "hands-on" activities.
- e. **Assessment Examples** are presented to help clarify how the teacher can conduct formative assessments in the classroom to assess student progress and understanding
- f. **Enrichment and Intervention** is instructional examples the stretch the thinking beyond the instructional examples and provides ideas for reinforcement of challenging concepts.
- g. **Examples, Observations, Phenomena** are included as exemplars of different modes of instruction appropriate to the unit in which they are listed. These examples include reflection, a link to real world application, and elaboration beyond the classroom. These examples are intended for instructional guidance only and are not assessable.
- h. **Curricular Connections and Integrations** are offered to assist the teacher and curriculum administrator in aligning the science curriculum with other areas of the school curriculum. Ideas are presented that will assist the classroom instructor in making appropriate connections of science with other aspects of the total curriculum.

This Instructional Framework is NOT a step-by-step instructional manual but a guide developed to help teachers and curriculum developers design their own lesson plans, select useful portions of text, and create assessments that are aligned with the grade level science curriculum for the State of Michigan. It is not intended to be a curriculum, but ideas and suggestions for generating and implementing high quality K-7 instruction and inquiry activities to assist the classroom teacher in implementing these science content expectations in the classroom.

**First Grade Unit:
Weather**

Content Statements and Expectations

Background –

This Earth Science unit focuses on the study of weather and how it changes from day to day and over the seasons. The young learners are given the opportunity to observe, record, and measure weather conditions over a period of time.

Code	Statements & Expectations	Page
E.ES.E.2	Weather – Weather changes from day to day and over the seasons.	1
L.ES.01.21	Compare daily changes in the weather related to temperature (cold, hot, warm, cool); cloud cover (clear, cloudy, partly cloudy, foggy); precipitation (rain, snow, hail, freezing rain); wind (breezy, windy, calm).	1
E.ES.E.3	Weather Measurement – Scientists use tools for observing, recording, and predicting weather changes	1
E.ES.01.31	Identify the tools that might be used to measure temperature, precipitation, cloud cover and wind.	2
E.ES.01.32	Observe and collect data of weather conditions over a period of time.	2

1 – Unit 3: Weather

Big Ideas (Key Concepts)

- Weather exhibits short and long term patterns.
- Tools can be used to assist the recording and predicting of weather.

Clarification of Content Expectations

Standard: Earth Systems

Content Statement: E.ES.E.2

Weather – Weather changes from day to day and over the seasons.

Content Expectation

E.ES.01.21 Compare daily changes in the weather related to temperature (cold, hot, warm, cool); cloud cover (clear, cloudy, partly cloudy, foggy) precipitation (rain, snow, hail, freezing rain); wind (breezy, windy, calm).

Instructional Clarification:

1. Compare is to note the similarities and differences in daily weather conditions.
2. Temperature comparisons are limited to cool, warm, cold, hot.
3. Cloud cover is limited to the classifications of clear, cloudy, partly cloudy, and foggy.
4. Precipitation types are limited to rain, snow, hail, and freezing rain.
5. Wind descriptions are limited to calm, breezy, and windy.

Assessment Clarification:

1. Temperature comparisons are limited to cool, warm, cold, hot.
2. Cloud cover is limited to the classifications of clear, cloudy, partly cloudy, and foggy.
3. Precipitation types are limited to rain, snow, hail, and freezing rain.
4. Wind descriptions are limited to calm, breezy, and windy.

Content Statement: E.ES.E.3

Weather Measurement – Scientists use tools for observing, recording, and predicting weather changes.

Content Expectations

E.ES.01.31 Identify the tools that might be used to measure temperature, precipitation, cloud cover and wind.

Instructional Clarifications

1. Identify is to recognize the tools used to measure temperature (thermometer), precipitation (rain gauge), and wind (wind vane or sock).
2. Weather measurement tools are limited to thermometers; eyes for cloud cover estimates, rain gauges, and wind vane or sock.
3. Measurements can be made in standard and metric units including: Celsius, Fahrenheit, centimeters, inches, clear, partly cloudy, cloudy, north, south, east, west and calm, breezy, windy.
4. Wind direction indicates the direction from which the wind is coming.

Assessment Clarifications

1. Weather measurement tools are limited to thermometers; eyes for cloud cover estimates, rain gauges, and wind vane or sock.
2. Measurements can be made in standard and metric units including Celsius, Fahrenheit, centimeters, inches, clear, partly cloudy, cloudy, north, south, east, west and calm, breezy, windy.

E.ES.01.32 Observe and collect data of weather conditions over a period of time.

Instructional Clarification

1. Observe is to look closely at weather conditions and collect data over a period of time.
2. Weather observations include observations over months to show seasonal changes.

