The Evolution of the T2L Science Curriculum

Over the last four years, the Teach to Learn program created 20 NGSS-aligned science units in grades K-5 during our summer sessions. True to our plan, we piloted the units in North Adams Public Schools, and asked and received feedback from our science fellows and our participating teachers. This feedback served as a starting point for our revisions of the units. During year 2 (Summer of 2015), we revised units from year 1 (Summer/Fall 2014) and created new units to pilot. In year 3, we revised units from years 1 and 2 and created new units of curricula, using the same model for year 4. Our understanding of how to create rich and robust science curriculum grew, so by the summer of 2018, our final summer of curriculum development, we had created five exemplar units and established an exemplar unit template which is available in the T2L Toolkit.

We made a concerted effort to upgrade all the existing units with exemplar components. We were able to do much, but not all. So, as you explore different units, you will notice that some contain all elements of our exemplar units, while others contain only some. The fully realized exemplar units are noted on the cover page. We did revise all 20 units and brought them to a baseline of "exemplar" by including the Lessons-At-A-Glance and Science Talk elements.

Grade 2

Land and Water

A T2L Exemplar Unit

MCLA NAPS Williams

Teach To Learn

A collaboration between MCLA, Williams College, and North Adams Public Schools

Funded by NSF DUE-IUSE Award #1432591

T2L Curriculum Unit

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Land and Water

Earth Science/Grade 2

In this unit, students will learn about the landforms and bodies of water that make up our planet. Students will explore mapping and learn how to represent land and water with maps. Students will learn about changes to the land through erosion and how these changes might be prevented.

Unit Creation and Revision History

Authors, Summer 2016
Joy DeMayo, Grade 2 Teacher, Colegrove Park Elementary School
Annie Gagnon, Biology major, Massachusetts College of Liberal Arts
Lindsay Osterhoudt, Science Coordinator, North Adams Public School
Valeria Sosa-Garnica, Political Science major, Williams College

Major Revisions, Summer 2018
Tiffinie Alvarez, Secondary Education major, English major, Massachusetts College of Liberal Arts
Amina Diop, Astrophysics major, Mathematics major, Williams College
Lauren Mangiardi, English Literature major, Elementary Education major, Massachusetts College of Liberal Arts
Priscilla Mercado, Computer Science major, English major, Williams College
Stephanie Nguyen, Elementary Education major, Interdisciplinary Studies major, Massachusetts College of Liberal Arts
Matthew Roychowdhury, Physics major, Williams College

Project Management
Leslie Rule, Teach to Learn, Massachusetts College of Liberal Arts

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Unit Plan

Stage 1 Desired Results

2-ESS2-2. Map the shapes and types of landforms and bodies of water in an area. **Clarification Statements:** Examples of types of landforms can include hills, valleys, river banks, and dunes. Examples of water bodies can include streams, ponds, bays, and rivers.
Quantitative scaling in models or contour mapping is not expected.

Technology K2: 3.1 Use various age-appropriate technologies to locate, collect, and organize information.

Technology K2: 3.4 Use a variety of age-appropriate technologies (e.g., drawing program, presentation software) to communicate and exchange ideas.

2-ESS2-3. Use examples obtained from informational sources to explain that water is found in the ocean, rivers and streams, lakes and ponds, and may be solid or liquid.

2-ESS2-4(MA). Observe how blowing wind and flowing water can move Earth materials from one place to another and change the

Meaning

UNDERSTANDINGS

Students will understand that…

- **Some events happen very quickly; while others occur very slowly over a time much longer than one can observe.**
- **Wind and water can change the shape of land.**
- **Maps show where things are located.**
- **You can map different shapes and kinds of land and water.**
- **Water is found in the ocean, rivers, lakes, and ponds.**
- **Water exists as solid ice and in liquid form.**
- **Because there is always more than one possible solution to a problem, it is useful to compare and test designs.**

ESSENTIAL QUESTIONS

1. How can we prevent flooding and erosion from harming our town?
2. What makes a picture a map?
3. How do you make a lake disappear? How do you make a mountain into a molehill?

shape of a landform. **Clarification Statement:** Examples of types of landforms can include hills, valleys, river banks, and dunes. **2-ESS2-1.** Investigate and compare the effectiveness of multiple solutions designed to slow or prevent wind or water from changing the shape of the land. **Clarification Statements:** Solutions to be compared could include different designs of dikes and windbreaks to hold back wind and water, and different designs for using shrubs, grass, and trees to hold back the land. **Literacy** **2.W.7.** Participate in shared research and writing projects (e.g., read several books on a single topic to produce a report: record science observations). **History and Geography** Describe how maps and globes depict geographical information in different ways. (G) Read globes and maps and follow narrative accounts using them. (G, H)	***Student Learning Targets*** 1. I can identify different types of landforms 2. I can describe different landforms using appropriate language 3. I can identify different types of bodies of water 4. I can provide examples of how bodies of water may be solid or liquid 5. I can explain how different models can represent the same object 6. I can identify different landforms found on our planet 7. I can describe characteristics of landforms 8. I can understand the different components of a map, including a key and a compass 9. I can use different maps for different uses 10. I can create a map that represents landforms or bodies of water 11. I can define erosion 12. I can explain how water shapes the land 13. I can explain how wind shapes the land 14. I can explain the process of erosion from a cliff to sand on the beach 15. I can predict the outcome of the cookie erosion activity 16. I can identify barriers to erosion and explain how they work 17. I can construct their own barriers for erosion, test them, and evaluate their efficiency 18. I can perform group research on landforms and bodies of water using assigned sources and sources they find on their own 19. I can write a paragraph about their research topic 20. I can produce and present a poster or brochure in groups 21. I can understand that erosion is a natural process with both negative and positive outcomes 22. I can explain that North Adams used to be Lake Bascom and that Lake Bascom no longer exists due to water erosion

