Kindergarten Companion Document

K-Unit 1: Observations with Senses

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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.

Kindergarten Unit:
Observing with Senses

Content Statements and Expectations

Background –

The Kindergarten Unit 1: *Observations with Senses* is the only unit in the K-7 Science Curriculum that focuses entirely on inquiry and science skills rather than science content within inquiry. This unit presents the initial opportunity for young learners to explore their world and concentrate on the skills necessary to make good observations. The importance of the use of the senses for observation continues throughout the curriculum in grades first through fourth. In the Instructional Examples, students are guided in the process of scientific inquiry through purposeful observations, raising questions, making sense of observations, developing vocabulary, investigating, and making meaning of the experience.

K-Unit 1: Observations with Senses

Big Ideas (Key Concepts)

- The five senses are sight, sound, touch, smell, and taste.
- The senses aid in observation that helps us to understand our surroundings.
- Not all senses are used for all observations.

Clarification of Content Expectations

Standard: Inquiry Process

Content Statement – S.IP.E.1
Inquiry involves generating questions, conducting investigations, and developing solutions to problems through reasoning and observation.

Content Expectation

S.IP.00.11 Make purposeful observation of the natural world using the appropriate senses.

Instructional Clarifications

1. A purposeful observation is to look closely and carefully at something to learn more about it.
2. The senses include the sense of sight, sound, touch, smell, and taste.
3. Appropriate senses refer to limited and appropriate use of senses in science for safety.
4. The sense of taste is only explored in carefully supervised and controlled investigations. Permission is required to use the sense of taste.
5. The sense of smell is only explored using the “wafting” technique and not a direct smell or inhalation of the material.
6. Students recognize that good observations are not limited to the sense of sight, but include purposeful observations using all the appropriate senses within safety guidelines.

Assessment Clarification

1. The senses include the sense of sight, sound, touch, smell, and taste.
2. Appropriate senses refer to limited and appropriate use of senses in science for safety.
3. Students recognize that good observations are not limited to the sense of sight, but include purposeful observations using all the appropriate senses within safety guidelines.

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

Inquiry Processes
S.IP.00.11 Make purposeful observation of the natural world using the appropriate senses.
S.IP.00.12 Generate questions based on observations using the senses.
S.IP.00.13 Plan and conduct simple investigations using the senses.
S.IP.00.14 Manipulate simple tools (hand lens, balances) that aid observation and data collection.
S.IP.00.16 Construct simple charts from data and observations.
Inquiry Analysis and Communication
S.IA.00.12 Share ideas about the senses through purposeful conversation.
S.IA.00.13 Communicate and present findings of observations.
S.IA.00.14 Develop strategies for information gathering (ask an expert, use a book, make observations, conduct simple investigations, and watch a video).
Reflection and Social Implications
S.RS.00.11 Demonstrate science concepts about the senses through illustrations, performances, models, exhibits, and activities.

Vocabulary

Critically Important–State Assessable	Instructionally Useful
senses	hazardous
observation	safety
sight	magnifying glass
sound	microscope
taste	binoculars
touch	telescope
smell	sweet
feel	salty
	bitter
	sour
	eyes
	ears
	nose
	skin
	hands
	feet
	mouth
	tongue

Instruments, Measurements, Representations

Sense	Body Part	Other Tools	Importance
sight	eyes	Magnifying glass Microscope Binoculars Telescope Eye glasses	Helps us to see things in the environment and recognize others
sound	ears	Hearing aid	Helps us receive information by verbal as well as non-verbal communication
taste	mouth, tongue		Helps us select and enjoy food. There are four familiar tastes: sweet, salty, bitter, sour
touch	hands, feet, skin		Helps us learn by feeling the size, texture, shape, temperature
smell	nose		Helps us enjoy pleasant smells and recognize dangerous situations (i.e. smoke from fire)

Instructional Framework

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Instructional Examples

Inquiry: S.IP.00.11, S.IP.00.13, S.IP.00.14, S.IP.00.16, S.IA.00.12, S.IA.00.13, S.IA.00.14

Objectives

- Students learn that there are five senses.
- Students use their senses to make purposeful observations about the world.
- Students will sort objects based on observable attributes including shape, size, color, sound, and smell.

Engage and Explore

- Take a walk outside to make purposeful observations. If feasible and the area is safe, have students walk barefoot. Encourage students to share with a partner, while on the walk, some of the things they observe. Ask students questions during the walk to help them focus on their senses. What do you hear, smell, feel, or see? (S.IP.00.11)
- Make purposeful observations from one place by placing a hula-hoop or tied string in a circle and sit very quietly in the middle. Have students cover their ears and make observations, then close their eyes and make observations. (S.IP.00.11)
- Engage the students in a whole group discussion about their observations. Identify the senses they needed to make the observations. (S.IP.01.11, S.IA.00.12, S.IA.00.13)
- Set up science exploration centers with activities that explore the senses. Include objects that make different types of noise; swatches of materials with different textures to feel; plastic bottles with familiar scents to smell by the wafting method and identify; objects of various shapes, colors, and

sizes to sort. (Note: Children should not be allowed to put things in their mouth to taste unless closely supervised.)(S.IP.00.11, S.IP.00.12, S.IP.00.13, S.IA.00.14, S.RS.00.11)

- Give students sets of blocks, toy cars, buttons, shells, or other materials that have various attributes to sort. The attributes include size, color, shape, thickness, flexibility, type of material (i.e. wood, metal, or plastic), number of holes, or others. After sorting objects, ask students to describe how they sorted them. (S.IP.00.11, S.IP.00.12, S.IP.00.13, S.IA.00.14, S.RS.00.11)
- Have students sit quietly for two minutes and listen to all the noises they hear. First have them predict what they think they will hear. Afterwards, make a class list of all the noises and the things they think made them. (S.IP.00.11, S.RS.00.11)