Assessment Clarification

1. Weather observations include observations over months to show seasonal changes.

Inquiry Process, Inquiry Analysis and Communication, Reflection and Social Implications
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Inquiry Process
S.IP.01.11 Make purposeful observations of the daily weather.
S.IP.01.12 Generate questions about weather events based on observations of temperature, rainfall, cloud cover, and wind speed.
S.IP.01.13 Plan and conduct simple observations into weather related phenomenon such as temperature, rainfall, cloud cover, and wind speed.
S.IP.01.14 Manipulate simple tools that aid in weather observations and data collection (thermometers, rain gauges, wind socks).
S.IP.01.15 Make accurate measurements with appropriate units for the weather observation tools. (Fahrenheit, Celsius, centimeters, North, South, East, West, breezy, windy, and calm)
S.IP.01.16 Construct simple charts from weather data and observations of temperature, rain fall, cloud cover, and wind speed.
Inquiry Analysis and Communication
S.IA.01.11 Share ideas about weather in Michigan through purposeful conversation.
S.IA.01.12 Communicate and present findings of observations and patterns in weather.
S.IA.01.13 Develop strategies for information gathering to find out about weather related phenomenon and events (ask a meteorologist, use a book, make observations, conduct simple investigations, and watch a weather report or video).
Reflection and Social Implications
S.RS.01.11 Recognize that science investigations into weather and data collection are done more than one time.
S.RA.01.12 Demonstrate weather and/or season concepts through various illustrations, performances, models, exhibits, and activities.

Vocabulary

Critically Important – State Assessable	Instructionally Useful
temperature cold warm hot cool weather conditions daily weather pattern cloud clear- sunny cloudy partly cloudy foggy precipitation rain snow hail freezing rain rain gauge wind vane wind sock breezy windy calm	solar percentage centimeters inches north south east west Celsius Fahrenheit

Instruments, Measurements, and Representations

Measurement	Instruments	Representations
temperature	Observation by senses Thermometer	cool, warm, hot, cold Celsius, Fahrenheit
cloud cover	Observation by senses	Clear/sunny, cloudy, partly cloudy, foggy
precipitation	Rain gauge Ruler or meter stick	centimeters, inches
wind	Observation by senses Wind vane Wind sock	calm, breezy, windy north, south, east, west

Instructional Framework

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Instructional Examples

Weather: E.ES.01.21

Weather Measurement: E.ES.01.31, E.ES.01.32

Objectives

- Make and record daily observations of temperature, cloud cover, precipitation, and wind.
- Use tools to measure temperature, precipitation, and wind.
- Use simple charts and tables to make pictographs to display recorded weather conditions.

Engage and Explore

- Take the class outside to make weather observations using their senses. Engage the students in a talk about what the weather is like today and what it was like yesterday. Ask them how scientists (meteorologists) know what the weather will be like tomorrow. E.ES.01.21, S.IP.0.11, S.IP.01.12, S.IA.01.12, S.IA.01.13
- Set up a table or center with weather instruments, including thermometers, rain gauges and pictures of rain gauges, wind vanes, wind socks, and weather events (clouds, rain, clear, snow, etc.) Give students opportunities to explore and ask questions. E.ES.01.31, S.IP.01.14, S.IA.01.12, S.IA.01.13
- Record questions students ask on a chart. These will give direction for inquiry activities for the rest of the unit.
- If necessary, explain to the students any safety considerations for the weather instruments. For example, thermometers are made with glass and are easy to break. E.ES.01.31

Explain and Define

- In a whole group setting, students discuss what they observed when they explored the weather instruments on the table or in the learning center. Ask students how they think scientists/meteorologists use the instruments. E.ES.01.31, S.IP.01.12, S.IA.01.12, S.IA.01.13
- After listening to children's ideas about weather and weather instruments, ask them what they might do to check their ideas. E.ES.01.21, E.ES.01.31, S.IA.01.14
- Read picture books that explain concepts about weather and how scientists use tools to measure weather data. Compare their ideas to the scientific ones. E.ES.01.21, E.ES.01.31, S.IA.01.14
- Give students opportunities to practice using the thermometers. Let them take temperature measurements inside and outside the classroom. They can place thermometers in bowls of various temperatures of water, in cups of snow, outdoors in sand or soil. Students can place thermometers in bowls of "oatmeal/porridge" to make a connection to the story of *Goldilocks and the Three Bears*. E.ES.01.31, S.IP.01.14, S.IP.01.15,
- Give students the opportunity to recognize what the thermometer looks like when the material is hot, warm, cool and cold. Role-play the recognition of hot, warm, cool, and cold by having students act like a thermometer and stand up when it is hot and sink as the temperature cools. E.ES.01.31, S.IP.01.14, S.IP.01.15, S.RS.01.12
- Let students make some simple weather instruments. For example, rain gauges and wind socks or wind vane. Ideas for constructing these can be found in children's books or on weather for kids Internet sites. Give children opportunities to use wind vanes, windsocks, and rain gauges to measure wind and precipitation. E.ES.01.31, S.IP.01.14, S.IP.01.15
- Allow the students to test their ideas through trial and error. When differences in data occur, brainstorm possible reasons for the differences in the class. Let students design an investigation to test their hypotheses. S.IA.01.12, S.IA.01.13, S.IA.01.14
- As a class, watch a weather forecast on television or look at one on the Internet. S.IA.01.14
- Read books about the different types of clouds and compare the pictures to the clouds they see. At this age, some students only think of the puffy cumulus or wispy cirrus clouds as clouds. Some children do not realize that a gray blanket of low-lying stratus clouds is really a type of cloud too. E.ES.01.21, S.RS.01.11