Stage 2 – Evidence

Evaluative Criteria	Assessment Evidence
● Participation ● Class activities/projects	1. Participation in class and group discussions 2. Participation and completion of class activities 3. Exit tickets 4. Writing in Science Journals

Stage 3 – Learning Plan

Students should have learned the following background knowledge and skills in the previous grades. The teacher will draw upon this knowledge and these skills in this unit:

Pre-K students:

- Can raise questions and engage in discussions about how different types of local environments (including water) provide homes for different living things.
- Explore and describe different places water is found in the local environment.
- Use simple instruments to collect and record data on elements of daily weather, including sun or clouds, wind, snow or rain, and higher or lower temperature
- Describe how local weather changes from day to day and over the seasons. Also, recognize patterns in those changes.

Kindergarten students:

- Use and share quantitative observations of local weather conditions to describe patterns over time.
- Construct an argument supported by evidence for how plants and animals (including humans) can change the environment.

First grade students:

- Use observations of sun, moon, and stars to describe that each appears to rise in one part of the sky, move across the sky, and set.
- Analyze provided data to identify relationships among seasonal patterns of change, including relative sunrise and sunset time changes, seasonal temperature and rainfall or snowfall patterns, and seasonal changes to the environment.

Lesson 1: In this lesson, students will learn about different landforms and representations of landforms.

Lesson 2: In this lesson, students will learn about different bodies of water and how they can exist in different states.

Lesson 3 (Literacy Lesson): In this lesson, students will read a rhyming book about landforms and then write an acrostic poem for one of the landforms.

Lesson 4: In this lesson, students will learn about the components of a map and how to read them. Then, they will learn how to create and improve maps, while including information about landforms and bodies of water into their maps.

Lesson 5: In this lesson, students will learn about the process of erosion and how wind and water is able to change the shape of land.

Lesson 6 (Literacy Lesson): In this lesson, students will learn more about wind erosion and predict the outcome of the cookie erosion activity.

Lesson 7: In this lesson, students will learn about the different methods of preventing erosion, specifically barriers, and will build their own barriers.

Lesson 8: In this lesson, students will conduct guided research on landforms and bodies of water. They will then create and share a brochure or poster based on their topic to show their understanding of the material.

LESSONS at a GLANCE

Key

					
Independent online student research	Tech Integration	YouTube Video (or other video site)	Kinesthetic Learning	Outdoor education	Lab work

Resource and Modalities Chart

Lesson	**Core Activities**	**Extensions**	**Tools and Modalities**
1. Landforms	• Landforms Video and KWL • Landforms PowerPoint • Landforms Headbandz • Virtual Tour of Landforms • Landform Song	• Field Trip to Mt. Greylock • Google Cardboard	   
2.Bodies of Water	• "The Water Bodies" video • Bodies of Water Booklet • "Bodies of Water" Headbandz • QR Code Scavenger Hunt • Google Cardboard/Google Street view • Map Extension	• Field trip to Hoosic River • Research on a Water Body • Exploration of relative size of countries • Looking at maps	 

3. An Introduction to Landforms (Literacy Lesson)	• "Learning about Landforms" video • Read Rhyming Book • Acrostic Poem • Art Integration	• Collecting materials outside for art depiction	
4. Mapping	• Treasure Hunt • Either read "*That Map! A Look at First Mapping Skills*" or watch Map features song • Types of Maps Activity • Perfect Island Project • Paired Text Passages	• Maze Activity	
5. Shaping the Land	• River Video • Erosion in a Tray • Glaciers Video • Glacier Activity • Alphabet of Valleys Video		
6. Cracking up- A story about Erosion (Literacy Lesson)	• Read Cracking Up- A Story About Erosion • Cookie Erosion Activity • Various Readings • Wind Erosion Bowls • Windy Windy (Erosion Tag)		

7. Preventing Erosion	• Erosion Barriers PowerPoint • Erosion Barriers Packet • Erosion Scavenger Hunt • Plant Barrier Demonstration • Preventing Erosion Designs		
8. Research Project	• Guided Research Project • Creative Depiction • Poster or Brochure		

Lesson Feature Key

Lessons in this unit include a number of features to help instructors. This key is a quick guide to help identify and understand the most important features.

Icons

Talk science icon: Look for this icon to let you know when to use some of the talk science strategies (found in the unit resources of this unit)

Anchor phenomenon icon: Indicates a time when an anchoring scientific phenomenon is introduced or when an activity connects back to this important idea**.**

Text Formatting:[SP#: ....] Any time you see a set of brackets like this, it indicates that students should be engaged in a specific science or engineering practice.

Underlined text in the lesson:

This formatting indicates important connections back to the central scientific concepts and is useful to note these connections as an instructor, as well as for students.

Callouts

Teaching Tip

In these call out boxes, you'll find tips for teaching strategies or background information on the topic.

Student Thinking Alert

Look out for common student answers, ways in which students may think about a phenomenon, or typical misconceptions.

