

Teacher Guide and Student Journal

Sample Activity and Planning Pages

Changing Earth: Today and Over Time

2ENG



S E C O N D E D I T I O N

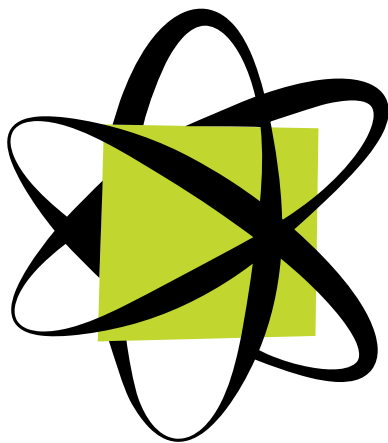
A second grade unit supporting Next Generation Science Standards
and Michigan Science Standards

S E C O N D E D I T I O N

Changing Earth: Today and Over Time

ZENG

A second-grade unit supporting **Next Generation Science Standards** and the **Michigan Science Standards** developed and written by the Battle Creek Area Mathematics and Science Center for



**CEREAL CITY
SCIENCE™**

by BCAMSC

Changing Earth: Today and Over Time

Pre-activity Informational Pages

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PLANNING

NEXT GENERATION SCIENCE STANDARDS

Disciplinary Core Ideas	Activities
ESS1.C: The History of Planet Earth <ul style="list-style-type: none">Some events happen very quickly; other occur very slowly, over a period of time much longer than one can observe.	3,6,7
2-ESS1-1. Use information from several sources to provide evidence that Earth events can occur quickly or slowly.	3,6,7
ESS2.A: Earth Materials and Systems <ul style="list-style-type: none">Wind and water can change the shape of the land.	1,2,3,5,6,7
2-ESS2-1. Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.	3,5,7
ESS2.B: Plate Tectonics and Large-Scale System Interactions <ul style="list-style-type: none">Maps show where things are located. One can map the shapes and kinds of land and water in any area.	2,3,4,5
2-ESS2-2. Develop a model to represent the shapes and kinds of land and bodies of water in an area.	2,3,4,5,6
ESS2.C: The Roles of Water in Earth's Surface Processes <ul style="list-style-type: none">Water is found in the ocean, rivers, lakes, and ponds. Water exists as solid ice and in liquid form.	4,5,6
2-ESS2-3. Obtain information to identify where water is found on Earth and that it can be solid or liquid.	4,5,6
ETS1.C: Optimizing the Design Solution <ul style="list-style-type: none">Because there is always more than one possible solution to a problem, it is useful to compare and test designs.	5,6,7
2-ESS2-1. Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.	3,5,7

NEXT GENERATION SCIENCE STANDARDS

Science and Engineering Practices	Activities
<p>Developing and Using Models Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions.</p> <ul style="list-style-type: none"> • Develop a model to represent patterns in the natural world. 	2,3,4,5,6
<p>2-ESS2-2. Develop a model to represent the shapes and kinds of land and bodies of water in an area</p>	2,3,4,5,6
<p>Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.</p> <ul style="list-style-type: none"> • Make observations from several sources to construct an evidence-based account for natural phenomena. • Compare multiple solutions to a problem. 	2,4,6,7
<p>2-ESS1-1. Use information from several sources to provide evidence that Earth events can occur quickly or slowly.</p>	2,4,6,7
<p>2-ESS2-1. Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.</p>	2,4,6,7
<p>Obtaining, Evaluating, and Communicating Information Obtaining, evaluating, and communicating information in K–2 builds on prior experiences and uses observations and texts to communicate new information.</p> <ul style="list-style-type: none"> • Obtain information using various texts, text features (e.g., headings, tables of contents, glossaries, electronic menus, icons), and other media that will be useful in answering a scientific question. 	2,3,4,5,6,7
<p>2-ESS2-3. Obtain information to identify where water is found on Earth and that it can be solid or liquid.</p>	2,3,4,5,6,7

PLANNING

NEXT GENERATION SCIENCE STANDARDS

Crosscutting Concepts	Activities
Patterns • Patterns in the natural world can be observed.	4,7
2-ESS2-2. Develop a model to represent the shapes and kinds of land and bodies of water in an area.	4,7
2-ESS2-3. Obtain information to identify where water is found on Earth and that it can be solid or liquid.	4,7
Stability and Change • Things may change slowly or rapidly.	1,6,7
2-ESS1-1. Use information from several sources to provide evidence that Earth events can occur quickly or slowly.	1,6,7

COMMON CORE STATE STANDARDS - READING

Reading Standards for Informational Text—Grade 2	Activities
Key Ideas and Details	
RI.2.1 - Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text.	2,3,4,6
RI.2.2 - Identify the main topic of a multi-paragraph text as well as the focus of specific paragraphs within the text.	2,3,5,6
RI.2.3 - Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text.	3,5,6
Craft and Structure	
RI.2.4 - Determine the meaning of words and phrases in a text relevant to a grade 2 topic or subject area.	3,6
RI.2.5 - Know and use various text features (e.g., captions, bold print, subheadings, glossaries, indexes, electronic menus, icons) to locate key facts or information in a text efficiently.	5,6
RI.2.6 - Identify the main purpose of a text, including what the author wants to answer, explain, or describe.	6
Integration of Knowledge and Ideas	
RI.2.7 - Explain how specific images (e.g., a diagram showing a machine works) contribute to and clarify a text.	4
RI.2.8 - Describe how reasons support specific points the author makes in a text.	4
RI.2.9 - Compare and contrast the most important points presented by two texts on the same topic.	
Range of Reading and Level of Text Complexity	
RI.2.10 - By the end of the year, read and comprehend informational texts, including history/social studies, science, and technical texts, in the grades 2-3 text complexity band proficiently, with scaffolding as needed at the high end of the range.	2,3,4,6

PLANNING

COMMON CORE STATE STANDARDS - WRITING

Writing Standards–Grade 2	Activities
Text Types and Purposes	
W.2.1 - Write opinion pieces in which they introduce the topic or book they are writing about, state an opinion, supply reasons that support the opinion, using linking words (e.g., because, and, also) to connect opinion and reasons, and provide a concluding statement or section.	2,3
W.2.2 - Write informative/explanatory texts in which they introduce a topic, use facts and definitions to develop points, and provide a concluding statement or section.	4,5,6,7
W.2.3 - Write narratives in which they recount a well-elaborated event or short sequence of events, include details to describe actions, thoughts, and feelings, use temporal words to signal event order, and provide a sense of closure.	3,6
Production and Distribution of Writing	
W.2.4 - (Begins in grade 3)	
W.2.5 - With guidance and support from adults and peers, focus on a topic and strengthen writing as needed by revising and editing.	2
W.2.6 - With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers.	
Research to Build and Present Knowledge	
W.2.7 - Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations).	3,4,5,6,7
W.2.8 - Recall information from experiences or gather information from provided sources to answer a question.	3,4,5,6,7

COMMON CORE STATE STANDARDS - LANGUAGE

Language Standards—Grade 2	Activities
Conventions of Standard English	
<p>L.2.1 - Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.</p> <ul style="list-style-type: none"> a. Use collective nouns (e.g., group). b. Form and use frequently occurring irregular plural nouns (e.g., feet, children, teeth, mice, fish). c. Use reflexive pronouns (e.g., myself, ourselves). d. Form and use the past tense of frequently occurring irregular verbs (e.g., sat, hid, told). e. Use adjectives and adverbs, and choose between them depending on what is to be modified. f. Produce, expand, and rearrange complete simple and compound sentences (e.g., The boy watched the movie; The little boy watched the movie; The action movie was watched by the little boy). 	1,2,3,4,5,6,7
<p>L.2.2 - Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.</p> <ul style="list-style-type: none"> a. Capitalize holidays, product names, and geographic names. b. Use commas in greetings and closings of letters. c. Use an apostrophe to form contractions and frequently occurring possessives. d. Generalize learned spelling patterns when writing words (e.g., cage → badge; boy → boil). e. Consult reference materials, including beginning dictionaries, as needed to check and correct spellings. 	1,2,3,4,5,6,7
Knowledge of Language	
<p>L.2.3 - Use knowledge of language and its conventions when writing, speaking reading, or listening.</p> <ul style="list-style-type: none"> a. Compare formal and informal uses of English. 	1,2,3,4,5,6,7