Explain and Define

- With the whole group, share students' ideas for sorting objects. Brainstorm different ways the objects were sorted to show that there is more than one way to sort them. Show students how to use a graphic organizer such as a chart, or a one or two circle Venn diagram to record how they sorted their objects. (S.IP.00.11, S.IA.00.12)
- Go on a blindfolded walk with a partner. Taking turns, one child will lead another through a specified area. After the blind-fold walk, have the student re-take the walk without the blindfold. In a large group discussion, let children describe how they felt when they were blindfolded compared to when they were not. Talk about what they are able to observe when they do not have their eyes to see. (S.IP.00.11, S.IA.00.13, S.RS.00.11)
- Read the book, *Through Grandfather's Eyes*, and compare the feelings experienced by John and his Grandpa to the ones they may have experienced in this activity. S.IP.00.11, S.IA.00.14)
- What color of eyes is the most common in the classroom? Give children a small mirror to look at their eyes. Make a graph of the color of eyes of all the children in the classroom.
- Put various shaped blocks in a bag. Ask the children to find a block with a certain shape or size. Can they find a block of a certain color? Discuss what information the senses can and cannot provide. (S.IP.00.11, S.IA.00.12)
- Identify food by only using the sense of taste. Cut up an apple, pear, and potato. With eyes closed, hold your nose and taste the pieces. Record whether or not you were able to identify the food correctly using only the sense of taste. (S.IP.00.11)
- Identify food with the sense of smell. Pop popcorn and keep it out of sight. Ask students how they know you popped popcorn. Ask for their evidence the popcorn has been popped. (S.IP.00.11, S.IA.00.12)

Elaborate and Apply

- Elaborate on observations with senses by introducing observation tools. Give students hand lenses or simple microscopes to observe small things, like grains of sand, swatches of different materials, leaves, small insects, coins, and other very small objects. Give students binoculars to use when they are outside. Compare how hand lenses can help the eye see things that are small and binoculars can help students see things better when they are very far away. (S.IP.00.11, S.IP.00.14, S.IP.00.15)
- Discuss with the children the size of objects such as an airplane when it is close and when it is far away. Have them draw pictures to show the difference. (S.IP.00.11, S.RS.00.11)
- Working with a partner or small group, one student sorts a small set of objects by an attribute of their choice. The partner must guess the attribute their partner used to sort the objects. (S.IP.00.11, S.RS.00.11)
- Are two ears better than one? Investigate this by choosing a child to go to the center of a circle. This child will close his eyes while the teacher points to one of the other children in the circle who will snap their fingers or lightly clap. The child in the center points to where he hears the sound coming. Do this two more times. Then try it again, but have the child in the center cover one ear with his hand, thus using only one ear to hear the snap or clap. Is the child as accurate as before? Repeat two more times. (S.IP.00.11, S.IP.00.12, S.IP.00.13, S.RS.00.11)
- The teacher or a student stands behind the door or a screen. Make noises for other students to guess. For example, ring a bell or open the drawer. Include an activity that does not make noise, for example, writing on paper. This will show that sometimes you need to use more than one sense to better interpret an event. (S.IP.00.11, S.RS.00.11)
- Review all five senses and how they help by reading the big book students put together during the unit (see Writing Integration activity). (S.IP.00.11, S.IA.00.14)
- Make a texture graph and select from many articles to glue them into categories that make them similar. After students have classified their articles, label them with color, hard, soft, rough, smooth, etc. (S.IP.00.16)

Evaluate Student Understanding

Formative Assessment Examples

- Evaluate students' use of terms, knowledge of all five senses, and ability to observe with them during the small group activities and whole group discussions. (S.IP.00.11)
- Evaluate students' ability to sort and describe the attribute used to sort objects during sorting activities and discussions about the sorting activities. (S.IP.00.11)

Summative Assessment Examples

- Which sense do you use to identify the color of a Teddy Bear? (sight) (S.IP.00.11)
- Which senses can you use to observe the size of a Teddy Bear? (sight and touch) (S.IP.00.11)

- Which sense do you use to know that something is burning on the stove in the kitchen when you are in another room? (smell) (S.IP.00.11)
- Which sense do you use to observe that your milk is cold? (touch) (S.IP.00.11)
- Which sense to you use to tell if a candy is sweet or sour? (taste) (S.IP.00.11)
- Which senses can you use to tell if a car is coming down the street? (sound, sight) (S.IP.00.11)
- Which sense do you use to know if the water is running in the bathroom sink but you are in the bedroom? (sound) (S.IP.00.11)
- Show a picture of objects in a one-circle Venn diagram. Large 2-D shapes of various kinds are inside the circle and small 2-D shapes of the same various shapes are outside the circle. Circle the way these shapes were sorted. (color, shape, size) (S.IP.00.11)

Enrichment

- Explore the parts of the eye and ear and how they work.
- Describe ways to care for the eyes, ears, and nose.
- Research physical impairments related to the senses and how people learn to cope.

Intervention

- Some students may be color-blind and have difficulty with certain colors. If you notice this in a student, you may wish to discuss this with a parent. Use attributes other than color to evaluate that child's ability to sort.
- When sorting objects by attributes, it helps to have the attribute name or picture (or both) on a card or sentence strip to be placed by that set of objects.
- Word cards and pictures of the sense that is in focus for the lesson posted on the blackboard will help struggling readers relate the word to the concept.

Examples, Observations, and Phenomena (Real World Context)

All the information we receive as humans comes to us through our senses. Each sense is important, but each has its limitations. People who do not have the use of one sense are able to compensate with another. The best way to receive information is by using all the senses together.

All the information we receive from our senses of sight and hearing comes to our brain through special nerve endings. The epidermis, or top layer of the skin, has many nerve endings and these send messages to the brain so that we can tell what we are feeling. We can feel hot or cold, wet or dry, hard or soft, rough or smooth, strange or familiar. Your brain then figures it out and lets us know what to do with it.

In humans, the sense of smell is weak. As humans evolved they developed reasoning skills and did not depend as much on the sense of smell as other animals. Some people develop their sense of smell for a special use, i.e. wine makers and perfume makers. The tongue is covered with taste buds that have many nerve endings. We can only taste four flavors – sweet, salty, sour, and bitter. Different parts of the tongue have receptors for certain flavors. Saliva plays a role in tasting. The food must get wet with the saliva before we can taste it. Our sense of smell helps us taste the food we eat.