ESSENTIAL QUESTION CONCEPT MAPS

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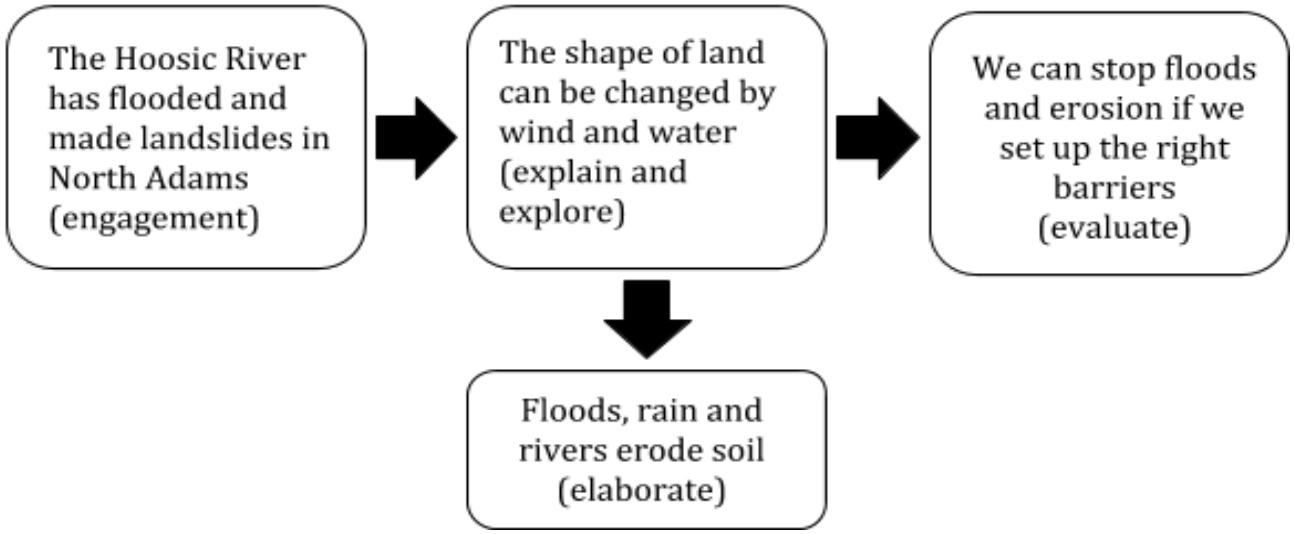