Elaborate and Apply

- Set up a weather station in the classroom with the students. Like meteorologists, they will make and record weather observations over time. E.ES.01.21, E.ES.01.31, S.IP.01.14, S.IP.01.15
- Students decide how to collect weather data and what instruments they will need. Students record information on a classroom chart and in their journal. E.ES.01.31, S.IP.01.14, S.IP.01.15, S.IA.01.14

- Discuss the collection of temperature, wind, cloud cover, and precipitation amounts with the weather tools. Better procedures for collecting weather will develop over time if children are allowed to make mistakes and then these are discussed in class for a whole group evaluation. E.ES.01.31, S.IA.01.12, S.IA.01.13, S.IA.01.14
- Supplement with and compare classroom data to official data from the Internet or weather channel. S.IA.01.14
- Teach students how to make a pictograph of their recorded data. At the end of a week or month of data collecting, make a graph and save. Make comparisons between weeks and months. Which month had the most sunny, rainy, or cloudy days? Which month had the fewest? Which month was the sunniest, cloudiest, or rainiest? How many big snowfalls were there during the winter months? What was the total amount of snow that fell in each storm? What was the total amount of rain or snow for a particular month? Which month was the snowiest? Keep these graphs and charts for comparisons over time. E.ES.01.21, E.ES.01.32, S.IP.01.12, S.IP.01.16
- Let students communicate their weekly or monthly findings to students in the other grades during morning announcements, in a monthly newsletter, or a weather chart in the hallway outside. E.ES.01.21, E.ES.01.32, S.IP.01.16, S.IA.01.12, S.IA.01.13

Evaluate student understanding

Formative Student Understanding

- Observe students as they use the weather tools for their ability to make accurate measurements. E.ES.01.31
- Observe students as they read weather data from a chart or pictograph.
- Evaluate the students' ability to make accurate comparisons (i.e. there were four more sunny days in March than in April. There were ten fewer inches of snow in January than in February.) E.ES.01.32
- Evaluate students' ability to use the weather vocabulary correctly and relate the weather instrument with the correct weather event. E.ES.01.31

Summative Assessment Examples

- Circle the instrument that is used to measure the wind. E.ES.01.31
- Put an X on the instrument that is used to measure the amount of rain that falls.
- (Show pictures of two thermometers with different readings - cold, hot). Which thermometer measured something that was hot? E.ES.01.31
- Circle the picture that BEST shows a windy day. E.ES.01.31
- Using the pictograph, tell how many days were sunny.
- Sally and Jose' wanted to collect weather for one week. List or draw the weather data they should collect. E.ES.01.21

Enrichment

- Lay a transparent hundred square on top of pictures of clouds. Count or estimate the number of squares that have a part of the cloud in them to determine the percentage of cloud cover.
- Explore other weather instruments or concepts not mentioned in the GLCEs but are used in everyday weather forecasts; for example, barometers for air pressure, anemometers for wind speed, wind direction, or humidity.
- Use the Internet to compare the weather in your school to weather in different states or countries.
- Teach children how to use and read an alcohol thermometer in Celsius and Fahrenheit.
- Learn to read weather maps like the ones on TV or the Internet (i.e. Weather Channel) or in the newspaper (i.e. USA today on the back page of the first section)

Intervention

- Some students will have difficulty reading the scale on the thermometer and/or rain gauge and will need extra practice. Give them practice skip counting by twos or fives, or whatever the scale is on your instruments may help. Using a thermometer or rain gauge with an easier scale may help.
- Place red and blue tape or marker on the thermometers to show where on the scale the temperature is hot and cold.

Examples, Observations, and Phenomena (Real World Context)

Weather is an everyday phenomena and local weather is easy to observe. Patterns over time are easier to notice when observations are recorded and made into graphs or tables. There are many examples of maps, charts, graphs, and tables in the news and on the Internet, but students should make their own. While observations can be made on a daily basis, when certain weather events such as unusually heavy winds, heavy precipitation, or thunderstorms occur, they can be discussed in the classroom and used as special opportunities for learning.

Have students relate weather conditions to the choice of clothing and outdoor activities.

Using tools for collection of weather data helps students to make connections with common weather information and the instrument used to quantitatively report weather.

Literacy Integration

Reading:

R.IT.01.01 Identify and describe the basic form, features, and purpose of a variety of informational genre including simple “how-to” books, science and social studies magazines.

R.CM.01.04 Apply significant knowledge from grade-level science, social studies, and mathematics texts.

Examples of trade books available for learning about the life cycles of animals and animal characteristics:

Air is All Around You, Franklyn M. Branley, 2006

The Wind Blew, Pat Hutchins, 1993

Clouds, Eric Carle

- Students may read about how the weather instruments they use and explain how they are like the ones the meteorologist uses.
- Students may read an informational text on how to make a weather instrument

Writing:

W.GN.01.03 Write an informational piece that addresses a focus question (e.g., What is a family?) using descriptive, enumerative, or sequence patterns that may include headings, titles, labels, photographs, or illustrations to enhance the understanding of central ideas.

