First Grade Companion Document

1-Unit 1: Sorting By Properties

Table of Contents Page 1

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.

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 test 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.