Animals have enhanced senses that help them survive. The owl and other nocturnal animals have special eyes that allow them to see in the dark. Deer, rabbits, and foxes are examples of animals with large ears to help the hear predators, prey and other dangers.

Literacy Integration

R.IT.00.04 Respond to individual and multiple texts by finding evidence, discussing, illustrating, and/or writing to reflect, make meaning, and make connections.

R.CM.00.04 Apply significant knowledge from grade-level science, social studies, and mathematics texts.

Examples of trade books available for learning about the individual senses:

The Five Senses, Aliki, 1989
The Five Senses, Margaret Miller, 1998

- After reading or listening to the reading of both texts that describe the five senses, students discuss how they use their senses. They discuss how the two books are the same and how they are different.

Writing

W.GN.00.03 Write a brief informational piece such as a page for a class book using drawings, words, word-like clusters, and/or sentences.

- Students cut and paste magazine pictures of people using their senses. They write a word or phrase about the picture for a classroom big book.

Speaking

S.CN.00.01 Explore and use language to communicate with a variety of audiences and for different purposes including problem solving, explaining, looking for solutions, constructing relationships, and expressing courtesies.

S.DS.00.03 Respond to multiple text types by reflecting, making meaning, and making connections.

- Students explain their thinking during the observation and sorting activities.
- Students engage in conversation about the readings from the suggested books and explain the connections they are making between the activities and the readings.

Mathematics Integration

G.GS.00.01 Relate familiar three-dimensional objects inside and outside the classroom to their geometric name, e.g., ball/sphere, box/cube, soup can/cylinder, ice cream cone/cone, refrigerator/prism

G.GS.00.02 Identify, sort, and classify objects by attribute and identify objects that do not belong in a particular group.

- Students use their senses to sort objects by shape, size, color, texture, etc.

Kindergarten Companion Document

K-Unit 2: Pushes and Pulls

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Kindergarten Unit 2:
Pushes and Pulls

Content Statements and Expectations

Background –

The kindergarten content expectations for Physical Science are intended to build on observations students have made about motion prior to entering school. The unit uses the early learners' ability to correctly sense some of the behaviors of simple mechanical objects and objects in motion. The young learner can attach appropriate language to observations and investigations into motion, including that objects fall toward the Earth.

K-Unit 2: Pushes and Pulls

Big Ideas (Key Concepts)

- The position of the observer and object affect the description of motion.
- Pushes and pulls are forces that change the motion of objects.
- Change in motion is affected by the shape and mass of an object.
- Objects on Earth fall down toward the Earth unless something holds them up.

Clarification of Content Expectations

Standard: Force and Motion

Content Statement - P.FM.E.1
Position-A position of an object can be described by locating the object relative to other objects or a background. The description of the motion of an object from one observer's view may be different from that reported from a different observers view.

Content Expectations

P.FM.00.11 Describe the position of an object (above, below, in front of, behind, on) in relation to other objects around it.

Instructional Clarifications

1. Describe is to tell or depict in spoken or written words the position of an object in relation to other objects around it.
2. At this level, students increase their describing words to include specific vocabulary that describes the position of an object in relation to other objects.
3. Students recognize that the description of the position of an object differs with the location of the observer.

Assessment Clarification

1. At this level, students increase their describing words to include specific vocabulary that describes the position of an object in relation to other objects.

P.FM.00.12 Describe the direction of a moving object (for example: away from or closer to) from different observers' views.

Instructional Clarifications

1. Describe is to tell or depict in spoken or written words the path of moving objects from different perspectives.
2. The description of the direction of a moving object is different when observing from different locations. (Example: A car moving toward a garage is moving toward the observer standing in the garage and away from the observer standing at the street.)
3. The description of the direction of a moving object in reference to another object is the same regardless of the location of the observer. (Example: The car that is moving toward the garage is moving toward the garage regardless of where the observer is standing.)

Assessment Clarification

1. The description of the direction of a moving object is different when observing from different locations.

Content Statement: P.FM.E.2

Gravity- Earth pulls down on all objects with a force called gravity. With very few exceptions, objects fall to the ground no matter where the object is on the Earth.

Content Expectation

P.FM.00.21 Observe how objects fall toward the Earth.

Instructional Clarifications

1. Observe is to look closely at something to learn more about it.
2. At this level, students are not held responsible for defining gravity.
3. Students observe that objects of all shapes and sizes fall down toward the Earth.
4. With few exceptions (helium filled balloons), objects fall to the ground no matter where the object is on Earth.
5. Note: A common misconception is that heavier or more massive objects fall to the Earth at a faster rate. All objects fall to the Earth at the same rate. The rate of falling objects is not appropriate for kindergarteners.

Assessment Clarification

1. Students observe that objects of all shapes and sizes fall down toward the Earth.

Content Statement: P.FM.E.3
Force – A force is either a push or a pull. The motion of objects can be changed by forces. The size of the change is related to the size of the force. The change is also related to the mass of the object on which the force is being exerted. When an object does not move in response to a force, it is because another force is being applied by the environment.

Content Expectations

P.FM.00.31 Demonstrate pushes and pulls on objects that can move**.**

Instructional Clarifications
1. Demonstrate is to show through manipulation of materials pushes and pulls on objects that make them move.
2. Students demonstrate the difference between a push and a pull.
3. A push is a force that moves an object away.
4. A pull is a force that moves an object toward.

Assessment Clarifications
1. Students demonstrate the difference between a push and a pull.
2. A push is a force that moves an object away.
3. A pull is a force that moves an object toward.

P.FM.00.32 Observe that objects initially at rest will move in the direction of a push or pull.

Instructional Clarifications
1. An object at rest is an object that is not in motion.
2. A push or a pull will cause an object at rest to move in the direction of the push or pull.

Assessment Clarifications
1. An object at rest is an object that is not in motion.
2. A push or a pull will cause an object at rest to move in the direction of the push or pull.

P.FM.00.33 Observe how pushes and pulls can change the speed or direction of moving objects.