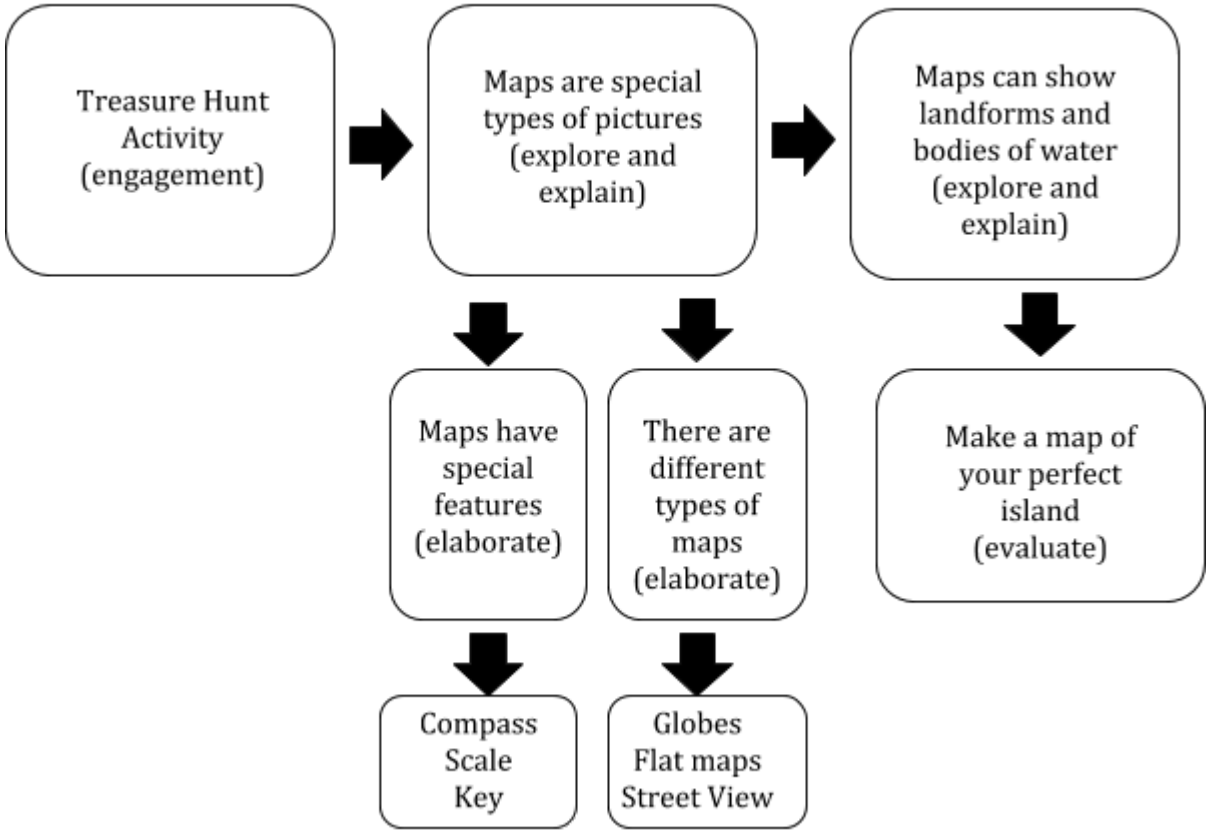
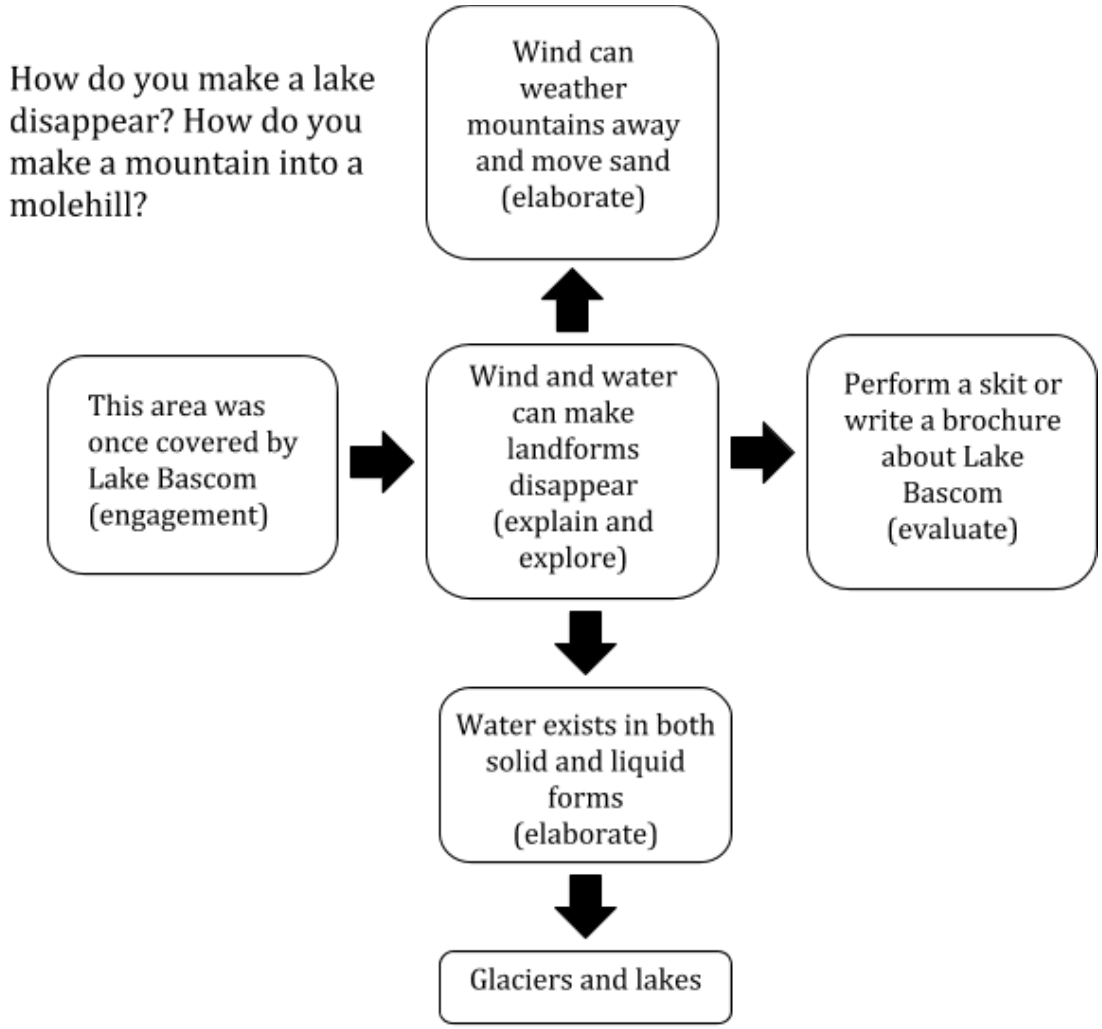
How can we prevent flooding and erosion from harming our town?