PLANNING

COMMON CORE STATE STANDARDS - LANGUAGE

Language Standards—Grade 2	Activities
Vocabulary Acquisition Use	
<p>L.2.4 - Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade 2 reading and content, choosing flexibly from an array of strategies.</p> <ul style="list-style-type: none"> a. Use sentence-level context as a clue to the meaning of a word or phrase. b. Determine the meaning of the new word formed when a known prefix is added to a known word (e.g., happy/unhappy, tell/retell). c. Use a known root word as a clue to the meaning of an unknown word with the same root (e.g., addition, additional). d. Use knowledge of the meaning of individual words to predict the meaning of compound words (e.g., birdhouse, lighthouse, housefly; bookshelf, notebook, bookmark). e. Use glossaries and beginning dictionaries, both print and digital, to determine or clarify the meaning of words and phrases. 	2,3,4,6
<p>L.2.5 - Demonstrate understanding of word relationships and nuances in word meanings.</p> <ul style="list-style-type: none"> a. Identify real-life connections between words and their use (e.g., describe foods that are spicy or juicy). b. Distinguish shades of meaning among closely related verbs (e.g., toss, throw, hurl) and closely related adjectives (e.g., thin, slender, skinny, scrawny). 	
<p>L.2.6 - Use words and phrases acquired through conversations, reading and being read to, and responding to texts, including using adjectives and adverbs to describe (e.g., When other kids are happy that makes me happy).</p>	1,2,3,4,5,6,7

COMMON CORE STATE STANDARDS - MATHEMATICS

Mathematics—Grade 2	Activities
Mathematical Practices	
1. Make sense of problems and persevere in solving them.	1,2,3,4,5,6,7
2. Reason abstractly and quantitatively.	1,2,3,4,5,6,7
3. Construct viable arguments and critique the reasoning of others.	1,2,3,4,5,6,7
4. Model with mathematics	1,2,3,4,5,6,7
5. Use appropriate tools strategically.	1,2,3,4,5,6,7
6. Attend to precision.	1,2,3,4,5,6,7
7. Look for and make use of structure.	1,2,3,4,5,6,7
8. Look for and express regularity in repeated reasoning.	1,2,3,4,5,6,7
2.OA Operations and Algebraic Thinking	
A. Represent and solve problems involving addition and subtraction.	
1. Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using drawings, and equations with a symbol for the unknown number to represent the problem.	
B. Add and subtract within 20.	
2. Fluently add and subtract within 20 using mental strategies. By end of Grade 2, know from memory all sums of two one-digit numbers.	2
C. Work with equal groups of objects to gain foundations for multiplication.	
3. Determine whether a group of objects (up to 20) has an odd or even number of members, e.g., by pairing objects or counting them by twos; write an equation to express an even number as a sum of two equal addends.	
4. Use addition to find the total number of objects arranged in rectangular arrays with up to 5 rows and up to 5 columns; write an equation to express the total as a sum of equal addends.	

COMMON CORE STATE STANDARDS - MATHEMATICS

Mathematics—Grade 2	Activities
2.MD Measurement and Data	
A. Measure and estimate lengths in standard units.	
1. Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.	
2. Measure the length of an object twice, using length units of different lengths for the two measurements; describe how the two measurements relate to the size of the unit chosen.	
3. Estimate lengths using units of inches, feet, centimeters, and meters.	
4. Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard length unit.	
2.MD Measurement and Data	
B. Relate addition and subtraction to length.	
5. Use addition and subtraction within 100 to solve word problems involving lengths that are given in the same units, e.g., by using drawings (such as drawings of rulers) and equations with a symbol for the unknown number to represent the problem.	
6. Represent whole numbers as lengths from 0 on a number line diagram with equally spaced points corresponding to the numbers 0, 1, 2,... and represent whole-number sums and differences within 100 on a number line diagram.	
C. Work with time and money.	
7. Tell and write time from an analog and digital clocks to the nearest 5 minutes, using a.m. and p.m.	
8. Solve word problems involving dollar bills, quarters, dimes, nickels, and pennies, using \$ and c symbols appropriately. Example: If you have 2 dimes and 3 pennies, how many cents do you have?	

COMMON CORE STATE STANDARDS - MATHEMATICS

Mathematics—Grade 2	Activities
D. Represent and interpret data	
9. Generate measurement data by measuring lengths of several objects to the nearest whole unit, or by making repeated measurements of the same objects. Show the measurements by making a line plot, where the horizontal scale is marked off in whole =-number units.	
10. Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph.	2

PLANNING

UNIT AT A GLANCE

Activity	Time to Complete	Lesson Level Learning Goal	Phenomenon/ Engineering Challenge	Summary: Students will...
1 Shapes of Land and Bodies of Water	Preparation: 15-20 min. Activity 1: 3 classes Lesson 1A: 45-50 min. 2 class periods Lesson 1B: 55-60 min.	Use observations and text to collect data and gain information about changes in the surface of the earth.	Observations in the schoolyard give evidence of changes in the shape of the land.	<ul style="list-style-type: none"> • Make observations and relate ideas about the cause of different shapes of landforms • Make observations in the schoolyard of possible changes in the shape of the area. • Record observations of the changes in the land due to water and wind.
2 Land on Earth	Preparation: 15-20 min. Activity 2: 4-5 classes Lesson 2A: 45-50 min. Lesson 2B: 45-50 min. Lesson 2C: 45-50 min. 2-3 class periods	Obtain information from text and maps to develop a model of landforms and bodies of water observed during the journey of John Wesley Powell.	Observations in the schoolyard give evidence of changes in the shape of the land.	<ul style="list-style-type: none"> • Collect data to determine that Earth is made up mostly of water. • Make observations of a photo of Earth taken from space. • Read about John Wesley Powell's journey across the country. • Use a map to determine different landforms and bodies of water across the US.
3 Major Landforms	Preparation: 20-30 min. Activity 3: 4 classes Lesson 3A: 45-50 min. Lesson 3B: 45-50 min. Lesson 3C: 45-50 min. 2 class periods Lesson 3D: 45-50 min	Develop models of landforms to test for effect of wind and water.	<p>Observations in the schoolyard give evidence of changes in the shape of the land.</p> <p>The surface of Earth has many shapes and formations.</p>	<ul style="list-style-type: none"> • Make a model of a landform. • Obtain and share information about a landform. • Use straws and their breath as wind and test to see if the shape of the landform changes with moving air • Use moving water on the model

UNIT AT A GLANCE

Students Figure Out How To:	Practices and Crosscutting Concepts	Assessment
<ul style="list-style-type: none"> • Generate questions about the shapes of the landforms and what caused the shapes. • Make observations to find evidence of changes in the land. • Record observations of changes in the land due to water or wind. 	<p>Asking Questions and Defining Problems</p> <p>Constructing Explanations and Designing Solutions</p> <p>Developing and Using Models</p> <p>Patterns</p> <p>Stability and Change</p> <p>Cause and Effect</p>	<p>Formative Assessment</p> <p>What We Think Chart</p> <p>Activity Page</p> <p>Science Talk</p> <p>Models</p>
<ul style="list-style-type: none"> • Interpret data to determine if Earth is mostly water or land. • Determine why the astronauts call Earth “the blue marble” through observations of a photo. • Obtain information from text to learn about different landforms and bodies of water. • Read a topographical map. • Make a sand model of the different landforms encountered on Powell’s journey. 	<p>Analyzing and Interpreting Data</p> <p>Constructing Explanations and Designing Solutions</p> <p>Developing and Using Models</p> <p>Asking Questions and Defining Problems</p> <p>Obtaining, Evaluating, and Communicating Information</p> <p>Patterns</p> <p>Cause and Effect</p> <p>Stability and Change</p>	<p>Formative Assessment</p> <p>Science Talk</p> <p>What We Think chart</p> <p>Group Discussions</p> <p>Summative Assessment</p> <p>Journal Entry</p> <p>John Wesley Powell illustrations</p> <p>models</p> <p>Science Talk</p> <p>Presentations</p>
<ul style="list-style-type: none"> • Make connections between the information from videos to the information from text and observations of pictures. • Use information from media and text to develop a model that explains a particular landform. • Test the model for evidence of a change in shape from wind and water. 	<p>Obtaining, Evaluating, and Communicating Information</p> <p>Constructing Explanations and Designing Solutions</p> <p>Analyzing and Interpreting Data</p> <p>Developing and Using Models</p> <p>Patterns</p> <p>Cause and Effect</p> <p>Stability and Change</p>	<p>Formative Assessment</p> <p>Science Talk</p> <p>Activity Pages</p> <p>Summative Assessment</p> <p>Student Models</p> <p>Journal Entries</p> <p>Student Presentations</p> <p>Concept Map</p> <p>Science Talk</p>