Instructional Clarifications
1. Students make purposeful observations of how the speed of an object can be changed by an added push or pull.
2. Students make purposeful observations of how the direction of an object in motion can be changed by a push or a pull.

3. A push or a pull that changes the direction or speed of an object includes an applied push or pull or an incidental push or pull, such as striking another object, friction, or gravity.

Assessment Clarifications:

1. Students make purposeful observations of how the speed of an object can be changed by an added push or pull.
2. Students make purposeful observations of how the direction of an object in motion can be changed by a push or a pull.

P.FM.00.34 Observe how the shape and mass of an object can affect motion.

Instructional Clarifications

1. Students make purposeful observations of how the motion of an object can be affected by shape, mass, and size.
2. Students observe how added mass affects the motion of the object.
3. Heavier objects require a greater force to start it in motion.

Assessment Clarifications

1. Students make purposeful observations of how the motion of an object can be affected by shape, mass, and size.

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

Inquiry Process
S.IP.00.11 Make purposeful observations of the movement of objects in response to pushes and pulls.
S.IP.00.12 Generate questions based on observations of objects falling toward the Earth.
S.IP.00.13 Plan and conduct simple investigations about pushes and pulls changing the speed or direction of moving objects.
S.IP.00.14 Manipulate simple tools (pencil) to collect data about the affect of pulls or pushes changing the speed or direction of moving objects.
S.IP.00.16 Construct simple charts from investigations about pushes and pulls changing the speed or direction of moving objects.
Inquiry Analysis and Communication
S.IA.0011 Share ideas through purposeful conversation about how pushes or pulls affect the speed or direction of moving objects.
S.IA.0012 Communicate and present findings of observations about the motion of an object (for example: away from or closer to) from different observer's views.
S.IA.0013 Develop strategies for information gathering (ask an expert, make observations, conduct investigations, watch a video) about forces affecting the motion of objects**.**
Reflection and Social Implications
S.RS.0011 Demonstrate the effect of pushes or pulls on the motion of objects through various illustrations, performances, models, exhibits or activities.

Vocabulary

Critically Important-State Assessable	Instructionally Useful
push pull direction speed shape size mass at rest above below in front of behind on under between on top away from closer to toward fast, faster slow, slower	north south east west right left different shapes (circle, square, triangle, cone, cylinder, sphere) weight

Instruments, Measurements, and Representations

Measurement	Instruments	Representations
distance a variety of objects travel	non-standard measurement instruments	non-standard units of measurement
weight of objects	comparison using senses	heavier, lighter, same

Measurement and measurement instruments are used in measuring how far an object travels compared to another object under the same conditions.

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

Position: P.FM.00.11, P.FM.00.12
Gravity: P.FM.00.21
Force: P.FM.00.31, P.FM.00.32, P.FM.00.33, P.FM.00.34

Objectives

- Make observations of a variety of moving objects, including falling objects and describe the motion and position of the object.
- Focus on pushes and pulls and how they affect the motion of objects.

Engage and Explore

- Before introducing vocabulary that describes motion, make purposeful observations of common objects and brainstorm ways to describe the motion of the object. (P.FM.00.11, P.FM.00.12, P.FM.00.31, P.FM.00.32, P.FM.00.13, S.IP.00.11)
- Explore the motion of different objects by allowing students to work in groups with different sizes of balls, toy cars or trucks, cylinders, blocks, and cubes. Students explore the motion of objects that roll and slide. Students receive little explanation at this time and are allowed to acquire a common set of experiences to draw on as they continue their study into the motion of objects. (P.FM.00.34, S.IP.00.11, S.IP.00.12, S.IP.00.13)
- Encourage students to ask *what would happen if…* questions as they explore the motion of the objects. At this point in their explorations, students ask and answer simple questions and investigate as the opportunity arises. (P.FM.00.31, P.FM.00.32, P.FM.00.33, P.FM.00.34, S.IP.00.11, S.IP.00.12, S.IP.00.13)
- In small groups ask students to describe the motion of the object from their position. Ask is the object moving away from you? Is the object

moving toward you? Are both descriptions accurate? P.FM.00.11, P.FM.00.12, S.IA.00.12, S.IA.00.13)

Explain and Define

- Chart student ideas about words that describe motion and the position of objects. Only after students have brainstormed words that describe motion, sort the words used to describe the motion of objects into words that describe direction, speed, and position. Ask students to use the class chart to make a sentence that describes the motion of an object using a word from all three categories. Model for the students how to make a chart that shows how the list of motion describing words can be sorted. (P.FM.00.34, P.FM.00.11, P.FM.00.12, S.IP.00.16, S.IA.00.12)
- Take this opportunity to have groups share their motion observations with the rest of the class. Listen for vocabulary that describes the motion of each object. (S.IA.00.12)
- Ask students for ideas of how they could organize their observations into a chart. Discuss the different objects and student observations of how each moved. Students at this level are not expected to be able to organize a chart and make data entries, but instead, kindergarteners should be able to volunteer their information from their observations and tell where on the chart their data would best fit. (S.IP.00.12)
- Discuss the description of the direction the object traveled. Ask students to stand in different positions around the room and roll a ball or object across the room. Ask individuals to describe the motion from his/her position. (P.FM.00.11, P.FM.00.12, S.IA.00.13)
- Ask students what started the objects moving. Most students will recognize that in order for the object to start moving it required a push. Write the terms push and pull on the board or chart paper. Discuss the meaning of the terms. Ask students to demonstrate a push and a pull. (P.FM.00.31, S.RS.00.11)
- Brainstorm examples of objects that require a push (balls, swings, toy cars, push door closed, push down lids, etc.) to start moving and objects that require a pull (wagons, tug-of-war, shade pulls, rope on the flag, pull up socks, pull open doors, pull up zipper, etc). (P.FM.00.31, P.FM.00.32, P.FM.00.33, S.RS.00.11, S.IA.00.12)
- Demonstrate pulls with the class by playing a game of tug-of-war and have students explain the difference between pushing and pulling. (P.FM.00.31, S.RS.00.11)

