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.

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

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

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
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.

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.

- 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.