PLANNING

UNIT AT A GLANCE

Activity	Time to Complete	Lesson Level Learning Goals	Phenomenon/ Engineering Challenge	Summary: Students will...
4 Major Bodies of Water	Preparation: 15-20 min. Activity 4: 4 classes Lesson 4A: 50-55 min. Lesson 4B: 50-55 min. Lesson 4C: 50-55 min. 2 class periods	Develop models of bodies of water to explain their features and how they are formed.	Observations in the schoolyard give evidence of changes in the shape of the land. The surface of Earth has many shapes and formations.	<ul style="list-style-type: none"> • Develop a model of a body of water. • Obtain and share information about a body of water. • Compare features and formation of different bodies of water found on Earth. • Develop a model that demonstrates how melting snow and ice change the land and bodies of water.
5 Snow and Ice on the Move	Preparation: 15-20 min. Activity 5: 2 classes Lesson 5A: 45-50 min. Lesson 5B: 55-60 min.. Observations and recording at 30 minute intervals.	Use observations of models and text to collect data and gain information about changes in the surface of Earth from melting ice and snow.	Observations in the schoolyard give evidence of changes in the shape of the land. The surface of Earth has many shapes and formations.	<ul style="list-style-type: none"> • Develop a model that demonstrates how melting snow and ice changes the land and bodies of water. • Compare the properties of liquid water and solid water . • Obtain information from text to find out the effect of melting snow and ice on the land. • Obtain information from text and maps to find out where water exists as a solid and a liquid.
6 Fast Changes	Preparation: 15-20 min. Activity 6: 4 classes Lesson 6A: 45-50 min. Lesson 6B: 45-50 min. Lesson 6C: 45-50 min. Lesson 6D: 45-50 min.	Obtain information from text and models to explain the rapid effect of landslides and earthquakes on the shape of the land.	Observations in the schoolyard give evidence of changes in the shape of the land. Video of an earthquake	<ul style="list-style-type: none"> • Investigate the effect of moving water (fast and slow) on soil at different angles. • Make a model to solve an engineering problem. • Obtain information from text and video about the effect of earthquakes on the shape of the land. • Follow directions to build a model of an earthquake.

UNIT AT A GLANCE

Students Figure Out How To:	Practices and Crosscutting Concepts	PE at Lesson Level and Assessment
<ul style="list-style-type: none"> Develop a model that demonstrates bodies of water and how they are formed. Obtain and relate information from text about a body of water. Use information to compare features of bodies of water and sources that form the body of water. 	<p>Obtaining, Evaluating, and Communicating Information Developing and Using Models Constructing Explanations and Designing Solutions</p> <p>Patterns Cause and Effect</p>	<p>Formative Assessment Science Talk Activity Pages</p> <p>Summative Assessment Science Talk Presentations and models Journal Entry</p>
<ul style="list-style-type: none"> Develop a model to find out the effect of melting snow and ice on landforms and bodies of water. Communicate a description of the effect of melting ice and snow on the shape of the land. Use text and maps to find out where water on Earth exists as a solid and a liquid. 	<p>Obtaining, Evaluating, and Communicating Information Developing and Using Models Analyzing and Interpreting Data</p> <p>Patterns Cause and Effect Stability and Change</p>	<p>Formative Assessment Activity Page T-chart</p> <p>Summative Assessment Journal Entry Model and presentations Science Talk</p>
<ul style="list-style-type: none"> Use information from investigations and observations to determine that some areas have greater erosion and landslides and others do not. Solve an engineering design problem to prevent erosion on a hillside. Use result of a model to explain the sudden changes in Earth's surface caused by an earthquake. 	<p>Asking Questions and Defining Problems Constructing Explanations and Designing Solutions Developing and Using Models Obtaining, Evaluating, and Communicating Information Planning and Carrying Out Investigations</p> <p>Patterns Cause and Effect Stability and Change</p>	<p>Formative Assessment Journal Entry What We Think Chart</p> <p>Summative Assessment Journal Entry Science Talk Activity Pages</p>

PLANNING

UNIT AT A GLANCE

Activity	Time to Complete	Lesson Level Learning Goals	Phenomenon/ Engineering Challenge	Summary: Students will...
7 Volcanoes Change the Surface of Earth	Preparation: 20-30 min. Activity 7: 3 classes Lesson 7A: 45-50 min. Lesson 7B: 45-50 min. Lesson 7C: 45-50 min.	Obtain information from text and media to explain how rapid changes to the shape of the land are caused by volcanic eruptions.	Observations in the schoolyard give evidence of changes in the shape of the land. Video of a volcano.	<ul style="list-style-type: none">• Raise questions about volcanoes based on observations from media and text.• Use media and text to gather facts about volcanoes.• Create a graphic organizer from information.

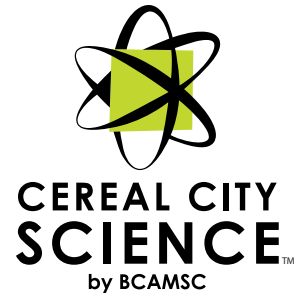
UNIT AT A GLANCE

Students Figure Out How To:	Practices and Crosscutting Concepts	PE at Lesson Level and Assessment
<ul style="list-style-type: none"> • Obtain and communicate information from media and text about changes to the land caused by volcanic eruptions. • Explain the changes to the land caused by volcanic eruptions. • Use a graphic organizer of gathered facts to write an informational story. • Use research strategies and skills for information gathering. 	<p>Obtaining, Evaluating, and Communicating Information</p> <p>Developing and Using Models</p> <p>Asking Questions and Defining Problems</p> <p>Constructing Explanations and Designing Solutions</p> <p>Cause and Effect</p> <p>Stability and Change</p>	<p>Summative Assessment</p> <p>Fact cards</p> <p>Journal Entries</p> <p>Science Talk</p> <p>Research Facts</p>

PLANNING

Dear Parent,

Your child is beginning a unit created at the Battle Creek Area Mathematics and Science Center. This unit was designed to promote science and engineering literacy and integrate reading and writing skills into high-interest science content. During the next twelve weeks, your child will be actively involved with the *Changing Earth: Today and Over Time* unit. This unit is geared for second graders and focuses on the following main areas of study:



1. Describe major surface features of Earth: landforms and bodies of water.
2. Describe how water exists on Earth as a solid and a liquid.
3. Develop models to explain how wind and water change the shape of the land.
4. Demonstrate how changes to the shape of the land can occur slowly and rapidly.
5. Obtain information from media and text to explain rapid changes in the shape of the land caused by landslides, earthquakes, and volcanoes.
6. Use information to solve an erosion problem using the Engineering Design Process.

During this unit of study, your child will learn about landforms and bodies of water. By observing pictures and making models, he/she will begin to describe different types of land, such as mountains, hills, valleys, and plains, and bodies of water such as streams, rivers, lakes, and oceans. Your student will also recognize that Earth has more water than land areas.

Through observation, informational text, building models, and investigations your child will be describing how wind and water change the shape of the land and that the changes can occur quickly or over a very long period of time that cannot be observed in a lifetime.