Elaborate and Apply

- Continue student exploration into the path of moving objects and describing motion, have students work in groups with the balls, toy cars and cylinders and ramps. Give students sufficient time to conduct simple investigations into the motion of objects down the ramps. At this stage in their learning, students ask and answer "what would happen if…" questions as they change the angle of their ramps and find other objects to roll down the ramp. P.FM.00.11, P.FM.00.34, S.IP.00.11, S.IP.00.12, S.IP.00.13)
- Facilitate the student activity by circulating among the groups and listening to their ideas and observing their simple investigations. Add a different shaped item to the students' objects, such as a wooden block or cube and ask students to describe the motion of the block down the ramp. (P.FM.00.34, S.IP.00.11)
- After students have had considerable time exploring motion with the ramps, ask students to share their observations. Ask students what started the objects moving down the ramp – a push or a pull? Introduce the concept that all objects are pulled toward the Earth. Kindergarten students have an idea that objects fall down. Demonstrate the release of the ball (without a push or pull) at the top of a ramp and have students describe the motion of the ball roll down the ramp. (P.FM.00.21, S.IP.00.11, S.IA.00.12)
- Change the angle of the ramp and repeat the release of the ball. Place the ramp flat and place the ball on the ramp. Ask students to discuss the push or pull that started the balls in motion when the ramp was at an angle. Students attach language to the concept at this point. Tell students that gravity is a force that pulls objects toward the Earth. (P.FM.00.21, S.IP.00.11, S.IA.00.12)
- Give students the opportunity to demonstrate how things fall down. Have students toss the ball up and observe it change direction and fall down. Students explore different size, shape, and mass of objects and observe and describe the path of motion as the objects fall down. (P.FM.00.21, P.FM.00.34, S.IP.00.11, S.IP.00.12, S.IP.00.13, S.IA.00.13)

Evaluate Student Understanding

Imbedded Assessment Examples

- Use the student discussion and trial and error investigations with the motion of different objects and the ramps to assess their ability to make observations of how objects move and fall down and plan and conduct simple investigations. (P.FM.00.21, P.FM.00.34)
- Use the class discussion and class chart to assess the students' ability to describe motion. (P.FM.00.11, P.FM.00.12)
- Use student examples of pushes and pull to assess their ability to demonstrate a push or pull. (P.FM.00.31)

- Use the students oral descriptions of the motion of the objects to assess their ability to describe the path of a moving object from different observers' views. (P.FM.00.12)
- As students work in groups, circulate among the students and listen to their ideas. Assess students' initial ideas about what started the objects moving. (P.FM.00.32)
- Use student descriptions of motion in different positions in the room. (P.FM.00.11 and P.FM.00.12)

Summative Assessment Examples

- Circle the pictures that demonstrate a push. (P.FM.00.31)
- Place an X on the pictures that demonstrate a pull. (P.FM.00.31)
- Circle the word that best describes the position of the ball. (P.FM.00.11)
- Draw an arrow that shows the path the ball will fall. (P.FM.00.21)

Enrichment

- Students plan and conduct simple investigations into motion of objects down ramps at different angles. The investigations include distance traveled and comparisons of distance of different shaped objects.
- Use a balance and have students make comparisons of motion of same shaped objects with different masses.
- Make observations of falling objects of different shapes and sizes that are dropped from the same distance.

Intervention

- Students are given the opportunity to explore different kinds of motion, rolling, sliding, bouncing, hopping, walking, running, etc.
- Practice left and right in terms of describing the motion and position of objects.

Examples, Observations and Phenomena (Real World Context)

Motion is an everyday phenomenon that develops into scientific knowledge of forces, including friction and gravity. Descriptive language that applies to motion gives students a basis for more detailed descriptions and the ability to describe from different observers' views. An awareness that the description of motion may change if the position of the viewer changes adds a new dimension to understanding motion and descriptions of motion.

The motion of an object does not change due to the description of the viewer. The motion of an object stays the same. It is the point of reference that may change. For example, the car moving toward the garage does not change, but the car moving away from or toward the observer changes with a change in the position of the viewer.

The terms mass and weight are often used interchangeably. The term mass refers to the amount of material that makes up an object. Mass is more accurate term in most scientific explorations and applications. Weight is only applicable when discussing the force of gravity.

Literacy Integration

Reading

R.IT.00.02 with teacher guidance, discuss informational text patterns including descriptive and sequential.

R.IT.00.04 respond to individual and multiple texts by finding evidence, discussing, illustrating, and/or writing to reflect, make meaning, and make connections.

R.CM.00.01 begin to 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.00.04 apply significant knowledge from grade-level science, social studies, and mathematics texts.

I Fall Down, Vicki Cobb, 1004
And Everyone Shouted Pull, Claire Llewellyn, 2001
Move It!, Adrienne Mason, 2005

- Activate prior knowledge of the motion of objects that are falling.
- Connect personal knowledge, experience, and understanding of how things fall down and the first introduction to gravity.
- Discuss and investigate the different experiences in the book.

Writing

W.GN.00.03 Write a brief informational piece such as a page for a class book using drawings, words, word-like clusters, and/or sentences.

W.GN.00.04 contribute to a class research project by adding relevant information to a class book including gathering information from teacher-selected resources and using the writing process to develop the project.

- Write about the motion of an object from the observers view.
- Compare the writing with that of another observers' view.

Speaking

S.CN.00.01 Explore the use of language to communicate with a variety of audiences and for different purposes including problem solving, explaining, looking for solutions, constructing relationships, and expressing courtesies.

S.DS.00.03 Respond to multiple text types by reflecting, making meaning, and making connections.

- Students use oral language to describe their observations and investigations into motion.
- Students communicate in small groups to solve problems and design a simple investigation.
- Retell an experience of falling down or objects that have fallen down.

Mathematics Integration

G.GS.00.01 Relate familiar three-dimensional objects inside and outside the classroom to their geometric name, e.g., ball/sphere, box/cube, soup can/cylinder, ice cream cone/cone, refrigerator/prism.