- Students may write an informational piece about a weather tool using a picture with titles, and labels.
- Students may write about a sequence of events during a storm they experienced.

Speaking:

S.CN.01.03 Speak effectively maintaining appropriate posture, eye contact, and position, using props such as photographs or illustrations in narrative and informational presentations.

S.DS.01.01 Engage in substantive conversations, remaining focused on subject matter, with interchanges building on prior responses in literature discussions, paired conversations, or other interactions.

- When having a discussion about their collected weather information, students will listen and respond appropriately to their classmates.
- Students will present what they have written about their weather instrument or storm experiences.

<p>Mathematics Integration</p>

D.RE.01.01 Collect and organize data to use in pictographs.

D.RE.01.02 Read and interpret pictographs.

D.RE.01.03 Make pictographs of given data using both horizontal and vertical forms of graphs; scale should be in units of one and include symbolic representations

N.ME.01.01 Count to 110 by 1's, 2's, 5's, and 10's, starting from any number in the sequence.

N.ME.01.02 Read and write numbers to 110 and relate them to the quantities they represent.

N.ME.01.03 Order numbers to 110; compare using phrases such as "same as", "more than", "greater than", "fewer than"; use = symbol. Arrange small sets of numbers in increasing or decreasing order

N.MR.01.09 Compare two or more sets in terms of the difference in number of elements.

- Students will collect data like the number of sunny days or the amount of precipitation during a storm and organize the data in charts and pictographs.
- Students will be able to read and interpret graphs and to answer questions like: What is the total number of days that were sunny in all the weeks? How many more or how many fewer days were cloudy than sunny?
- Students will read the temperature using the scale on an alcohol thermometer and tell when one temperature is hotter or colder than another.

First Grade Companion Document

1-Unit 4: The Sun Warms the Earth

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This instructional framework is an effort to clarify possible units within the K-7 Science Grade Level Content Expectations. The Instructional Framework provides descriptions of instructional activities that are appropriate for inquiry science in the classroom and meet the instructional goals. Included are brief descriptions of multiple activities that provide the learner with opportunities for exploration and observation, planning and conducting investigations, presenting findings and expanding thinking beyond the classroom.

These companion documents are an effort to clarify and support the K-7 Science Content Expectations. Each grade level has been organized into four teachable units- organized around the big ideas and conceptual themes in earth, life and physical science. . The document is similar in format to the Science Assessment and Item Specifications for the 2009 National Assessment for Education Progress (NAEP). The companion documents are intended to provide boundaries to the content expectations. These boundaries are presented as “notes to teachers”, not comprehensive descriptions of the full range of science content; they do not stand alone, but rather, work in conjunction with the content expectations. The boundaries use seven categories of parameters:

- a. **Clarifications** refer to the restatement of the “key idea” or specific intent or elaboration of the content statements. They are not intended to denote a sense of content priority. The clarifications guide assessment.
- b. **Vocabulary** refers to the vocabulary for use and application of the science topics and principles that appear in the content statements and expectations. The terms in this section along with those presented

within the standard, content statement and content expectation comprise the assessable vocabulary.

- c. **Instruments, Measurements and Representations** refer to the instruments students are expected to use and the level of precision expected to measure, classify and interpret phenomena or measurement. This section contains assessable information.
- d. **Inquiry Instructional Examples** presented to assist the student in becoming engaged in the study of science through their natural curiosity in the subject matter that is of high interest. Students explore and begin to form ideas and try to make sense of the world around them. Students are guided in the process of scientific inquiry through purposeful observations, investigations and demonstrating understanding through a variety of experiences. Students observe, classify, predict, measure and identify and control variables while doing "hands-on" activities.
- e. **Assessment Examples** are presented to help clarify how the teacher can conduct formative assessments in the classroom to assess student progress and understanding
- f. **Enrichment and Intervention** is instructional examples the stretch the thinking beyond the instructional examples and provides ideas for reinforcement of challenging concepts.
- g. **Examples, Observations, Phenomena** are included as exemplars of different modes of instruction appropriate to the unit in which they are listed. These examples include reflection, a link to real world application, and elaboration beyond the classroom. These examples are intended for instructional guidance only and are not assessable.
- h. **Curricular Connections and Integrations** are offered to assist the teacher and curriculum administrator in aligning the science curriculum with other areas of the school curriculum. Ideas are presented that will assist the classroom instructor in making appropriate connections of science with other aspects of the total curriculum.

This Instructional Framework is NOT a step-by-step instructional manual but a guide developed to help teachers and curriculum developers design their own lesson plans, select useful portions of text, and create assessments that are aligned with the grade level science curriculum for the State of Michigan. It is not intended to be a curriculum, but ideas and suggestions for generating and implementing high quality K-7 instruction and inquiry activities to assist the classroom teacher in implementing these science content expectations in the classroom.

