

Science Lesson Sequence

Part 1: Instructional Context

Name: Kaitlynn Woods

Grade Level: 4th

Performance Expectation: 4-ESS2-1. Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.

[Clarification Statement: Examples of variables to test could include angle of slope in the downhill movement of water, amount of vegetation, speed of wind, relative rate of deposition, cycles of freezing and thawing of water, cycles of heating and cooling, and volume of water flow.]

[Assessment Boundary: Assessment is limited to a single form of weathering or erosion.]

- *The performance expectation asks students to find evidence of how erosion occurs from water, ice, wind and/or living things through observations or measurements. The DCI's focus is on "earth materials and systems" (ESS2.A) and "Biogeology" (ESS2.E). Living things such as plants, animals, and humans can have a large effect on the way earth surfaces change over time. Rain, wind and ice also can change the way the earth's surface looks over time and can affect the plants, animals and humans that live in that surface's location/area. Living things, wind, water, and ice can also break apart pieces of the earth's surface and move them to different places/locations.*
- *The cross cutting concepts include patterns and cause and effect relationships, focused on patterns being used as evidence to support explanations, and cause and effect relationships to explain change.*
- *The science/engineering practice focuses on planning and carrying out investigations by making observations to create data as the basis for evidence to explain phenomenon.*

Unit-Level Phenomenon and Driving Question:

- **Phenomenon:** *Earth's surfaces change because of water, wind and living things carrying it to new places and breaking it down.*
 - o *Sub-phenomena: Earth's surface changes over time.*

- **Driving question:** *How does the Earth's surface change by water, wind, or living things?*
- **Explanation:** *Students will be able to explain and provide evidence from observations that rain, wind, and living things can cause a landscape to erode and break apart or weather and change shape and size.*
Kids Explanation: Earth's surface changes because rain carries dirt to other places, the wind carries dirt to other places, and some animals move dirt while some plants work to hold it in place.

Focus for Your 3-Lesson Sequence: *Students will make observations to provide evidence of weathering and erosion by water, wind or living things. Students will look at photos of eroded earth's surfaces and be able to recognize where water, wind, or living things have caused the surface to change. Students will interact with sand to cause erosion and weathering by blowing air onto the sand and pouring water onto the sand's surface, but the students will see the effects of living things holding the sand in place by a plant.*

3-dimensional Learning Goal:

- *Children will make observations to serve as the basis for evidence in order to explain earth's materials and systems highlighting the cause and effect relationship of how water, wind and living things change the earth's surface.*

Part 2: Sequence of Three Lessons

Lesson	Format	Lesson Focus	Science and Engineering Practice	Aspect of Science & Engineering Practice	Science Talk	Evidence of Children's Learning
1	<i>Whole group</i>	<i>Learning about erosion and its effect on the earth's surface</i> <i>Sub-phenomenon: Observations of pictures of Michigan surfaces that have effects of weathering and erosion</i>	<i>Planning and carrying out investigations</i>	<i>Planning investigations to answer questions building on K-2 experiences.</i>	<i>We will be doing a science talk in the first lesson to elicit students' sense-making of the Michigan land surface photos shown by using their background knowledge</i> <i>Information is later given during the lesson about erosion and weathering in relation to earth's surface when looking at the photos of Michigan.</i>	<i>Student's responses during the science talk building on previous knowledge of phenomenon.</i>
2	<i>Individual</i>	<i>Testing cause and effect relationships of wind, water, and land on earth's surfaces.</i>	<i>Planning and carrying out investigations</i>	<i>Make observations to produce data to serve as the basis for evidence</i>	N/A	N/A

		<i>Sub-phenomenon: Sand weathering and eroding away by water and wind, but living things (plants) holding sand in place.</i>		<i>for an explanation of a phenomenon .</i>		
3	<i>Whole group</i>	<i>Science Talk, Analyzing evidence/data</i>	<i>Planning and carrying out investigati ons</i>	<i>Use evidence to explain the phenomenon .</i>		<i>Students will turn in packet of data/observations collected during investigation to provide supports as evidence of their understandings of the effects of erosion and weathering.</i>

Part 3: Lesson Plans

Lesson 1

Anticipated Teaching Date: *March 7th*

Time Estimate: *50 minutes*

Materials:

- Students need to bring their devices (laptops) to class and log into the online science program (TCI).
- Teacher will have the TCI online program shown on the big screen/clear touch board.
- Teacher will also have photographs of different earth surfaces in Michigan.
 - o  Michigan's Surfaces Pictures

Safety Considerations: N/A

Introduction (10:20-10:30)