Your child will be actively involved in the constructing of, and reflecting on, new scientific knowledge as he/she becomes a learner as well as a user of knowledge. Asking questions, developing solutions, interpreting and reconstructing information, and reflecting on his/her knowledge are all components incorporated into this unit.

Suggestions for activities to do at home are included with this letter. These activities will reinforce the concepts taught during this unit instruction.

May you enjoy quality time with your child while discussing the concepts involved with the unit. Let us know if we may be of assistance.

The Outreach Staff
Battle Creek Area Mathematics and Science Center
(269) 213-3907 or (269) 213-3905

ACTIVITIES TO DO AT HOME

1. Take a walk with your child around your yard, the neighborhood, or nearby park and look for signs of changes in the land due to wind and water. If you have access to a digital camera take pictures of the eroded area and then return in a week or two to observe if there is further change. Have your child make a digital notebook of the changes over time.
2. If your yard has an area that erodes after a heavy rainstorm, brainstorm with your student how you might design and build a device together that reduces the erosion.
3. Make a flour and salt dough model with your child of an area that has landforms (mountains, plains, plateaus, and hills) and bodies of water (oceans, rivers, lakes, streams and ponds). You will need:
 - a. 3 cups flour
 - b. 1 cup salt
 - c. 1 cup water
 - d. 3 tablespoons of oil.

Mix the salt and flour in a bowl. Add water and oil gradually and form a ball. Knead the dough until it is mixed. Do an Internet search of physical or topographical maps and have your child select a region he/she would like to use for the model. Using the map as a guide, encourage your child to spread the dough out on a piece of cardboard and begin to make raised landforms, flat landforms, and different bodies of water. Let the model dry for one to two days and paint the different landforms and bodies of water. Have your student add a color key and explain the model to family members and friends.

4. Go to the library and check out books to read related to landforms and bodies of water. Example titles:

Erosion, Changing Earth's Surface by Robin Koontz

How Mountains Are Made by Kathleen Weidner Zoehfeld

Where the River Begins by Thomas Locker

The Drop Goes Plop by Sam Godwin

Oceans by Wil Mara

Wind, Water, Ice by Susan Ring

ACTIVITY 1

CHANGING LAND AND WATER

Teacher Background Information

The major geologic surface features of Earth include the landforms and bodies of water that can be observed. Students' preconceptions regarding landforms and bodies of water are relatively limited to what they see in their area and travels. The introductory lesson provides a look into changes in the local vicinity that students can see and make observations of changes over time. Then the lessons progress to landforms and bodies of water that have taken on grand shapes due to the movement of air and water. The student engagement and exploration into how the surface of the earth changes begins with a schoolyard exploration. Students make observations of areas on the schoolyard that have eroded or changed due to wind, water, vegetation, and human activity. The movement of air and water over the surface of the earth can cause little changes and very large changes. The changes can occur quickly and over long periods of time.

The exploration of changes in the schoolyard also provides the opportunity for students to take action. They consider the change in the land and if over time it can cause a hazard or problem. Their action may be a simple warning cone of a crack in the sidewalk or a plan to stop erosion from water dripping off a building.

Considerations for Students With Special Needs

All prompts and passages in the Student Journal should be read aloud, with repeated directions and checking for understanding prior to writing.

Students are asked to draw and write in their Student Journals. Students may benefit by working with a partner in the longer writing pieces. Students with an IEP should be allowed to dictate their ideas and answers.

Pair students for school yard observations to accommodate students that have difficulty understanding directions or need multiple reminders of the purpose of the outing.

Ask a bilingual student or adult to translate the purpose for the schoolyard observations for English Language Learners.

Engage the Learner

This initial phase of learning activates students' prior knowledge and preconceptions regarding processes that shape the earth. Students begin to make connections between what they have observed in their area and the changes that occur over time.

ESTIMATED TIME

Lesson 1A: 45-50 minutes

2 class periods

Lesson 1B: 45-50 minutes

LESSON LEVEL LEARNING GOAL

- Use observations to collect data and gain information about changes in the surface of the playground and Earth.

MATERIALS NEEDED

For each student:

student pages

Teacher provides:

digital camera (optional)

chart paper

markers

ESS2.A: EARTH MATERIALS AND SYSTEMS

- Wind and water can change the shape of the land.

TEACHING TIP

During facilitation of group discussions carry a clipboard with questions to help draw out student ideas. Record their ideas and questions to use during the Science Talk.

LESSON 1A

TEACHING TIP

Throughout the activities in the Teacher Guide you will notice that specific student instructions from the Student Journal pages are given first and italicized. Additional information for the teacher follows the italicized instructions in plain print.

TEACHING TIP

If your class/school has access to a digital camera, take pictures of the students' findings to project in the class during their sharing and as they report their findings.

TEACHING TIP

Keep the What We Think About the Surface of the Earth chart visible in the classroom throughout the unit. It serves as a record of student preconceptions and their conceptual shifts as the unit and learning progresses.

LESSON 1A: SCHOOLYARD DETECTIVES

Advance Preparation

Conduct a survey of your school yard and make note of areas that have been weathered and eroded due to exposure to wind and rain or water movement. Check for areas where rain water has dripped off the roof and made a change in the surrounding area. You may also find areas that have been eroded due to runoff from the parking lot, playground, and sidewalks. Some areas may have cracks in the sidewalks and parking lot due to thawing and freezing and plant roots.

Make a *What We Think About The Surface of Earth* chart to keep a record of students' initial thinking and conceptual shifts as the unit progresses.

What We Think About the Surface of Earth				
What We Think	Questions We Have	What We Did	What We Figured Out	How Does That Help Us to Solve the Challenge?

Procedure

Engage the learner

Start the lesson by describing something you noticed that had changed in the schoolyard on your way into the building.

Examples:

- I noticed on my way into the building today that there is a large rut in the yard along the edge of the sidewalk. I wonder what caused that to happen. I was careful not to step off the sidewalk into the rut. Has anyone else noticed that? Was it always there?
- I noticed as I drove my car into the parking lot that the pothole in the entrance is getting bigger and bigger. What do you suppose caused that to happen?

Allow time for students to share experiences they have had with ruts, potholes, erosion, or pooling of water. Explain to the class that they are going to become schoolyard detectives and scientists and investigate changes in the land and soil around the schoolyard.

Ask students for examples of when they have seen changes in the land (their yard, a park, the schoolyard) and what they think might cause that change. Ask students for ideas of where they might find areas in the school yard that have changed over time. Ask:

- Where do you think we might observe changes in the land around the schoolyard? What makes you think that?
- Can anyone add to _____'s idea?
- Where else might we observe changes?
- Do you think the changes happened slowly or rapidly?
- How can we find out about changes in the schoolyard and what causes them?
- Has anyone noticed where water pools on the playground after a rain? What about that puddle that keeps coming back?

Read the Student Journal prompt and have students explain the purpose of the investigation in their own words.

Your class is investigating changes in the shape of the land in your schoolyard.

1. *Draw and label an example of a change in the shape of the land in the schoolyard that you observed.*
2. *Draw and write how you think the land changed.*

Ask students to explain in their own words the focus of the school yard investigation and what they are to record in their Student Journals. Ask students to recall experiences of playing in sand with water, or playing in the hose, and recall changes in the sand and yard due to the movement of the water. Ask students to relate experiences to what they might observe in the schoolyard.

Explore the concept

Divide the class into teams of two and have students take their Student Journals and pencils outdoors to make drawings of their findings. Allow sufficient time for students to complete their outdoor explorations. Facilitate the team exploration by circulating among the students and observing their investigations. To check progress and help the teams make connections between the changes and possible causes, ask:

- Can someone explain what you have observed so far?
- What evidence do you have that there was a change in the shape of the land in this area?
- What do you think was the cause of the change? Was it rapid change or did the change happen slowly? What makes you think that?
- What effect does that have on the shape of the land?
- Do you think the change happened quickly or slowly over a period of time? What makes you think that?

Stability and Change

- Things may change slowly or rapidly.

CAUSE AND EFFECT

- Simple tests can be designed to gather evidence to support or refute student ideas about causes.