**First Grade Unit:
The Sun Warms the Earth**

Content Statements and Expectations

Background –

This Earth Science unit focuses on the sun providing the light and warmth necessary for plant and animal life, and how plant and animal life are dependent on a variety of earth materials.

Code	Statements & Expectations	Page
E.ES.E.1	Solar Energy – The sun warms the land, air, and water and helps plants grow.	1
E.ES.01.11	Identify the sun as the most important source of heat, which warms the land, air, and water on the Earth.	1
E.ES.01.12	Demonstrate the importance of sunlight and warmth in plant growth.	1
E.ES.E.2	Weather – Weather changes from day to day and over the seasons.	2
E.ES.01.22	Describe and compare weather related to the four seasons in terms of temperature, cloud cover, precipitation, and wind.	2
E.ES.01.23	Identify severe weather characteristics	2
E.ES.01.24	Describe precautions that should be taken for human safety during severe weather conditions (thunder and lightning, strong winds, and heavy precipitation)	2

1-Unit 4: The Sun Warms the Earth

Big Ideas (Key Concepts)

- The sun warms the Earth.
- It is usually warmer in the daytime than at night.
- It is usually warmer in the summer than in winter.
- Weather is related to the four seasons.
- Severe weather can occur throughout the year.

Clarification of Content Expectations

Standard: Earth Systems

Content Statement: E.ES.E.1

Solar Energy – The sun warms the land, air, and water and helps plants grow.

Content Expectation

E.ES.01.11 Identify the sun as the most important source of heat, which warms the land, air, and water on the Earth.

Instructional Clarification

1. Identify means to recognize that the sun warms the land, air, and water.
2. The sun can be identified as the primary source of heat on Earth.
3. Air, water, and land are affected differently by the sun's heat.
4. It is usually warmer in the daytime than at night.
5. It is usually warmer in the summer than in the winter.
6. The Earth is just the right distance from the sun to support life.

Assessment Clarification

1. The sun can be identified as the primary source of heat on Earth.

E.ES.01.12 Demonstrate the importance of sunlight and warmth in plant growth.

Instructional Clarification

1. Demonstrate is to show through manipulation of materials and investigation the importance of sunlight and warmth in plant growth.
2. Plants need sunlight and warmth to grow and survive.

Assessment Clarification

1. Plants need sunlight and warmth to grow and survive.

Content Statement: E.ES.E.2

Weather – Weather changes from day to day and over the seasons.

Content Expectations

E.ES.01.22 Describe and compare weather related to the four seasons in terms of temperature, cloud cover, precipitation, and wind.

Instructional Clarification

1. Describe is to tell or depict in spoken or written words weather related to the four seasons.
2. Compare is to note the similarities and differences between the seasons in terms of temperature, cloud cover, precipitation, and wind.
3. Weather can be described as having seasonal patterns in which cloud cover, temperature, precipitation, and wind follow general observable patterns.
4. Observable weather descriptions can be used to describe and compare spring, summer, fall, and winter.

Assessment Clarification

1. Weather can be described as having seasonal patterns in which cloud cover, temperature, precipitation, and wind follow general observable patterns.
2. Observable weather descriptions can be used to describe and compare spring, summer, fall, and winter.

E.ES.01.23 Identify severe weather characteristics.

Instructional Clarification

1. Identify is to recognize severe weather conditions and characteristics.
2. Severe weather events will be limited to thunderstorms, lightning, tornadoes, high winds, and blizzards.
3. Use discretion when teaching young children about severe weather events. Some children can be traumatized by graphic descriptions of these destructive weather phenomena.
4. Descriptions of these severe weather events will be limited to description by wind speed, precipitation type and amount, duration, frequency, and the size of the event.
 - a. Thunderstorm: A thunderstorm is a storm with lightning and thunder. They have gusty winds and heavy rain. They can occur in any season, but are more common in spring and summer in Michigan and in the afternoon or evening hours.
 - b. Lightning: Lightning is a bright flash of electricity produced by a thunderstorm.
 - c. Tornado: A tornado is a windstorm that happens over land and has a funnel-shaped cloud that extends and touches the ground. (If it does not touch the ground it is referred to as a funnel cloud, not a

tornado.) Winds can be 40 mph to over 300 mph. Tornadoes usually last five to ten minutes, although some have lasted as long as an hour. They usually happen between the months of March and August in Michigan. There are close to 1,000 thunderstorms in the US every year. Most of them (75%) are weak.

- d. Blizzard: A blizzard is a winter storm with large amounts of falling or blowing snow and very strong winds (greater than 35 mph) for an extended period of time (greater than 3 hours).