Welcome students, then *ask them to open their chrome books and go to TCI.*

The students often do this task for science so it should be an easy thing for them to get into. Once they log into TCI on their chromebooks, I will have them go to Unit 3 Lesson 1. *I will then ask them to close their chromebooks/keep them close to closed and I will open/show the pictures of Michigan geographic surfaces on the clear touch board.*

Main Teaching Activities (25 minutes)

We will begin the science lesson with the science talk about the pictures of Michigan's geographic surfaces. I will be asking open ended questions that allow for the students to think about what they noticed and what caused the surface to look the way it does. (10 minutes)

After the talk, we will begin to learn about erosion and weathering by opening TCI and beginning the online program for this lesson. Students will be asked to open up their chromebooks and go to their TCI program again and find Unit 3, Lesson 1 on the Text with Notes section from the left hand side of the screen.

I will read the introduction to the students and we will discuss some of the questions on the introductory page.

The students will then have time to read each of the sections and go back after reading each section to the questions at the bottom of the 4 sections. The students can either listen to the reading with headphones or read quietly. (about 15 minutes)

Science Talk Plan

NGSS Performance Expectation: 4-ESS2-1. Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.

[Clarification Statement: Examples of variables to test could include angle of slope in the downhill movement of water, amount of vegetation, speed of wind, relative rate of deposition, cycles of freezing and thawing of water, cycles of heating and cooling, and volume of water flow.]

[Assessment Boundary: Assessment is limited to a single form of weathering or erosion.]

Disciplinary Core Idea:

ESS2.A: Earth Materials and Systems

- Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around.

ESS2.E: Biogeology

- Living things affect the physical characteristics of their regions.

Topic: Making observations to provide evidence of weathering and erosion by water, wind and living things.

Scientific Phenomenon

Earth's surfaces change because of water, wind and living things.

Background Information: Students will be able to explain and provide evidence from observations that rain, wind, and living things can cause a landscape to erode and break apart or weather and change in shape and size.

- [Weathering & Erosion Video For Kids | 3rd, 4th & 5th Grade](#)

Artifacts and/or experiences to illustrate the phenomenon and launch the talk

The students will be looking at pictures in a slideshow of earth surfaces in Michigan and attempt to explain how they were formed.

-  Michigan's Surfaces Pictures

Driving question: How does the Earth's surface change by water, wind, or living things?

Questions to elicit children's lived experiences (especially outside of school) and family and community knowledge

1. *Where have you seen similar land features such as these in the photos?*

Follow-up questions: *Why does it look this way?*

2. *Where have you noticed things in our environment that look broken, misshapen, or shaved down?*

Follow-up questions: *How would that have happened?*

3. *How do you think our recent weather has affected our environment?*
Follow-up questions: *Would this have caused things to break, crack or become misshapen?*

Write at least 3 questions. Add more lines if needed.

Questions to elicit children's ideas and reasoning

4. *How do you think the earth surface in this picture from Michigan was formed?*
Follow-up questions: *Why does it look this way?*
5. *What do you notice about the landscape?*
Follow-up questions: *What is happening around the structure?*
6. *How is this landscape different from other landscapes?*
Follow-up questions: *What other landscapes look similar to this landscape?*

Talk moves to help children express their ideas and reasoning

1. Say More
2. Ask for Evidence/Reasoning
3. Poker Face/Evaluation Avoidance

A possible ordering of questions in your science talk

1. *Where have you noticed things in our environment that look broken, misshapen, or shaved down?*
2. *How do you think our recent weather has effected our environment?*
3. *Where have you seen similar land features such as these in the photos?*
4. *What do you notice about the landscape?*
5. *How do you think the earth surface in this picture from Michigan was formed?*
6. *How is this landscape different from other landscapes?*

TEACHER: Write students' Ideas of weathering, deposition, and erosion down on our class thinking page to return to in lesson 3. Tracking thinking and a formative assessment strategy.

Conclusion (15 minutes)

I will prompt the students with different questions about what was read in each section to check for understanding of each type of erosion and weathering that can occur, i.e. water, wind, and living things.

Questions:

- What is erosion? What is weathering?
- What can cause erosion? What causes weathering?

- What type of weathering changes the Earth's surface?
- What happens when something weathers over time?

Students can refer back to readings to answer questions and the teacher will have each section pulled up on the screen to explain along with them. Inform students that in the next lesson they will be doing an activity that will allow them to create their own weathering and erosion.

Lesson 2

Anticipated Teaching Date: *March 9th*

Time Estimate: *50 minutes*

Materials:

- Material 1 - 7 buckets full of sand
- Material 2 - water cup filled with water x 7
- Material 3 - small plant x 7
- Material 4 - straws x 7
-  Investigation Packet

Safety Considerations: Students should be careful and responsible with the materials they are given as they can be very messy if not used correctly.