SCIENCE TALK

Science Talk is a critical component of science lessons. Science Talk provides an avenue for the exploration of ideas and exchange of points of view, and is intellectually and academically challenging. Science Talk is not an add-on to the lesson and provides academically productive talk that is critical for learning in science. (See Science Talk in the Appendix.)

LESSON 1A

TEACHING TIP

If some teams made observations and presented the same change on the schoolyard, invite them to become a larger team and work together to figure out the cause of the change and if action needs to be taken to prevent further change.

CAUSE AND EFFECT

- Simple tests can be designed to gather evidence to support or refute student ideas about causes.

DEVELOPING AND USING MODELS

Modeling in K-2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatizations, or storyboard) that represent concrete events or design solutions.

- Distinguish between a model and the actual object, process, and/or events the model represents.
- **Compare models to identify common features and differences.**
- **Develop and/or use a model to represent amounts, relationships, relative scales, and/or patterns in the natural and designed world(s).**
- Develop a simple model based on evidence to represent a proposed object or tool.

- What do you think it will look like if we come back and observe this change in one week? What makes you think that? What would cause that to happen?

Using a digital camera or phone, take pictures of the different changes in the surface of the school yard. Allow sufficient time for students to make observations and complete their drawings of their findings.

Have the students return to the classroom with their Student Journals and meet as a team. If some teams made observations of the same change on the schoolyard, invite them to become a larger team and work together to develop a model and figure out the cause of the change and if action needs to be taken to prevent further change.

Allow time for the students to share their recordings from their observations with their team. After students have had the opportunity to discuss their ideas, distribute chart paper and markers to each group and ask them to develop a model using their observations and initial ideas of what caused the change they observed on the schoolyard. If necessary, review what it means to develop a model and that a model is a drawing that explains their thinking. Remind students that they will have the opportunity to revise their models as the lessons progress and as they obtain further information about changes in the land.

Facilitate the model development by circulating among the teams and listening to their ideas and observations. To help teams build confidence and rely on their own understandings, ask:

- What common observations did the team record in the Student Journals?
- Why do you think those observations were important?
- How will you show that in your model?
- Can someone add on to _____'s idea?
- What do the rest of you think?
- What other observations are important for your model?
- What ideas do you have about the cause of the change?
- Can you show that in your model?
- Who can retell or explain what _____ just said?
- Do you think the change that you observed might get worse or continue to change? What makes you think that?

- Do you think it might cause a problem on the schoolyard if it continues?
- How might you find out?

Allow sufficient time for all teams to develop their initial models.

Explain the concept and define the terms

Science Talk

Ask the students to bring their Student Journals and models and sit in a circle for a whole class sharing of their findings. Ask teams to describe their observations and why they think their findings provided evidence of a change in the shape of the land in the schoolyard. Ask what they think caused the change.

If you were able to take pictures of their observations, project the photos for the students to explain what they observed.

Encourage students to challenge one another in their thinking.

Ask:

- What do you think about what _____ said?
- Do the rest of you agree? Why or why not?
- Does anyone have the same or similar observation but a different way to explain it?
- Can you explain why your answer makes sense?
- What is changing in your observation? What is staying the same?
- Do you think the change occurred quickly or over a long period of time? What makes you think that?
- Who else would like to share their observation from the school yard?
- _____, I noticed that your team observed _____. Can you share what you were thinking about that?
- What do you think caused that to happen?
- What do you think we would observe if we went back to the school yard and made another observation? Do you think the change would be greater? Would the change still be there?
- What do you think would happen if the cause of the change continues over time? What do you think about that?

CONSTRUCTING EXPLANATIONS AND DESIGNING SOLUTIONS

Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.

- **Use information from observations (firsthand and from media) to construct an evidence-based account for natural phenomena.**

Stability and Change

- Things may change slowly or rapidly.

SCIENCE TALK

Science talk is a critical component of science lessons. Science talk provides an avenue for the exploration of ideas and exchange of points of view, and is intellectually and academically challenging. Science talk is not an add-on to the lesson and provides academically productive talk that is critical for learning in science. (See Science Talk in the Appendix.)

LESSON 1A

TEACHING TIP

Keep the What We Think About the Surface of the Earth chart visible in the classroom throughout the unit. It serves as a record of student preconceptions and their conceptual shifts as the unit and learning progresses.

Allow time for all the teams to present their models and their ideas of what caused the change. Listen for initial ideas related to weathering and erosion. Do not introduce terms at this time. Make a note of teams that have an early understanding of how water, wind, and vegetation cause changes in the surface of Earth. Listen for ideas that relate to the small amount of wind and water as runoff that causes the change in the land on the schoolyard. Check for early thinking that might relate to the amount of force associated with the movement of wind, water, and growing plants, to make the different changes in the schoolyard.

Make a plan to allow teams to make further observations of the change in the school yard to record observable changes over time.

Introduce the What We Think chart and ask students to explain their ideas of what causes changes in the shape of the land using their models and observations from the schoolyard exploration. Record any questions the students may have at this time.

Explain that as they continue to gather further information about changes in the land, they will revisit the chart and keep a record of their ideas, questions, and what they figure out.

Encourage students to become detectives at their homes; to look around the yard, local park, or area where they live and look for changes in the land.

Assessment: Formative

Use the Activity Page, models, and Science Talk to assess the students' beginning ability to make connections to the cause and effect relationship between the force of moving air and water and growing vegetation to changes to the land.

LESSON 1B: RAISING QUESTIONS ABOUT CHANGES IN THE SURFACE OF THE EARTH

Teacher Background Information

The major geologic surface features of Earth include the landforms and bodies of water that can be observed. Students' preconceptions regarding landforms and bodies of water are relatively limited to what they see in their area and travels. The introductory lesson provides a look into landforms and bodies of water that have taken on grand shapes due to the movement of air and water. Students continue to make observations of changes in the land of the schoolyard due to rain, melting snow, wind, and plant growth. They begin to make connections between what they observed on the schoolyard and major formations on Earth's surface.

Advance Preparation

Do an Internet search of videos of erosion due to water and wind. Examples:

Search PBS Learning Media using the term "erosion."

Search You Tube using the term "weathering and erosion for kids."

If there has been a weather event (rain, wind, thawing and freezing) that may have caused changes to the students observations of erosion on the schoolyard, plan time for students to go outdoors and observe their area of interest. Take digital pictures so students can compare and look for changes.

Procedure

Review the What We Think chart from the previous lesson and ask students to retell what they have discovered about changes in the land on the schoolyard. Make additions to the chart as needed.

Explore the concept.

Divide the class into groups of four students. Distribute one picture from the *Weathering Card* set to each group. Ask the groups to make observations of the picture and discuss their ideas about the formation in the picture and how the land and bodies of water were formed.

Facilitate the group observations by circulating among the students, listening to and recording their initial ideas. To check student progress and help them elaborate on their ideas, ask:

- Can someone explain what you have discussed so far?
- What do you mean when you say...?
- Why do you think that?

MATERIALS NEEDED

For each student:

student pages

For each group of 4:

Weathering Card, 1

For the class:

Weathering Card Set

Teacher provides:

clipboard

Post-It Notes

ESS2.A: EARTH MATERIALS AND SYSTEMS

- Wind and water can change the shape of the land.

LESSON 1B

ASKING QUESTIONS AND DEFINING PROBLEMS

Asking questions and defining problems in K–2 builds on prior experiences and progresses to simple descriptive questions that can be tested.

- Ask questions based on observations to find more information about the natural and/or designed world(s).
- Ask and/or identify questions that can be answered by an investigation.
- Define a simple problem that can be solved through the development of a new or improved object or tool.

TEACHING TIP

Use the What We Think chart to keep a record of the students' initial ideas about the landforms and bodies of water in their pictures. In following lessons, they will come back together and apply their new information to their original thinking.

CAUSE AND EFFECT

- Simple tests can be designed to gather evidence to support or refute student ideas about causes.

Stability and Change

- Things may change slowly or rapidly.

