First Grade Companion Document

1-Unit 4: The Sun Warms the Earth

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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:
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 live, and how plant and animal life are dependent on a variety of earth materials.

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 generable 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 sever 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

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. Ehlert, 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.