What makes a picture a map?





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Tiered Vocabulary List

Tier 1	Tier 2	Tier 3
Mountain Hill Water Direction Wind Land River Map Representation	Landform Identify Models Modeling Presentation Erosion Man-made Natural Barrier Flood	Plateau Hoosic River Acrostic Globe Compass Weathering

SCIENCE CONTENT BACKGROUND

The following section is designed to give teachers the necessary background information for the material covered in this unit, as well as a little additional information to allow instructors to answer questions and provoke them into thinking about possible extensions. The best science education, especially when designed for elementary schoolers, is local; that way students can relate what they learn in class to their lives, region, and first-hand experience in an exciting and engaging way. As such, this unit is structured around two bodies of water, the Hoosic River and Lake Bascom-**these are intensely specific to North Adams and the northern Berkshires**. Instructors who do not live in the Berkshire region are highly encouraged to find similar anchoring phenomenon that are specific to their region. It might be helpful to research local flooding and/or erosion (caused by wind and/or water) and lakes that have either appeared or disappeared from the region. **This will require advance work and research on the part of the instructor**, but it is our belief that the curriculum will be better for it.

Essential Questions:

1. ***How can we prevent flooding and erosion from harming our town?***
   Flooding occurs when the ground cannot absorb enough water. It can sometimes be prevented by growing plants or setting up rain catchers. When flooding does happen, it can be diverted through drains, ditches, and rain-chutes. Concrete barriers and dikes keep floods away from sensitive areas. Erosion occurs when there are not enough barriers to keep soil and rocks in place, and can be prevented by putting in natural barriers, like trees, or man-made barriers, like fences and walls. By the end of this unit, students should be able to explain how one of these elements will stop floods where they live. Students also have the option to create their own solutions.

2. ***What makes a picture a map?***
   A picture becomes a map when it represents a space in a way that lets you know more about it than can be seen at ground level. Maps normally include a title, compass rose, a scale, and a key. Students should be able to identify these features by the end of the unit, as well as be able to explain their significance to the map.

3. ***How do you make a lake disappear? How do you make a mountain into a molehill?*** *Lakes can vanish if their water is drained out to lower ground or pumped somewhere else. The source of water for a lake can also be blocked or diverted, allowing the lake to evaporate away. Mountains can be worn down by glaciers and rivers, obliterated by volcanic eruptions and lava flows, and ground down by chemical, temperature-based, or biological factors into dust and blown away by wind and water. By the end of this unit, students should be able to come up with their own answer as to how these phenomena occur, including reasons such as the ones listed above to explain their findings.*

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Anchoring Phenomena

There are two anchoring phenomena in this unit. One anchoring phenomenon is the local Hoosic River which caused the historic floods and landslides in North Adams in 1927, 1938, and 1942. This phenomenon will make flooding and erosion relevant to the students and encourage them to think about how to build barriers against flooding.

The second anchoring phenomenon is Lake Bascom, a large glacial lake that covered the region from Pownal to Cheshire and Williamstown to North Adams near the end of the last Ice Age. Lake Bascom will be a concrete example of how glaciers, mountains, and rain can cause lakes to either form or disappear.

Rationale for Order of Content

In order to teach students the effects of water and wind erosion on the Earth, they first must learn about the Earth's features. For this reason, in lessons one and two, students are introduced to the different types of landforms and water bodies. Since the effects of erosion are mostly evident through the formation of landforms and changes in the land, the students' knowledge of landforms is further reinforced in the literacy lesson (lesson three: An Introduction to Landforms).

Students acquire mapping skills in the fourth lesson, so they can see the large changes in Earth's geography which were caused by water and wind erosion. Once students have built up their background knowledge of the Earth's surface, they will learn about how water can shape the Earth's surface. Specifically, they will learn about types of water erosion such as rain, flood, river, and glacial erosion in the fifth lesson. In addition, they will learn about how water can create new landforms such as valleys. In lesson six, students will learn about the other type of erosion, wind erosion, and its effects. Afterwards, students will learn how erosion affects humans. Specifically, the natural disasters which can result from erosion and the solutions humans

have implemented. To actively engage students, in lesson seven, students will utilize their knowledge to design solutions to prevent erosion. As a final project, students will apply their knowledge of landforms and water bodies to create a brochure or poster.

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Key Science Ideas

1. Landforms and bodies of water come in different shapes and sizes
    a. Landforms are named differently based on:
        i. shape (i.e. plateaus vs. valleys)
        ii. size (i.e. mountains vs. hills)
        iii. their relationship to bodies of water (i.e. peninsulas vs. islands)
    b. Water can either be moving or still (i.e. rivers vs. ponds) and be solid or liquid (i.e. glaciers vs. lakes)
2. Water can change the landscape
    a. Water can move dirt, rocks, and land by pushing them with physical force (i.e. canyons, rivers, glaciers, weathering)
    b. Water can dissolve away rocks (i.e. stalactites, stalagmites)
3. Wind can change the landscape
    a. Wind can blow away dirt, dust, and sand (i.e. sand dunes, dust storms)
    b. Wind can change the shape of landforms by wearing them down
4. Barriers can protect people, homes, and nature from harmful changes in the land and water
    a. Barriers can stop erosion and floods from occurring (i.e. windbreaks, plant cover, drainage ditches and pipes)
    b. Barriers can keep floods and erosion away from sensitive areas when they occur (i.e. storm barriers, concrete walls, fences, temporary reservoirs)
5. Maps
    a. Maps are like pictures of an area seen from above
    b. Maps are made for a particular purpose. Therefore, some maps depict different key features and leave others out. (i.e. topographical maps show only elevation, political maps show only cities and borders, etc.)
    c. Maps include special features and labels to provide information about an area. These features are:
        i. Compass rose
        ii. Key/Legend
        iii. Title
        iv. Scale

Explanation:
The shape of the Earth's surface is influenced by many complicated factors, including the shifting of tectonic plates and the upwelling of magma from below the crust. This unit, however, will just focus on the Earth's landforms and bodies of water, and how wind and water change the Earth's appearance. Water is the more important of the two when it comes to shaping landforms. Water can shape the land **mechanically** by pushing, pulling, and flushing rocks around. Other factors that affect how water can change the land's shape are gravity, which pushes the water into the rock and soil that it rests on, and temperature. Water can seep into rocks and heat or freeze, causing the rock to break apart into smaller pieces.