- How do you know?
- Tell me more about...
- Who can add to _____'s idea?
- How might you find out or confirm that your ideas are correct?
- What do you think caused that formation to look like that? Do you think it will stay like that? What might change?
- How is your picture related to some of the changes we observed on the schoolyard?
- Can someone say more about that?
- What questions do you have about what you observe in the picture?

When the groups have concluded their observations and sharing of ideas about the pictures, invite each group to present their picture and ideas of how the land and bodies of water were formed and came to look that way. Listen for initial ideas that relate to wind and water movement that helped to carve the shapes in the earth. Record common terms or ideas students share on the What We Think About the Surface of the Earth chart.

After all groups have completed their sharing of initial ideas, take this opportunity for students to raise questions about their ideas and the shape of the land in their pictures to add to their questions about the changes on the schoolyard.

Have the students return to their groups and distribute Post-It Notes for students to write questions they have about the landforms and bodies of water in the pictures. Ask students to write one question per Post-It Note. Review the common ideas and ask students to generate questions based on their initial ideas and wonderings.

Facilitate the process of developing questions by circulating among the groups and listening to their exchange of ideas.

Science Talk

As a class, develop a driving question that will be investigated throughout the unit. To help students form questions based on their initial thinking ask?

Examples:

- What causes the changes in the shape of the land?
- How are different shapes in the land and bodies of water formed?

- What made the different shapes in the land and bodies of water?
- How long did it take to shape the different landforms?

Ask students for their ideas of how they could find out the answers to their questions. Check for ideas that may relate to investigations, obtaining information through research and building models to test ideas. Ask: What information do we need to know to be able to answer our question(s)? Make a class list of what the students think they need to find out. Record their ideas on the What We Think chart.

Assessment: Formative

Use the Science Talk and What We Think chart to assess the students' initial ideas of what shapes the surface of the earth.

SCIENCE TALK

Science talk is a critical component of science lessons. Science talk provides an avenue for the exploration of ideas and exchange of points of view, and is intellectually and academically challenging. Science talk is not an add-on to the lesson and provides academically productive talk that is critical for learning in science. (See Science Talk in the Appendix.)

ACTIVITY 2

LAND ON EARTH

Teacher Background Information

The surface, or outer layer of Earth, is covered by land and water. Three-fourths of the surface is water and one-fourth is land. A common misconception among young learners is quite the opposite. Student experiences are closely related to land and although Michigan students are familiar with the Great Lakes, rivers, ponds, and lakes, it is difficult for them to realize the vastness of oceans and how much of the planet is covered by water.

Explore the Concept

This phase of the learning provides students with the opportunity to observe, investigate and explore the different bodies of water and landforms that exist on Earth. Students actively explore, observe, and make models to gain a better understanding of how the land, air, and water shape the surface of Earth.

Students begin developing a deeper understanding of the interactions between land, air, and water, patterns in how they affect one another, and patterns that exist within the interactions.

Considerations for Students With Special Needs

All prompts and passages in the Student Journal should be read aloud, with repeated directions and checking for understanding prior to writing.

Students are asked to draw and write in their Student Journals. Students may benefit by working with a partner in the longer writing pieces. Students with an IEP should be allowed to dictate their ideas and answers.

The reading and drawing assignment for the John Wesley Powell journey may be tedious for some students. It may be helpful if students are encouraged to share in a “think aloud” and orally express their interpretations and ideas and then start to draw and write.

Ask a bilingual student or adult to translate the prompts in the Student Journal and story of John Wesley Powell’s journey.

LESSON 2A: THE BLUE MARBLE

Advance Preparation

Inflate the globe. Keep the globe inflated as it will be used in following lessons.

If your classroom or school has a school globe, have it available as a student resource throughout the explorations of the planet.

ESTIMATED TIME

Lesson 2A: 45-50 minutes

Lesson 2B: 45-50 minutes

Lesson 2C: 45-50 minutes

2-3 class periods

LESSON LEVEL LEARNING GOAL

- Obtain information from text and maps to develop a model of landforms and bodies of water observed during the journey of John Wesley Powell.

MATERIALS NEEDED

For each student:

student pages

For each group of 4:

1 Earth from Space picture

For the class:

1 globe, inflatable

2 alcohol wipes

Teacher provides:

classroom globe (optional)

apple

knife (for cutting apple)

chart paper

marker

ESS2.A: EARTH MATERIALS AND SYSTEMS

- Wind and water can change the shape of the land.

ESS2.B: PLATE TECTONICS AND LARGE-SCALE SYSTEM INTERACTIONS

- Maps show where things are located. One can map the shapes and kinds of land and water in any area.

LESSON 2A

TEACHING TIP

If students struggle remembering or identifying their right index finger, take a marker and place a dot on their finger.

TEACHING TIP

This may be the students' initial experience in using tally marks to record data. Explain that each mark represents one response and when five marks are reached, they are grouped and at the end of the data collection they will count the number of groupings of five and add any remainder.

Math

2.OA Operations and Algebraic Thinking

Add and subtract within 20.

1. Fluently add and subtract within 20 using mental strategies. By end of Grade 2, know from memory all sums of two one-digit numbers.

Represent and interpret data

2. Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph.

Bring an apple and a knife for slicing the apple to be used in the teacher demonstration.

Procedure

Engage the learner

Review the class discoveries and ideas about changes in the land on the schoolyard and the formations from the *Weathering Card* set. Ask students what they think caused the changes and formations. Check for ideas that include water, wind, and human activity. Explain that in this lesson the class is going to investigate what Earth is made of. Ask students if figuring out more about the surface of Earth and bodies of water will be helpful in figuring out changes in the surface of Earth.

Use the What We Think chart to review the students' initial ideas of how the landforms for the *Weathering Card Set* were formed. Ask students if they think that similar formations or changes in the land happen in the schoolyard. To help the class make connections among their pictures and the schoolyard, ask:

- How does the shaping of the land in the pictures relate to changes that are happening in the schoolyard?
- Do you think the land in the schoolyard changes? What makes you think that?
- Do the rest of you agree? Why or why not?
- What do we already know about the wind that might help us in our understanding of how the earth changes?
- What do we already know about rain that might help us in our understanding of how the earth changes?
- What can you recall about the term force that might help us in our understanding of how the earth changes?

Write the following question on the board or chart paper:

What is the surface of Earth made of?

Conduct a whole class brainstorming session and record their ideas on the What We Think chart. Check for ideas that identify different bodies of water, types of earth materials, or landforms. Refer to student ideas that refer to Earth being made up of land and water. Conduct an informal class survey and count the number of students who think that there is more land and the number of students who think there is more water.

Ask:

- What evidence do you have that makes you think that?
- Do the rest of you agree? Why or why not?
- How might we find out.

Explore the concept.

After students have made their predictions about the surface of Earth, show the class the inflated globe. Ask students if the graphics on the globe give them clues that help to answer the question. Make adjustments to their predictions if necessary.

Tell the class that they are going to use the inflatable globe for a “ball toss” activity as one way to find out if there is more water or land on Earth. Point out the parts of the globe that represent water and the parts that represent land. Ask students to hold up their right hand, and then show you their right index or “pointer” finger.

Make a T-chart on the board or chart paper to collect data for the exploration.

land	water

Toss the ball to a student, ask the student to tell if the right index finger fell on water or on land on the globe. Make a tally mark on the chart to represent where the finger fell. Continue the “game” until all students have had at least one opportunity to catch the globe and until your data shows that the students’ fingers fell on water more often than on land. You may have to repeat the ball toss a couple of times to demonstrate that there is more water than land.

Explain the concept and define the terms.

Analyze the results from the tally marks on the chart. As a class, add the tally marks for the water and land categories. Ask students what they can infer from the “globe toss” game. Tell the class that the globe represents a model of Earth and that the blue on the globe represents the same area covered by water as water on Earth and the landmasses represent the same area as land on Earth. Make a bar graph on the board or chart paper that represents the results of the “globe toss.”

Explain that the Earth is mostly made up of water. Three-fourths, or 75%, of the Earth is covered by water and only one-fourth, or 25%, is covered by land. Ask students to explain their ideas of $\frac{3}{4}$ and $\frac{1}{4}$.