Introduction (5- 10 minutes)

Students will come into the classroom and sit in their normal spaces. Ask students to stay at their seats and not touch the pre-prepped activity in the back of the classroom on a table. We then will go over the types of changes that happen to earth's surfaces and how it happens. I will open the TCI program before the students get into the classroom, and we will briefly go through each section pertaining to erosion and weathering, water, wind, and living things. I will ask students questions about the lesson section content and they will respond as I give assistance with knowledge and remembering content from the prior lesson.

Students will be placed into groups of 3-4 and each will be stationed with one of each materials for the group to share. Each student will be given a task/role to complete for the activity which is preplanned.

Main Teaching Activities (~35 minutes)

I will explain to the students what the activity is going to be and we will be in groups of 3. The students are going to fill out a packet that follows along with the activity as they complete the experience. The students will be placed in different areas in the room with the tub of sand, with a straw, cup and water, and a small plant. They will be expected to fill out the worksheets as they go. (5 minutes)

Activity: In groups of 3, the students will be expected to create their own weathering and erosion phenomenon. Each group will have a tub with sand and be given a straw, a small cup of water, and a tiny plant. Each person in the group will be responsible for one phenomenon of erosion/weathering which

includes wind, water, and living things. The activity will first be step-by-step easily modeled by myself as the experience happens to assist in understanding and for classroom management. The students will need to watch me as they complete the next task.

The first being wind, a student will blow air through the straw onto the sand to create a weathering effect on the sand. The second will be water where the 2nd student in the group will lightly pour water onto the sand to show the effects of erosion on the sand. Lastly, the final student will take the small plant and dig it into the sand to show that as wind and water will move across the surface, living things will support parts of the surface to stay in place. Each of these three steps will be modeled more simplified by the teacher. Time will be given for the students to enact the step and have time to write down their observations and new understandings. (30 minutes)

- This hands-on activity allows for all students in my classroom to participate in the activity. I have two students who I expect to not complete the worksheets via their specific needs, but they can participate in the activity and know how to be responsible for a step with those materials.

Conclusion (5 minutes)

Students will be asked to pause where they are and quietly clean up their space. The analysis and discussion of the science experience will happen in lesson 3, which the students will be told. Students will place their cup and straws on a plate and clean the space if there is sand in the area. Students will put their investigation packet in their science folder and line up at the door. One student from each group will pour their sand outside.

Lesson 3

Anticipated Teaching Date: *March 10th*

Time Estimate: *50 minutes*

Materials:

- Material 1 - Investigation packet

Safety Considerations: N/A

Introduction (5 minutes)

Students will come into the classroom and sit in their normal spaces. I will ask them to take out their investigation packets and tell them that we are going to go over the questions as a class. If the students need more time to complete the packets, they can be given that time depending on how much they still need to complete. The students will then after the discussion fill out the sheet with pictures of different earth formations and the students will be asked to describe how the erosion or weathering occurred. I will then ask the students to sit in their groups.

Main Teaching Activities (40 minutes)

Students in their groups will go over their findings in their investigation packets and fill out what needs to still be completed. They will have a small turn and talk moment with their group to discuss questions, such as what went well in your investigation? What didn't go as you thought? Did anything surprise you? What did you notice?

How do wind water and living things work to change Michigan's surface? Where did we see evidence of this in our investigation?

What about the earth's surface? What are some other examples of deposition or erosion you can think of? Where else have you seen deposition and erosion?

After a few minutes, we will then come together as a class and I will have each group share out their experiences and what their processes were when enacting the different types of weathering and erosion. (15 minutes) I then will ask my students to share their understandings of weathering and erosion by asking questions about how wind causes weathering and how water and living things cause erosion. At this point I will have Lesson 1 of TCI open to refer back to if necessary with the students. After the discussion the students will finish the rest of the packet that has photos of different earth surfaces on it and underneath they will describe what occurred and how it occurred, as well as modeling erosion, deposition, and weathering. This will be independent work and will be collected at the end of the lesson. The students will actively complete the answer at the end of their packet (pages 5-7) as a way to formally assess their understanding of the content. Time will be organized so students have enough time to complete the questions, but also leave time to hopefully debrief at the end.

Conclusion (5 minutes)

I will bring the class back together and instruct them on what to do next. After the students have finished the packet, they will turn in their packet into the science slot as they line up. I will ask the students to clean up their space, push in their chairs, turn in both the packet and the worksheet, and then line up at the door to leave.