- Measurement – measure distance an object travels in non-standard units of measurement.
- Geometry – identify familiar shapes of different objects.

Kindergarten Companion Document

K-Unit 3: Basic Needs of Living Things

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.

Kindergarten Unit 3:
Basic Needs of Living Things

Content Statements and Expectations

Background –

The Kindergarten content expectations for life science build a greater understanding of the basic needs of all living things and classify living and nonliving things. Through direct classroom experiences of living things and their habitats, students begin to think beyond movement as the defining characteristic of life and recognize characteristics of living things with eating, breathing, and reproducing.

K - Unit 3: Basic Needs of Living Things

Big Ideas (Key Concepts)

- All living things have basic needs (air, water, food and space).
- Nonliving things do not have these basic needs.

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, food and space. 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 Expectations

L.OL.00.11 Recognize that living things have basic needs.

Instructional Clarifications
1. Recognize is to identify as by previous experience or perceive as truth that living things have basic needs.
2. The needs of living things is limited to air, water, food and space to survive.
3. Living things include plants and animals.
4. Plants require air, water and sunlight to make their own food.

Assessment Clarifications
1. Living things need air, water, food and space to survive.
2. Living things include plants and animals.

L.OL.00.12 Identify and compare living and nonliving things.

Instructional Clarifications
1. Identify means recognize the differences between living and nonliving things.
2. Students identify living things as plants and animals.
3. Living things need air, water, and food to survive.
4. Nonliving things do not need water, food or need air.
5. Nonliving things include things that once lived and things that never lived (logs versus rocks).

Assessment Clarifications
1. Students identify living things as plants and animals.
2. Living things need air, water, and food to survive.

3. Nonliving things do not take in water, food or need air.

Content Statement - E.SE.E.1
Earth Materials – Earth materials that occur in nature include rocks, minerals, soils, water, and the gases of the atmosphere. Some earth materials have properties that sustain plant and animal life.

Content Expectation

E.SE.00.12 Describe how earth materials contribute to plant and animal life.

Instructional Clarifications

1. Describe is to tell or depict in spoken or written words how soil and water contribute to plant and animal life.
2. At this level, students describe how plants grow in the soil and need water to grow and survive.
3. At this level, students describe how animals eat plants that grow in the soil, need water, and air to breathe to grow and survive.

Assessment Clarifications

1. At this level, students describe how plants grow in the soil and need water to grow and survive.
2. At this level, students describe how animals eat plants that grow in the soil, need water, and air to breathe to grow and survive.

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

Inquiry Processes
S.IP.00.11 Make purposeful observation of the natural world using the appropriate senses.
S.IP.00.12 Generate questions based on observations using the senses.
S.IP.00.13 Plan and conduct simple investigations using the senses.
S.IP.00.14 Manipulate simple tools (hand lens, balances) that aid observation and data collection.
S.IP.00.16 Construct simple charts from data and observations.
Inquiry Analysis and Communication
S.IA.00.12 Share ideas about the senses through purposeful conversation.
S.IA.00.13 Communicate and present findings of observations.
S.IA.00.14 Develop strategies for information gathering (ask an expert, use a book, make observations, conduct simple investigations, and watch a video).
Reflection and Social Implications
S.RS.00.11 Demonstrate science concepts about the senses through illustrations, performances, models, exhibits, and activities.

Vocabulary

Critically Important-State Assessable	Instructionally Useful
living things	space
basic needs	sunlight
nonliving things	once living
air	dead
water	organisms
food	
plants	
animals	
survive	

Instruments, Measurements, Representations

Observation Tools	Representation
hand lens	Observation of living and non-living things.
pencils	Construct simple charts that demonstrate living and non-living. (T-chart)

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.00.11, L.OL.00.12

Objectives

- Make observations of plants and animals and their interactions.
- Focus on the needs of each and how they help the organism survive.
- Make observations on differences of living and nonliving things living things and that living things have specific needs.

Engage and Explore

- Brainstorm what is needed for organisms that will live in a classroom habitat. (L.OL.00.11)
- Students will set up a habitat to include living and non-living organisms for example: in a terrarium with soil, seeds, worms, rocks, and bark. (L.OL.00.11, L.OL.00.12, S.IP.00.11, S.RS.00.11)
- An aquarium could be used with appropriate materials.
- Students will observe the habitat over time, taking class notes/pictures/ journal entries - on any changes that they see over the course of the unit. (S.IP.00.11, S.IP.00.12)
- Plant need experiments may be done concurrently (for example – watering one seed and not another, or putting some in the dark and some in the light, etc.) (L.OL.00.11**,** S.IP.00.11, S.IP.00.13)

Explain and Define

- Living things have needs that sustain them and nonliving things do not. Identify living and nonliving things in the habitat. Students identify the needs of living things. (L.OL.00.11, L.OL.00.12)
- Make a t chart to help organize the living and nonliving characteristics. (L.OL.00.12, S.IP.00.16)
- Address the misconception that seeds need sunlight to sprout and grow. Discuss the results of seeds in the light and seeds in the dark and how seeds do not get direct sunlight when planted in the ground. (L.OL.00.11)

Elaborate and Apply

- Air, water, food and space should be elaborated on. (L.OL.00.11)
- Compare/Contrast the basic needs of plants with animals and humans. (L.OL.00.11)
- Discuss the Earth materials soil, air, and water and how they contribute to the growth and survival of plants and animals. (E.SE.00.12)
- Determine if other living things would be able to survive in our classroom habitat and what may be the limiting factors. (L.OL.00.11, S.IA.00.12, S.IA.00.13)
- Explore many outside habitats and compare them to the classroom habitat. (S.IP.00.11, S.IP.00.12, S.IA.00.12, S.IA.00.13)

Evaluate Student Understanding

Formative Assessment Examples

- Check student observation/pictures/journal entries to determine if observations are appropriate/applicable. (L.OL.00.11)
- Student conversations in their groups can be used as basis for monitoring understanding. (L.OL.00.11)

Summative Assessment Examples

- Circle the living things. (L.OL.00.12)
- Circle the needs of living things. (L.OL.00.11)
- Choose the thing that is not alive. (L.OL.00.12)
- Choose the thing that does not use food. (L.OL.00.11)
- Choose the thing that does not need air. (L.OL.00.11)

Enrichment

- Students plan and build a habitat using an aquarium, terrarium or other habitat and some different organisms.