Assessment Clarification

1. Severe weather characteristics will be limited to thunder and lightning, strong winds, and heavy precipitation.

E.ES.01.24 Describe precautions that should be taken for human safety during severe weather conditions (thunder and lightning, strong winds, and heavy precipitation)

Instructional Clarification

1. Describe is to tell or depict in spoken or written words precautions that should be taken during severe weather conditions.
2. Precautions will be limited in description to severe weather events in Michigan.
3. Safety ideas will be limited to safe areas to go and places to avoid in each of these severe weather events as applicable.
 - a. Thunder and lightning - Go inside a sturdy building if you can. If you are in a car, stay in the car. Do not use the telephone or computers. If you cannot go inside, stay away from tall buildings or trees. Do not go into pools, lakes, or other bodies of water.
 - b. Tornadoes or high winds - Go down to a basement or into a room that is in the center of the building. Get under a sturdy piece of furniture. Stay away from windows. Get out of cars or trailer homes.
 - c. Blizzards – At home, stay inside. If outside, get to shelter. In a car or truck, stay inside. Run the car for about 10 minutes each hour for heat. Exercise to stay warm.
 - d. All storms - Flashlights should be used instead of candles when the power goes out. Stay away from fallen power and utility lines. Stay off the phone or computer.
4. Safety in severe weather includes listening to weather media and adults.

Assessment Clarification

1. Precautions will be limited to severe weather characteristics in Michigan.
2. Safety ideas will be limited to safe areas to go and places to avoid during severe weather.
3. Safety in severe weather includes listening to weather media and adults.

Inquiry Process, Inquiry Analysis and Communication, Reflection and Social Implications
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Inquiry Process
S.IP.01.11 Make purposeful observations of the daily weather to relate to the four seasons in terms of temperature, cloud cover, precipitation and wind.
S.IP.01.12 Generate questions about weather events based on observations of temperature, precipitation, cloud cover, and wind speed.
S.IP.01.13 Plan and conduct simple observations into weather related phenomenon such as temperature, precipitation, cloud cover, and wind speed.
S.IP.01.14 Manipulate simple tools that aid in weather observations and data collection (thermometers, rain gauges, wind socks or wind vanes).
S.IP.01.15 Make accurate measurements with appropriate units for the weather observation tools. (Fahrenheit, Celsius, centimeters, North, South, East, West)
S.IP.01.16 Construct simple charts from weather data and observations of temperature, rain fall, cloud cover, and wind speed.
Inquiry Analysis and Communication
S.IA.01.11 Share ideas about weather, severe storms and seasons through purposeful conversation.
S.IA.01.12 Communicate and present findings of patterns in weather and observations of weather related to seasons.
S.IA.01.13 Develop strategies for information gathering to find out about weather related phenomenon, changes in the seasons, and severe weather events (ask a meteorologist, use a book, make observations, conduct simple investigations, and watch a weather report or video).
Reflection and Social Implications
S.RS.01.11 Recognize that science investigations into weather and data collection are done more than one time.
S.RA.01.12 Demonstrate weather and/or season concepts through various illustrations, performances, models, exhibits, and activities.

Vocabulary

Critically Important – State Assessable	Instructionally Useful
severe weather thunderstorm lightning tornadoes blizzards breezy wind windy strong winds safety seasons summer fall winter spring temperature cool warm hot cold cloud cover precipitation rain snow sunny precautions	solar percentage centimeter inches source of heat observations Celsius Fahrenheit

Instruments, Measurements, Representations

Measurement	Instruments	Representations
temperature	observation by senses thermometer	cool, warm, hot, cold Celsius, Fahrenheit
cloud cover	observation by senses	clear, cloudy, partly cloudy, foggy
precipitation	rain gauge ruler or meter stick	centimeter, inches
wind	observation by senses wind vane wind sock	calm, breezy, windy

Instructional Framework

*The following Instructional Framework is an effort to clarify possible units within the K-7 Science Grade Level Content Expectations. The Instructional Framework provides descriptions of instructional activities that are appropriate for inquiry science in the classroom and meet the instructional goals. Included are brief descriptions of multiple activities that provide the learner with opportunities for exploration and observation, planning and conducting investigations, presenting findings, and expanding thinking beyond the classroom. The Instructional Framework is **NOT** a step-by-step instructional manual, but a guide intended to help teachers and curriculum developers design their own lesson plans, select useful and appropriate resources and create assessments that are aligned with the grade level science curriculum for the State of Michigan.*

Instructional Examples

Solar Energy: E.ES.01.11

Weather: E.ES.01.22, E.ES.01.23, E.ES.01.24

Objectives

- Plan and conduct simple investigations of the sun's warming of the Earth.
- Make weather observations and manipulate simple tools that aid in weather observations and data collection over time.
- Describe the characteristics of severe weather events and safety precautions related to severe weather.
- Use simple charts, tables, or pictographs to compare monthly and seasonal weather conditions.