Examples of water affecting the land are seen everywhere. A prime case of this is how the moving water in riverbeds causes erosion by flushing pebbles and dirt away. As gravel, pebbles, sand, and eventually large rocks and boulders are carried along in the current, **they rub against the rock surface on the bottom of the river, carving out pieces and making the river grow deeper and deeper.** If the river is old enough and the rock is soft enough, then the water can carve out huge trenches and canyons, such as the Grand Canyon. Rivers can change course several times over the years as the water running through them finds the fastest way to travel to the ocean. If rivers change course enough times or many different rivers come together, they can form not just canyons but large valleys. Because the river water in these valleys will collect at the very lowest point, **valleys formed by rivers often resemble a giant V when looked down at the middle** (think of them as widened out canyons).

Glaciers are another example of how water shapes the land. **Glaciers are large sheets of ice** that flow down towards the sea in the same manner as rivers, only much more slowly. Glaciers are often a great deal larger than rivers, and as a result they can carve out huge pieces of rock and large quantities of gravel from the mountains they roll over. Consequently, in the process, glaciers decrease the mountains' height and carve out large valleys. Because glaciers are so much wider and stiffer than rivers, **they carve out more gently curved valleys that are shaped like giant U's when viewed down the middle**. The bottom of a glacier will almost always start to melt before the rest of the glacier. For this reason, a glacier will slowly glide down a slope on a slippery cushion of melted water like an ice cube on a slanted table. This meltwater will sometimes flow ahead of the glacier,

carrying gravel with it and leaving them in large beds in low-lying areas. Over the course of hundreds or even thousands of years, glaciers will melt away, leaving the boulders and rocks they were carrying in all sorts of odd locations and positions. Berkshire valley is one of the greatest examples of glacial erosion. The entire region was once covered and carved by glaciers. Balance Rock in the Berkshires is a piece of a mountain that was left behind by a melted glacier.

Water can also wear away more gently on rock. **Sometimes rainwater will soak into rock and then freeze,** expanding as it does. With enough cycles of freezing and melting, the water will create large cracks in the rock and cause pieces to break off. This is the way most large stones turn into smaller pieces of gravel.

Lastly, **water can dissolve certain types of soft rock**. In caves, water will drip off the caves' ceilings, bringing with it pieces of dissolved rock. Over time these residual pieces of rock add up and form stalactites on the ceiling and stalagmites on the floor. The sandstone that once filled in the empty space beneath the famous arches of Arches National Park in Utah were also dissolved away by water.

Wind often plays an important role in the landscapes of dry areas. **Winds carry large quantities of sand and dust for thousands of kilometers**; every year, winds carry enough dust to fill ten million dump trucks out of the Sahara Desert! Wind can carry particles over wide, flat areas, such as plains. Sometimes the winds can blow away fertile soil, making the area drier and harder to farm. This process, called dust erosion, is a major problem around the world, especially in central China, Australia, and the plains of central United States. The Dust Bowl of the 1930's is an especially severe and famous example of dust erosion.

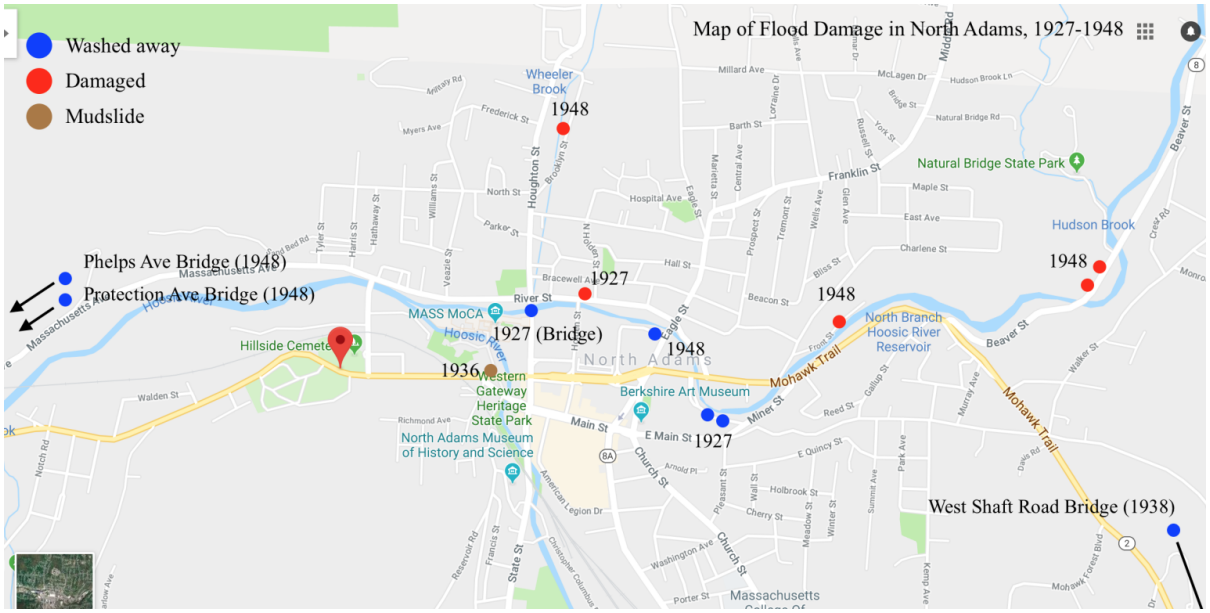
The sands that winds carry can blast against rocks as they travel in the air, scarring their surfaces with lines and wearing them away. Sometimes sand blown along by wind can run into an obstacle–a bush, rock, or man-made object–**and the sand will pile up over time, forming a sand dune.**

Erosion often has negative effects. As outlined above, dust erosion can deprive farmers of healthy soil, and water erosion can cause landslides. Yet erosion can also be positive, especially for the people who receive soil through erosion. Until the Aswan Dam was built on the Nile River in Egypt, it flooded annually, leaving behind fertile black soil washed down from the mountains of Sudan, Ethiopia and Uganda. This eroded soil has nourished Egypt throughout its 5,000 years of civilization. Wind erosion can increase a soil's quality by blowing in good-quality soil and can also clean a soil of toxins or pollutants by blowing away harmful particles.