Part 4: Evidence of Children's Learning

Task: The students will be completing an investigation packet as they complete their science experience during lesson 2, this includes them having to make observations and collect data through their experiences with erosion, deposition, and weathering. Lesson 3 will have the students utilize their science packed to share out/develop knowledge, but they will also have a worksheet that they will complete to check their understanding of erosion and weathering through the processes of wind, water, and living things. The discussion we will have at the beginning of lesson 3, will also help to elicit understanding verbally from my students. After page 5 of the investigation packet, which will mainly be completed during lesson 3, will have the students utilize the why these 3 earth processes occur and how.

The packet is also scaffolded for English language learning students and students who struggle with writing. Students have sentence frames to support the articulation of their ideas, and spaces to draw/record what they observed in the investigation.

The discussions scattered throughout lessons 1-3 also serve as formative assessments, allowing the teacher to support students throughout the lessons when gaps in learning are identified. The primary goal is to let students explore and work together, and by lesson 3 any remaining gaps we can work together to explain so students walk away with a lesson-level understanding of the 3-D learning goal

Investigation Packet

Exemplary Response to the Task: Mastery of the lesson-level learning goal can be shown through very specific, labeled diagram drawings of what happened during the investigation.

The following should be included and labeled in their drawings:
Earth's surface/sand, hills/change in elevation, Rain, River, Plant, Wind

An example of an exemplary written response is as follows:

- Describe what you observed and showed in your diagram?
- I observed **that when rain fell, some sand that represented the earth's surface was washed away toward the bottom of the bin.** I think this happened because **when the rain fell, it pushed some of the sand down the slope of the bin, and it collected in a new spot.**

Criteria for Analyzing Children's Responses to the Task:

RUBRIC

	Advanced / 3	On Level / 2	Beginning / 1	Unattempted / 0
DIAGRAMS 1: ____ / 3 2: ____ /3 3: ____ /3	My drawings include all the labels listed in the question with detail and color. They clearly show what I observed in relation to erosion, deposition, and weathering, and may have other aspects labeled or explained.	My drawings have all the necessary labels with some color and show my main observations of erosion, deposition, or weathering	My drawings are missing some or all labels and show how the investigation was set up, but not what I observed during the investigation.	I did not draw clearly or label anything. There is no color and nothing I observed is included yet.
EXPLANATIONS	My explanations clearly state what I	My explanations state what I	My explanations state what I	I do not have full explanations of

1: ____ / 3 2: ____ / 3 3: ____ / 3	observed in relation to erosion, deposition, and weathering. I articulated clearly evidence for my thoughts using the sentence framed.	observed and why I think that happened (cause and effect). At least 1-2 of my explanations are in relation to erosion, deposition, and weathering.	observed but 2 or more are not related to weathering, erosion, and deposition yet.	what I observed yet, and nothing is in relation to weathering, deposition, or erosion yet.
PHOTO ANALYSIS 1: ____ / 3 2: ____ / 3 3: ____ / 3	My description of what is happening in the photo includes all the necessary terms, is written in full thoughts/sentences, and clearly describes how weathering, erosion, and deposition are shown in the photo and how they impact the earth's surface in Michigan.	My description have all, or all but one of the necessary terms and connects to at least 2 of the observable phenomena (erosion, deposition, weathering) to describe the photo of Michigan's surfaces in full thoughts/sentences most of the time.	My description has 1-2 of the necessary terms and is connected to 1 or none of the observable phenomena (yet). It describes some of what has impacted Michigan's surfaces.	My descriptions has 1 or none of the necessary terms and is not yet describing the impacts of the observable phenomena on Michigan's surfaces.
EROSION, WEATHERING, DEPOSITION TERMS Same: ____ / 3 Different: ____ / 3	My explanations clearly state what is similar and different about the observable phenomena (erosion, weathering, and deposition) in full thoughts/sentences. I connect/contrast the terms in 2 or more ways.	My explanations clearly state what is similar and different about the observable phenomena (erosion, weathering, and deposition) in mostly full thoughts/sentences . I connect/contrast the terms in 1-2 ways.	My explanations state at least 1 similarity or difference between the observable phenomena but might be missing one of the observable phenomena. My thoughts are not in full sentences/form yet.	My explanations do not yet connect or contrast the observable phenomena and are not in full thought/sentence form.
DRAWINGS Erosion: ____ / 3 Deposition: ____ / 3 Weathering: ____ / 3	My drawings are clearly labeled(2+ labels), colored, and show an accurate example of the observable phenomena (erosion, weathering, and deposition).	My drawings are mostly labeled (1-2 labels), and show an example of observable phenomena (erosion, weathering, and deposition).	My drawings have 1 or no labels and do not yet accurately show an example of the observable phenomena (erosion, weathering, and	My drawings have no labels and do not yet show any connection to the observable phenomena (erosion, weathering, and deposition).

			deposition).	
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