Analyzing and Interpreting Data

Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations.

- Record information (observations, thoughts, and ideas).
- Use and share pictures, drawings, and/or writings of observations.
- Compare predictions (based on prior experiences) to what occurred (observable events).
- Analyze data from tests of an object or tool to determine if it works as intended.

LESSON 2A

CONSTRUCTING EXPLANATIONS AND DESIGNING SOLUTIONS

Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.

- **Use information from observations (firsthand and from media) to construct an evidence-based account for natural phenomena. Use tools and/or materials to design and/or build a device that solves a specific problem or a solution to a specific problem.**
- Use tools and/or materials to design and/or build a device that solves a specific problem or a solution to a specific problem.
- Generate and/or compare multiple solutions to a problem.

SCIENCE TALK

Science talk is a critical component of science lessons. Science talk provides an avenue for the exploration of ideas and exchange of points of view, and is intellectually and academically challenging. Science talk is not an add-on to the lesson and provides academically productive talk that is critical for learning in science. (See Science Talk in the Appendix.)

Hold up an apple. Cut the apple into four equal pieces. Demonstrate $\frac{1}{4}$ and $\frac{3}{4}$ of the apple as land and water. Check for understanding that $\frac{3}{4}$ is greater than $\frac{1}{4}$. Draw a circle on the board and divide it into quarters. Ask a student volunteer to come to the board and color in $\frac{3}{4}$ of the circle that would represent water and ask another student to color in the area that represents land.

Check the What We Think chart for initial student ideas about the surface of Earth. Record the activity in the What We Did column and their findings in the What We Figured Out column. Example: The surface of the Earth is mostly made up of water; $\frac{3}{4}$ of the surface is water and $\frac{1}{4}$ of the surface is land.

Ask students if understanding that Earth is made up of land and water helps them to figure out the changes on the schoolyard and how the different shapes and bodies of water were formed in the pictures from the card set.

Science Talk

Elaborate on the concept.

Ask students if they think that scientists would use the same method the class used to find out if there is more land or water on Earth's surface. Ask for their ideas of how scientists might determine how much land and water is on Earth.

Divide the class into groups of four students and distribute the picture of Earth from space. Ask the groups to examine the picture and discuss what scientists might learn from a photo of our Earth that they may not be able to discover from the surface. Give the students sufficient time to discuss the photo before explaining what they are observing. Distribute scrap paper and encourage group members to take notes about their ideas.

To facilitate the group discussions, circulate among the groups and listen to their ideas and explanations. To help groups make sense of their observations and elaborate on their explanations, ask:

- What have you noticed in the picture so far? What do you think you are seeing?
- Tell me more about the blue area. What do you think the white is? Where is the land?
- Does the picture show the entire surface of Earth?
- What is hidden from view?
- What do you mean when you say...?

After students have had the opportunity to discuss their ideas in the small groups, conduct a whole class sharing of their findings. To help the class collaboratively make sense of the surface features as shown in the photo, ask:

- Who can explain what your group observed in the photo?
- Do the rest of you agree with what _____ said? Did someone observe something different?
- Did someone observe the same thing, but can explain it differently?

As a class, discuss what is most visible on the surface of the side of Earth that can be seen in the photo. Explain that scientists now have the advantage of looking at Earth from space and can observe the land and water to determine that Earth has more bodies of water than land. Tell the students that astronauts have nicknamed planet Earth the “big blue marble.” Discuss student ideas as to why Earth might have that nickname. Record their ideas on the class chart.

If time and opportunity permit, have the students observe multiple photos of Earth from space on the NASA website: <https://go.nasa.gov/3hi2HLr>, and read the story, “The Big Blue Marble” (<https://go.nasa.gov/3vgffv2>).

Evaluate the students’ understanding of the concept

Pre-writing Strategy: Science Talk

Divide the class into groups of four and distribute the photo of Earth from space to each group. Ask the students to discuss the questions in the Student Journal. Give the students sufficient time to orally express what they will draw and write and listen to the ideas of others. Circulate the inflatable globe and invite students to look at the class globe, if possible.

Journal Entry

Draw a picture of what planet Earth looks like from space. Color the land green and the water blue.

Write why astronauts also call planet Earth the “big blue marble.”

Assessment

Use the What We Think chart, Science Talk and Journal Entry to assess the students’ understanding that Earth’s surface is made up of land and water.

Use the Science Talk and Journal Entry to assess the students’ understanding that Earth’s surface is mostly water.

Use the Science Talk and group work to assess the students’ ability to share ideas about science through purposeful conversation.

WRITING

Text Types and Purposes

W.2.1 Write opinion pieces in which they introduce the topic or book they are writing about, state an opinion, supply reasons that support the opinion, using linking words (e.g., because, and, also) to connect opinion and reasons, and provide a concluding statement or section.

Production and Distribution of Writing

W.2.5: With guidance and support from adults and peers, focus on a topic and strengthen writing as needed by revising and editing.

EXTENSIONS

Have the students play the “globe toss” game again and compare their results after making another bar graph.

Show the students maps of their community, their state, the United States, and the world. Help them find different locations on each of these maps. Have them find the same locations on the different maps.

INTEGRATION

Social Studies: Continue reinforcing the location of the land and water areas on Earth by using the globe. Have the students explore different locations on a globe. Reinforce these locations with pictures.

ENGINEERING DESIGN PROCESS

The Engineering Design Process provides students with a series of steps to guide them as they solve problems and design and test products, models, and solutions. The process is cyclical, yet not necessarily in an order. Students are encouraged to evaluate as they progress through the process, revisit the mission often, and revise thinking and their plan multiple times as the process unfolds.

Engineers do not always follow the Engineering Design Process steps in order, one after another. It is very common to design something, test it, find a problem, and then go back to an earlier step to make a modification or change the design. Engineers must always keep in mind the mission or problem they are trying to solve and the limitations (cost, time, material, etc.) that are part of the solution to the problem. Two key elements in working as an engineer are teamwork and design-test-and-redesign.

Mission

- Defines the problem and what the engineers are trying to design or build.
- Describes the limitations within which the engineers must solve the problem.

Brainstorm Ideas

- Imagine, discuss, and sketch possible solutions.
- Conduct research into what has already been done.
- Discover what materials are available, time frame, and other limitations.

Plan and Design

- Draw and write a plan.
- Design your solution through drawing and manipulating materials.
- Develop a plan or steps and a schedule.

Build

- Construct your engineering device or project.
- Follow your plan.
- Adjust and test along the way.