Engage and Explore

- Engage students in a variety of opportunities to observe, collect, and record weather phenomena over multiple seasons. (Note: Although this unit is one of four for first grade, it can follow or be combined with the weather unit so that weather observation opportunities can occur throughout the year.) (E.ES.01.21, S.IP.01.11, S.IP.01.14, S.IP.01.15, S.IP.01.16)
- Engage students in a discussion about seasons, the appropriate clothing, and activities they can do during each season. (E.ES.01.22, S.IA.01.12, S.IA.01.13)
- Give students the opportunity to explore the thermometer and discuss their ideas in groups. (S.IP.01.14, S.IP.01.15)
- Take students outdoors to make weather observations using their senses. (E.ES.01.22, S.IP.01.11)

- Generate questions about why the temperature is different in the shade and sun or morning and afternoon. (E.ES.01.11, S.IP.01.12)
- After measuring different earth material with the thermometer, ask the students if the temperature they are taking is that of the air, the land, or water. Students at this age need to come to think of air as a substance too. Often remind them that air is all around, even if you cannot see it. (E.ES.01.11, S.IP.01.13, S.IP.01.15)
- Plan and conduct investigations into the different temperatures they observed outdoors, for example measure the temperature of the air in the sun and shade, measure the temperature of the soil in the sun and shade, or measure the temperature of a container of water in the sun and shade. (E.ES.01.11, S.IP.01.13, S.IP.01.14, S.IP.01.15)

Explain and Define

- Share information from investigations of temperature of air, land, and water in different locations. Discuss the most important source of heat that affected the material. (E.ES.01.11, S.IA.01.12)
- Gather artifacts or pictures to represent the seasons; for example, an umbrella, pictures of snowmen, sand pail and shovel, buds on a twig, pictures of a tornado, pictures of lightning, etc. Have students sort the pictures and/or artifacts by season and explain why they sorted the pictures or objects as they did. E.ES.01.22, S.IP.01.11, S.IA.01.13)
- Discuss weather patterns and data from classroom weather data collection. Relate the different weather phenomena to different seasons. (E.ES.01.22, S.IA.01.12, S.IA.01.13)
- Read books about the seasons. Connect to the real world by reading the book about a particular season on the first day of the season. Look at weather data collected during the previous season. Of course, weather patterns will overlap the calendar's designation for seasons. (E.ES.01.22, S.IA.01.14)
- It can help students become more aware that air is a substance by filling waving plastic bags back and forth, filling them with air. Invert a plastic cup and carefully push it down into an aquarium filled with water. If a paper towel is wadded up and placed in the cup first, when you lift the cup out of the water, the towel will be dry. Submerge the cup again, but this time, tip it slightly and watch the bubbles of air come out. (E.ES.01.12, S.IP.01.11)

Elaborate and Apply

- Continue collecting weather observations from the classroom weather station set up in Unit 3 (Weather). (Note: Collecting and recording weather data provides multiple opportunities to practice mathematics skills in the context of real world events. Saving the collected weather data over time in the form of graphs and text can help students see seasonal patterns.)

- Take or draw pictures of a tree located on the school grounds, perhaps one outside the classroom window. Watch how it changes over the school year. (E.ES.01.22, S.IP.01.11, S.RS.01.11)
- Discuss human and other animal activities in different seasons. (E.ES.01.22, S.IA.01.12)
- Engage students in conversations about severe weather. (Note: A good time to do this would be when you practice the safety drills for the weather event or when the weather event is in the news. These discussions can lead to questions about that event and inquiry activities.) (E.ES.01.23, S.IA.01.12, S.IP.01.12)
- Read books about the different types of severe weather. Discuss observations and changes in cloud cover, wind speed, and precipitation during a storm. Compare them to the weather observations before the storm. How did the local observations during the storm compare to the storm's characteristics from the book or other informational text? (E.ES.01.23, S.IA.01.14)
- Share information about safety during storms. This information can be found on Internet sites such as the NOAA's National Weather Service and the American Red Cross. (E.ES.01.23)
- Students can act out a play of things they should do during severe weather. E.ES.01.23, S.RS.01.11)
- Engage the students in discussion to answer a *what would happen if* question: What would happen if there weren't any sun? S.RS.01.11, S.IP.01.12)

Evaluate Student Understanding

Formative Assessment Examples

- Observe students as they use the tools to make accurate measurements. (S.IP.01.14, S.IP.01.15)
- Evaluate the students' use of weather vocabulary in their descriptions of weather, seasons and severe weather events. Are they using the measurement terms correctly? Do they understand the differences in seasons? Do they know what to do during severe weather? (E.ES.01.22, E.ES.01.23)
- Use the class discussion to evaluate the students' understanding of the relationship between weather and seasons. (E.ES.01.22)
- Use the investigation presentations and *what would happen if* questions to evaluate the students' understanding that the sun is the most important source of heat. (E.ES.01.11)

Summative Assessment Examples

- Match an activity to the season (Swimming outside-summer, playing in snow-winter, playing in or raking fallen leaves-fall, flying kites or planting gardens-spring. (E.ES.01.22)
- Circle the picture of the thermometer that demonstrates summer. (S.IP.01.14)
- Show pictures of rain and snow. Circle the type of precipitation that falls when it is cold. (E.ES.01.22)

- Put an X on what you do not see during a thunderstorm. (Show pictures of clouds, lightning, sun) (E.ES.01.23)
- Put an X on the pictures that show what you could do during a thunderstorm if you are home. (Pictures of a child reading a book, playing a board game, working on a computer, talking on the telephone) (E.ES.01.23)
- Put an X on the pictures of where you should go if you are outside when you hear thunder. (Pictures of a child inside a garage, picture of a child under a picnic shelter, picture of a child standing under a tree, pictures of kids swimming in a pool or lake) (E.ES.01.23)
- Circle the BEST picture that shows where the Earth gets most of its heat. (Moon, sun, campfire, oven, volcano) (E.ES.01.11)