Intervention

- Break students into research groups that focus on one aspect of the ecosystem e.g. Plant group, worm group, rock group, soil group, and have students report out on the happenings of their group over observable time.
- Then rotate through each group for more experience.

Examples, Observations, and Phenomena (Real World Context)

All organisms have basic needs (air, water, food or nutrition, and space). Young learners have a difficult time relating the basic needs of living things to themselves and other familiar animals. The recognition of plants as living things and the identification of trees as plants is also key at this stage in their understanding of living and non-living things.

The classification of things as living and non-living is the first step in classification of organisms. All living things have basic life functions: need food, grow, and have young. Living things include all plants and animals, including humans. Non-living things include sand, rocks, clouds, and all man-made items. Children's toys are often given characteristics of living things that may add to the confusion of young learners. Media also attach living characteristics to non-living things that students may site as living.

Parts of living things, such as leaves, branches, and molted skin are examples of once living things that cannot continue living without the whole organism. It does not grow, need food, air, or water, or have young.

Literacy Integration

Reading

R.IT.00.04 respond to individual and multiple texts by finding evidence, discussing, illustrating, and/or writing to reflect, make meaning, and make connections.

R.CM.00.01 begin to 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.00.04 apply significant knowledge from grade-level science, social studies, and mathematics texts.

There are many good trade books available for learning about living and non-living things and their needs for survival. Many books focus on single organisms or habitats.

One Small Square, Donald Silver, 1997
Under One Rock, Anthony D. Fredericks, 2001
Animals and Their Babies*, Melvin Berger, 1993*
The Tiny Seed, Eric Carle, 1987
Wonderful Worms, Linda Glaser, 1992

- After reading or listening to the reading of texts that describe living things and their needs to survive, students discuss their experiences with living things, both plants and animals. Students relate how they find their food, water, air, and space in their homes and neighborhoods to that of animals in their habitats.

Writing

W.GN.00.03 write a brief informational piece such as a page for a class book using drawings, words, word-like clusters, and/or sentences.
W.GN.00.04 contribute to a class research project by adding relevant information to a class book including gathering information from teacher-selected resources and using the writing process to develop the project.

- Write a book on your classroom habitat experience.
- Write a fact book about one of the animals or plants observed in the classroom or schoolyard.

Speaking

S.CN.00.01 explore and use language to communicate with a variety of audiences and for different purposes including problem-solving, explaining, looking for solutions, constructing relationships, and expressing courtesies.

S.DS.00.03 respond to multiple text types by reflecting, making meaning, and making connections.

- Read your book to the class.
- Students share their observations of living and non-living things.
- Students engage in conversation about the classroom habitat and the needs for the living organisms in the habitat.

Mathematics Integration

G.GS.00.02 Identify, sort, and classify objects by attribute and identify objects that do not belong in a particular group.

- Students sort things using the criteria of living and non-living.
- Students make observations of different leaves and sort by similar size, shape, color and other attributes.

Kindergarten Companion Document

K-Unit 4: My Earth

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Kindergarten Unit 4:
My Earth

Content Statements and Expectations

Background –

The essential learning in Earth Science for Kindergarteners is to be able to identify different earth materials and recognize the earth materials necessary to grow plants, linking the common thread of understanding in Life Science and Earth Science.

K–Unit 4: My Earth

Big Ideas (Key Concepts)

- The Earth is made of materials (rocks, sand, soil, and water) that have many different properties.

Clarification of Content Expectations

Standard: Organization of Living Things

Content Statement – E.SE.E.1
Earth Materials- Earth materials that occur in nature include rocks, minerals, soils, water, and the gases of the atmosphere. Some Earth materials have properties that sustain plant and animal life.

Content Expectations

E.SE.00.11 Identify Earth materials that occur in nature (rocks, sand, soil, and water).

Instructional Clarifications
1. Identify means to recognize rock, sand, soil and water as earth materials and to recognize their differences.
2. Identification of Earth materials is limited to the observations of rocks, sand, soil, and water.
3. Soil consists of once living and never living materials (decomposing plant and animal materials, rock, gravel, sand, and clay).

Assessment Clarifications
1. Identification of Earth materials is limited to the observation of rocks, sand, soil, and water.

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

Inquiry Processes
S.IP.00.11 Make purposeful observation of different earth materials (water, soil, sand, rock) using the appropriate senses.
S.IP.00.12 Generate questions based on observations of different earth materials.
S.IP.00.13 Plan and conduct simple investigations into the ability of different earth materials to absorb water.
S.IP.00.14 Manipulate simple tools (hand lens, balances) that aid observation and data collection of different earth materials, including water.
S.IP.00.15 Make accurate measurements with appropriate (non-standard) units of different earth materials.
S.IP.00.16 Construct simple charts from data and observations of earth materials.
Inquiry Analysis and Communication
S.IA.00.12 Share ideas about investigations into the properties of earth materials through purposeful conversation.
S.IA.00.13 Communicate and present findings of investigations into the ability of different earth materials to absorb water.
S.IA.00.14 Develop strategies for information gathering about earth materials. (Ask an expert, use a book).
Reflection and Social Implications
S.RS.00.11 Demonstrate through models and activities how earth materials absorb water.

Vocabulary

Critically important – State Assessable	Instructionally Useful
soil water rock sand	materials air gravel clay particle sieve

Instruments, Measurements, Representations

Measurement	Instruments	Representations
Compare weight of different earth materials	Balance	Heavier, lighter
Observations of texture, color, grain size	Hand lens	Color, larger, smaller, rough, smooth

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

Earth Materials: E.SE.00.11

Objectives

- Recognize that the earth is made up of water and land.
- Make observations and classify earth materials as water, sand, soil, or rock
- Explore how water and earth materials interact when combined.