Test and Adjust

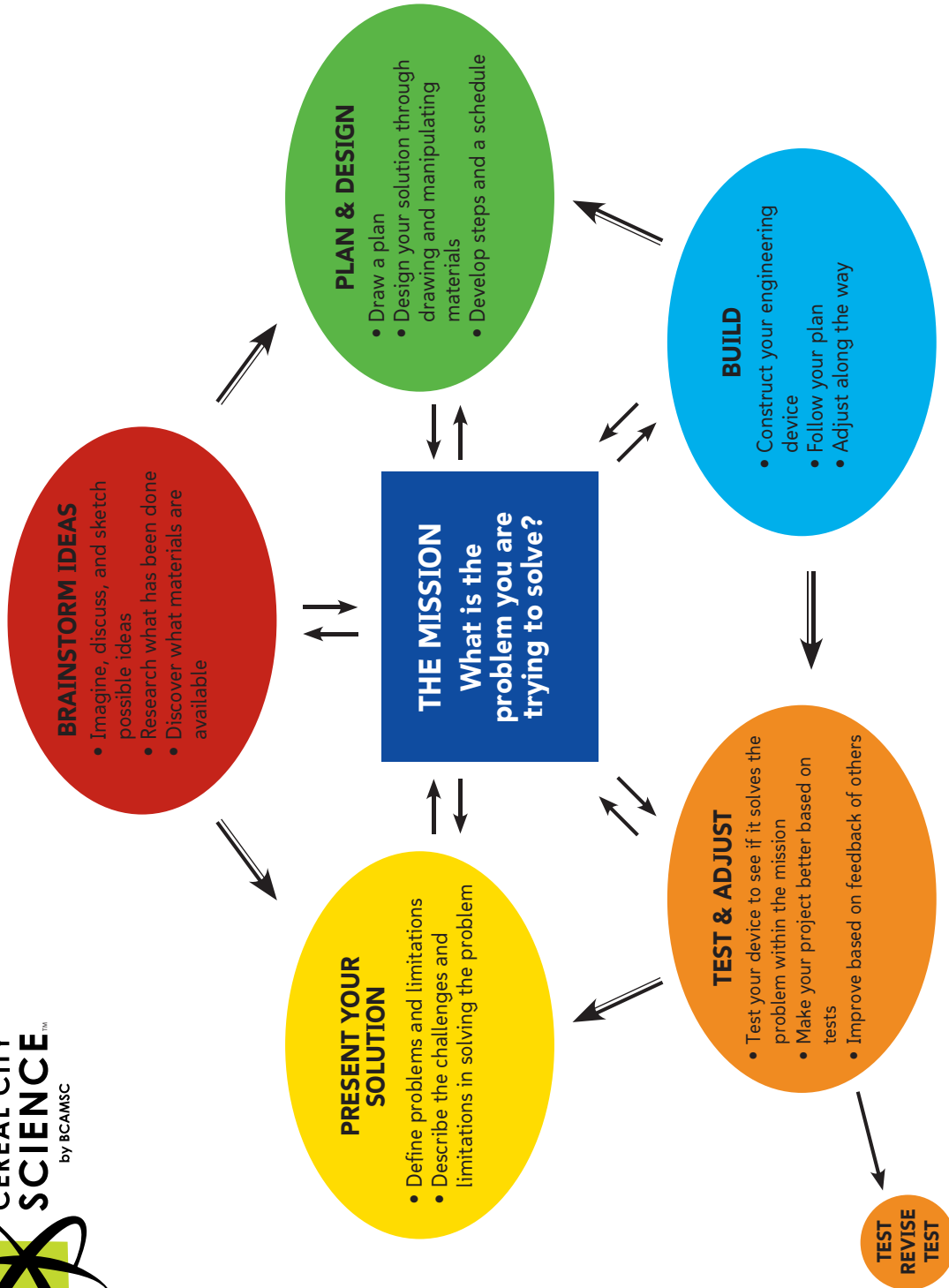
- Test your device to see if it solves the problem within the mission and limitations.
- Make your project better based on tests: Test → Revise → Test.
- Improve based on feedback of others.

Present Your Solution

- Demonstrate how your solution solves the problem.
- Define problems and limitations.
- Describe the challenges and limitations in solving the problem.
- Describe additional revisions that could improve the device or project.

ENGINEERING DESIGN PROCESS

ENGINEERING DESIGN PROCESS



by Battle Creek Area Mathematics and Science Center
Cereal City Science
Adopted from the Carnegie Mellon Robotics Academy

Changing Earth: Today and Over Time

2ENG



S E C O N D E D I T I O N

A second grade unit supporting Next Generation Science Standards
and Michigan Science Standards

Name: _____

Name _____

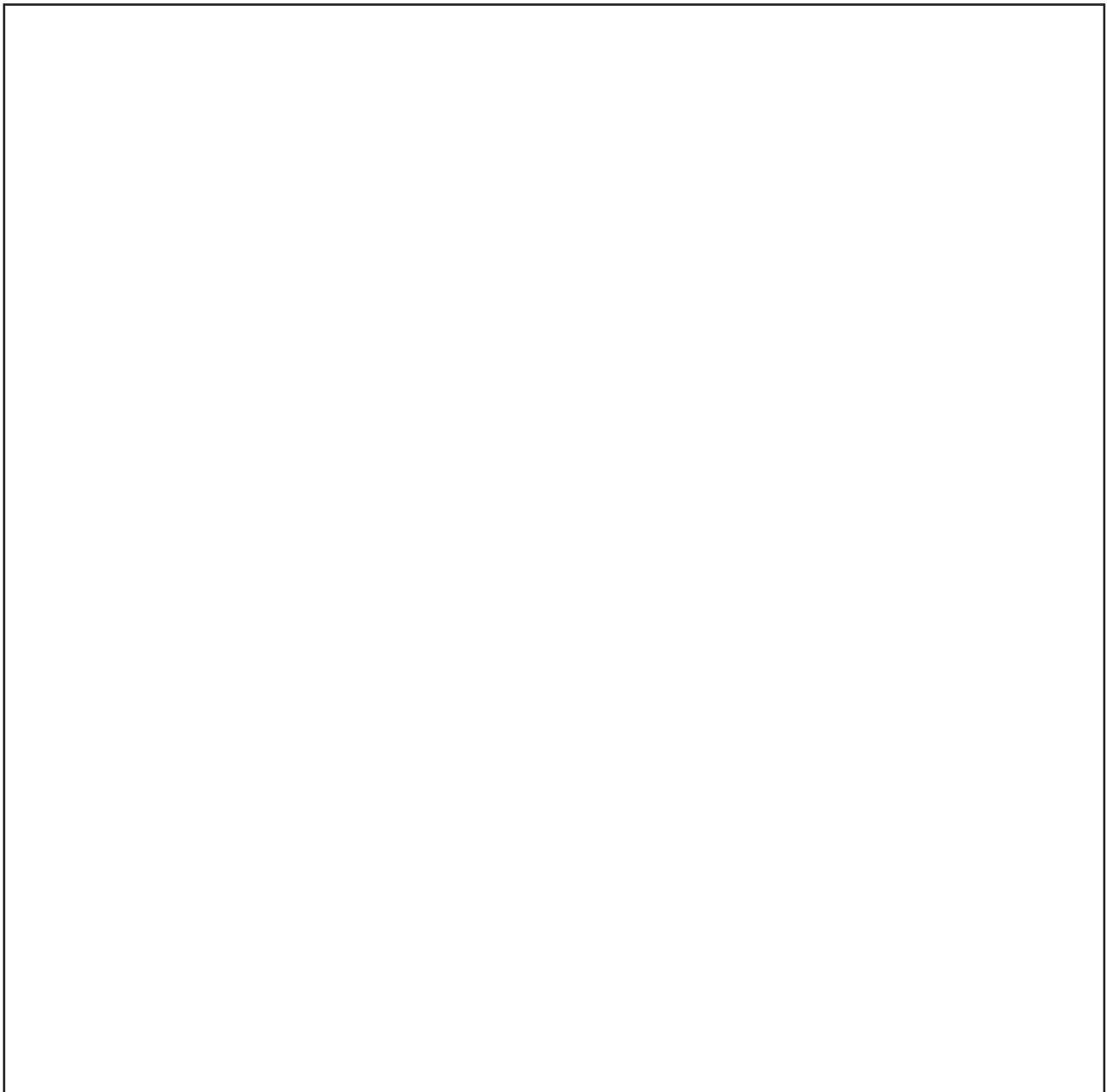
Date _____

Raising Questions About
Landforms and Bodies of Water**1A**

.....

Your class is investigating changes in the shape of the land in your schoolyard.

1. Draw and label an example of changes in the shape of the land in the schoolyard that you observed.



1A

A C T I V I T Y

Raising Questions About Landforms and Bodies of Water

Name _____

Date _____

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2. Draw and write how you think the land changed.



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Name _____

Date _____



Draw a picture of what planet Earth looks like from space.
Color the land green and the water blue.



Write why astronauts also call planet Earth the "big blue marble."

K E Y T E R M S

Name _____

Date _____

.....

Handwriting practice lines consisting of multiple sets of solid top and bottom lines with a dashed midline.

Name _____

K E Y T E R M S

Date _____

.....

Handwriting practice area consisting of multiple sets of three horizontal lines (top solid, middle dashed, bottom solid).

K E Y T E R M S

Name _____

Date _____

.....

Handwriting practice area consisting of multiple sets of horizontal lines. Each set includes a solid top line, a dashed middle line, and a solid bottom line, providing a guide for letter height and placement.