Enrichment

- Investigate and compare the length of day and angle of the sun throughout the seasons. Relate the amount and angle of sunlight to temperature and seasons.
- Some students can design another experiment to show how the sun affects water and soil differently
- Although Michigan does not experience hurricanes, they are the world's biggest weather event and they get much attention in the news. Remnants of a hurricane can reach Michigan in the form of clouds and rain. Some students will be interested in learning more about hurricanes as a severe weather event.
- Some students may be interested in learning how the seasons vary in different parts of the country and different parts of the world.

Intervention

- If students have not yet learned to read an alcohol thermometer, use a digital thermometer like one used for cooking or a temperature probe connected to a computer.
- Review the appropriate dress for different seasons.
- Provide resources that demonstrate human and other animal activity in different seasons.

Examples, Observations, and Phenomena (Real World Context)

Weather is an everyday phenomenon. In Michigan, there are many opportunities to observe weather events that will allow students see the connection of classroom learning to the real world. We have four distinct seasons and often experience severe weather events. These weather events or results of weather events (i.e., no power) sometimes close the school. Emergency procedures for severe weather events are practiced in the classroom. Severe weather events that occur outside of Michigan are also in the media when they happen and are other opportunities to learn about the real world outside the classroom.

The changing of seasons in Michigan is evident through observations of trees and animal activity. Students relate seasons to what plants and animals do.

Literacy Integration

Reading

R.IT.01.01 Identify and describe the basic form, features, and purpose of a variety of informational genre including simple “how-to” books, science and social studies magazines.

R.CM.01.04 Apply significant knowledge from grade-level science, social studies, and mathematics texts.

- Students may read about how the severe weather, safety, seasons.
- Students apply their knowledge about seasons to animal behavior and plant growth.
- Students may read an informational text on severe weather events and seasons.

Grade level appropriate informational text to extend the learning in this unit:

Red Leaf, Yellow Leaf. Ehler, L. (1991)

The Seasons of Arnold's Apple Tree Gibbons, G. (1984)

Thunder Cake, Polacco, P. (1990)

A New Coat for Anna, Ziefert, Harriet. (1988)

Writing

W.GN.01.01 write a personal narrative using illustrations and transitional words such as before, after, now, or finally to indicate a sequence of events, sense of story (beginning, middle, and end), and physical descriptions.

W.GN.01.03 write an informational piece that addresses a focus question (e.g., What is a family?) using descriptive, enumerative, or sequence patterns that may include headings, titles, labels, photographs, or illustrations to enhance the understanding of central ideas.

W.GN.01.04 use a teacher-selected topic to write one research question; locate and begin to gather information from teacher-selected resources; organize the information and use the writing process to develop a project.

- Students may ask a question about one of the severe weather types and research to answer the question (e.g., What is a blizzard?)
- Students can write a story indicating a sequence of events about their experiences during a severe weather event.
- After learning about safety tips for hurricanes, thunderstorms, blizzards, or tornadoes, students can write an informational text that summarizes what they should do for one type of severe weather.

Speaking

S.DS.01.04 plan and deliver presentations using an informational organizational pattern (e.g., descriptive, enumerative, or sequential) providing several facts and details to make their point while maintaining appropriate posture and eye contact using a prop.

- Students can share what they learned about the weather events or weather safety. They can report their findings from weather data and collection as if they were a weather person on the radio or television.
- Anna needed a new coat, but the war had just ended and people had no money. This story tells how Anna got her wool coat through bartering, starting with shearing of the sheep for wool.

Mathematics Integration

D.RE.01.01 Collect and organize data to use in pictographs.

D.RE.01.02 Read and interpret pictographs.

D.RE.01.03 Make pictographs of given data using both horizontal and vertical forms of graphs; scale should be in units of one and include symbolic representations

N.ME.01.01 Count to 110 by 1's, 2's, 5's, and 10's, starting from any number in the sequence.

N.ME.01.02 Read and write numbers to 110 and relate them to the quantities they represent.

N.ME.01.03 Order numbers to 110; compare using phrases such as "same as", "more than", "greater than", "fewer than"; use = symbol. Arrange small sets of numbers in increasing or decreasing order

N.MR.01.09 Compare two or more sets in terms of the difference in number of elements.

N.MR.01.10 Model addition and subtraction for numbers through 30 for a given contextual situation using objects or pictures; explain in words; record using numbers and symbols; solve.*

- Students observe and record the number of sunny, cloudy, rainy or snowy days in a month and make a pictograph. Compare each month's pictographs to see which month has more rainy, cloudy, or sunny days.

- Students collect data from weather reports and record the amount of snow that falls in storms that occur throughout the winter. They use this information to make a pictograph. For example, each snowflake can represent one inch of snow. They can compare the amount of snow from each storm and make an addition and subtraction problem to solve.