Engage and Explore

- Engage student thinking by finding evidence that the Earth is made up of water and land. Use an inflatable globe and toss the globe to each student. Have students tell if their thumbs landed on land or water. Collect class data using tally marks. (E.SE.00.11, S.IP.00.16, S.RS.00.11)
- Go on a class rock hunt and ask students to collect samples of rocks for a class collection. (E.SE.00.11, S.IP.00.11, S.IP.00.12)
- Students use observations of class rock collections to generate questions about earth materials. The teacher records the questions on a class chart for future reference. (E.SE.00.11, S.IP.00.12, S.IP.00.16)
- Students observe, sort, illustrate and describe rocks using different properties. (size, shape, color, texture, lighter and heavier, sink and float) (E.SE.00.11, S.IP.00.11, S.RS.00.11)
- Students sort, illustrate and classify particles in a soil sample. (E.SE.00.11, S.IP.00.11, S.RS.00.11)
- Students compare texture, particle size, and color of different soil samples. (E.SE.00.11, S.IP.00.11)

- Students plan and conduct investigations to separate mixtures of sand, soil and rocks using a variety of materials (sieve, water, funnels, coffee filters, screens) (E.SE.00.11, S.IP.00.13)
- Students plan and conduct investigations on the properties of sand, soil and rocks such as the ability to absorb water. (E.SE.00.11, S.IP.00.13)

Explain and Define

- Students use observations from investigations to share their findings and describe sand, soil and rock. Students define the terms using their own descriptions and vocabulary at this time. (E.SE.00.11, S.IA.00.12)
- Students use pictures to sequence observation of rocks and soil such as from dark to light (color), small to large (size) etc. (E.SE.00.11, S.RS.00.11)
- Students describe and compare the results when water is mixed with different earth materials. (E.SE.00.11, S.IP.00.13, S.IA.00.12)
- Students describe their methods of separating mixtures earth materials in sequential order. (E.SE.00.11, S.IA.00.13)
- Students identify earth materials in pictures of different landscapes (desert, forest, beach, etc.) and classify them as soil, rocks, sand or water. (E.SE.00.11, S.RS.00.11, S.IA.00.14)
- Students identify once living materials in soil samples and describe ways that they are different from living things. (E.SE.00.11, S.IP.00.11)

Elaborate and Apply

- Student predict which earth material would be best for plant growth. (E.SE.00.11, S.IP.00.12)
- Students plan and conduct and plant growth investigations in different earth materials (sand, soil, water) Observations should consist of simple descriptions using student vocabulary. (E.SE.00.11, S.IP.00.13)
- Students gather information about earth materials from picture books and videos. Students at this age need to see large examples of earth materials such as boulders, lakes, rivers, deserts, and beaches. (E.SE.00.11, S.IA.00.14)

Evaluate Student Understanding

Embedded Assessment Examples:
- Student journal observations and soil classification charts. (E.SE.00.11)
- Student investigations and explanations. (E.SE.00.11)

Summative Assessment Examples**:**
- Circle the Earth material with the smallest parts. (E.SE.00.11)
- Circle the object that would not be a part of soil. (E.SE.00.11)
- Circle the object in the picture made from earth materials. (Picture of a landscape) (E.SE.00.11)
- Circle the place on the map that is made of water. (E.SE.00.11)
- Circle the object that is not an earth material. (E.SE.00.11)

Enrichment

- Students plan and conduct investigations with other types of earth materials such as gravel, clay and peat.
- Students investigate the uses of earth materials such as in building materials. Students can take a walk outside to observe building materials such as bricks, cement and tile. Students can generate questions about the origins of these materials based on their observations.

Intervention

- Sorting and classifying other familiar objects by size, texture and color.
- Measuring and comparing familiar objects using nonstandard units.
- Observing globes and identifying land and water on the globe.

Examples, Observations and Phenomena (Real World Context)

Early learners are naturally curious about the objects in their environment – soil, rocks, water, sand, rain, snow, and so on. Children are fascinated by the properties of soil and water at an early age as they make mud pies and observe plants around their home and school. Kindergarteners may enter school with an idea that the Earth is made up of soil, rocks, pebbles, sand, water and living things. They should be encouraged to closely observe materials found on Earth and begin to describe their properties. The essential learning in Earth science for the kindergarten student is to be able to identify different Earth materials and recognize the Earth materials necessary to grow plants, linking the common thread of understanding in life science and Earth science. The importance of earth materials (air, water, and soil) in plant growth can be seen in home gardening projects or visits to a farm.

Literacy Integration

Reading

R.CM.00.01 begin to 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.IT.00.04 respond to individual and multiple texts by finding evidence, discussing, illustrating, and/or writing to reflect, make meaning, and make connections.

Everybody Needs a Rock, Byrd Baylor and Peter Parnall (1985)
Let's Look at Rocks, Jeri Cipriano (2004)
Dirt: The Scoop on Soil, Natalie M. Rosinsky (2002)
If You Find a Rock, Peggy Christian and Barbara Hirsch Lembe (2000)

- Activate prior knowledge through class observations of rocks before reading the books.
- Use books to extend student thinking related to observing and classifying rocks.

Writing

W.GN.00.03 write a brief informational piece such as a page for a class book using drawings, words, word-like clusters, and/or sentences.

W.GN.00.04 contribute to a class research project by adding relevant information to a class book including gathering information from teacher-selected resources and using the writing process to develop the project.

- Draw pictures and write words to describe properties of rocks, soil and sand.
- Draw pictures to record results from investigations.

Speaking

S.CN.00.01 explore and use language to communicate with a variety of audiences and for different purposes including problem solving, explaining, looking for solutions, constructing relationships, and expressing courtesies.

S.DS.00.01 engage in substantive conversations, remaining focused on subject matter, with interchanges beginning to build on prior responses in literature discussions, paired conversations, or other interactions.

- Engage in substantive conversations generating questions, making claims, using evidence and sharing explanations.

Mathematics Integration

M.PS.00.05 Compare length and weight of objects by comparing to reference objects, and use terms such as shorter, longer, taller, lighter, heavier.

- Compare length and mass using non- standard units of measure.