Hoosic River:

Floods have always been a part of the Hoosic River's history (the Southbank of the river in Williamstown, for example, is a natural floodplain). However, when people settled in the river valley during the nineteenth and early twentieth century, their impact made the floods more dramatic and harmful. The loggers of North Adams in the early and mid-nineteenth century deforested the hillsides, and grazing sheep and cattle kept the woods from growing back for years. Therefore, whenever the area underwent heavy rains or snowfall, **the water would rush down the hills without any trees to hold it back and absorb it. As a result, the water carried loose soil from the hills on its journey to the river**. The mills built dams in the area in the nineteenth and twentieth century; these dams trapped the silt from the hills in the riverbed, turning the rocky bottom of the river into the muddy bed it is today. The dams also slowed the river's flow to the Hudson in New York, making it easier for the river to overflow its banks in the surrounding town.

On October 4, 1869, North Adams underwent its first major flood when heavy rains caused the mill dams to burst, destroying rivers, bridges, and houses. There was $100,000 worth of damage (not adjusted for inflation). In 1927, six inches of rain fell in 36 hours, washing away bridges, homes, and cars. Luckily, no one died, but it caused $2 million worth of damage. In 1938 it flooded again, leaving 300 people homeless and killing two. The heaviest flood occurred on December 31, 1948, when 8 inches fell in three days, washed away businesses and caused $1.2 million worth of damage.



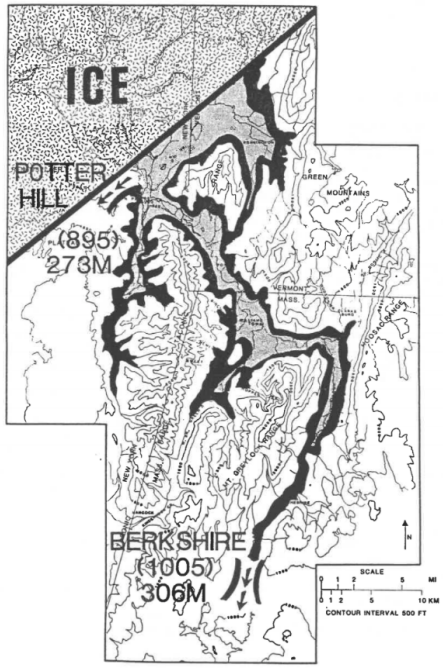
In the 1950's **the Army Corps of Engineers built flood chutes through North Adams,** encasing it in concrete and steel rebar. The chutes stopped the flood damage. When Hurricane Irene happened in 2011, the chutes kept the rain from harming the town.

But, unfortunately, they destroyed the river habitat in North Adams; the concrete walls heat up and make the river too warm for fish to sustain life, and the vegetation that once grew along the banks are stunted due to the walls. The chutes were also only built to last fifty years and have started to fall; three sections in Willow Dell are now missing. **New ideas are needed for how to protect North Adams from floods while preserving the Hoosic River.** The Hoosic River Watershed Association (HooRWA), in addition to cleaning up the river, is trying to find ways to remove the concrete and make the river more accessible while keeping North Adams safe. If teachers want to learn more about the Hoosic River and explore it with their classes, we highly recommend contacting HooRWA at http://hoorwa.org. The Hoosic River Revival Coalition has created a "River Ranger Interactive Your" with associated curriculum materials for grades 2, 4, and 5.

PDF link here:
https://hoosicriverrevival.org/wp-content/uploads/2016/09/HRR-Interpretive-Walk-Curriculum-1.pdf

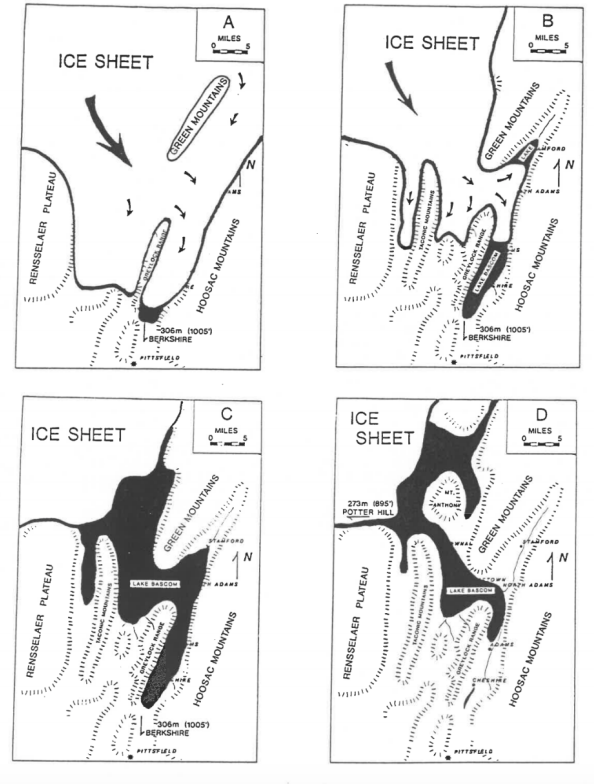
Lake Bascom:

Around 28,000 years ago, during the Last Ice Age, **all of New England down to Long Island Sound was covered in a massive sheet of ice called the Laurentide Ice Sheet**. During this time, everything in the Berkshires except for the highest peaks were under 1,000 feet of ice. As the ice sheet melted northward around 16,000 years ago, the Hoosic River, which is older than the ice sheet, began to flow again. The spillway that it would have emptied out into, however, (near Hoosick Falls in New York) was blocked by a massive wall of (unmelted) ice. As a result, the Hoosic, along with melted water from the ice sheet and the Green and Walloomsac rivers, **started filling up the entire Hoosic River valley**. Lake Bascom rose until it had a shoreline of 1,075 feet above sea level. It was finally high enough to discharge excess water into the Housatonic river valley in Pittsfield. At this point, it probably covered 300 square kilometers, and it **was around 500 feet deep in North Adams (the height of a fifty-story building!)**. 700 years later, the ice sheet that had been blocking Lake Bascom from emptying out to the west near Hoosick Falls finally melted away, allowing the water to drain down the Hudson to the sea and leaving behind nothing but a river.



How do we know Lake Bascom ever existed? The deltas of rivers which flow into lakes are filled up with certain types of gravels and the bottoms of the lakes are filled with special kinds of silt and clay. Geologists found these types of rocks and soils in the Berkshire valley. Scientists in the Hoosic Valley used them to figure out that the area had been underwater and the borders of the ancient lake. They calculated the time of the lake's existence based on how deep these sediments were buried. The thicker, especially clay-like soils concentrated at the bottom of the lake are in Williamstown and North Adams. This dense, unstable earth is unsuitable for growing crops compared to the lighter, more sponge-like soil left on the shallow slopes of Lake Bascom around Adams. This explains why Adams has a longer history of farming than North Adams. The shifting silt of the dry lake bed also makes it harder to build strong roads and bridges in this area.

Image on page 18: What Lake Bascom would have looked like right after the last of the ice sheets melted away. The arrows to the south show where Lake Bascom would have discharged extra water before the ice melted away. The northwest arrows show where it discharged water as it emptied out after the ice sheets disappeared.



Maps of the northern Berkshires before, during, and after Lake Bascom. It shows how the area was covered in ice, how the ice melted out to fill Lake Bascom, and how the lake began to shrink after it could drain out at Potter Hill.

Maps:

In this unit, maps will be presented **both as a type of knowledge to be learned and as a tool for understanding other topics.** In lesson 4, students will be formally introduced to maps. They will learn about maps and the different types of maps. They will also learn about the purposes of maps, whether it be for finding treasure or describing a "perfect island".

In later lessons, the students will be looking at maps in the context of landforms and erosion. In these lessons, they should be reminded to think about what the map highlights and what it excludes. Is there any reason why the mapmaker made these choices? What can the map tell the students that they cannot learn from words, games, and pictures? Teachers should put students in this type of mindset when engaging with maps in the unit.

Lesson 1: Landforms

BACKGROUND

Overview of the Lesson

In this lesson, students will learn about different types of landforms through a variety of activities which are focused on how to identify and describe landforms. Students will also be introduced to the concept of modeling and how to use models to represent real-life structures. ***Note:*** This lesson includes the use of Google Cardboard as an extension. If the teacher chooses to include the extension, please ensure that these will be available for students prior to starting this lesson. Part of this lesson has been adapted from: http://betterlesson.com/lesson/635801/where-is-water-found-on-earth?from=cc_lesson_title

Focus and Spiral Standard(s)

Focus Standard: 2-ESS2-2. Map the shapes and types of landforms and bodies of water in an area.
Clarification Statements:

- Examples of types of landforms can include hills, valleys, river banks, and dunes.
- Examples of water bodies can include streams, ponds, bays, and rivers.
- Quantitative scaling in models or contour mapping is not expected.

Spiral Standard: 4-ESS2-2. Analyze and interpret maps of Earth's mountain ranges, deep ocean trenches, volcanoes, and earthquake epicenters to describe patterns of these features and their locations relative to boundaries between continents and oceans.

Technology K2: 3.1 Use various age-appropriate technologies to locate, collect, and organize information.
History and Geography 4. Describe how maps and globes depict geographical information in different ways. (G)

NGSS Alignment

Science/Engineering Practice (SEP)	Disciplinary Core Idea (DCI)	Cross Cutting Concepts (CCC)
SP2 Developing and using models	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. (2-ESS2-2)**	**Engineering Design:** Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem. (2-ESS2-2)

Learning Targets

1. I can identify different types of landforms.
2. I can describe different landforms using appropriate language.

Assessment(s)

- Students will be assessed by the exit ticket handed out at the end of the lesson.
- Check students' KWL chart and responses in their science journal for understanding.

WIDA Language Objectives

(Dependent on the needs of your ELL students.)

Key Vocabulary

Tier 1: mountain, hill
Tier 2: identify, landform
Tier 3: plateau

RESOURCES AND MATERIALS

Quantity	Item	Source
1	Projector and Computer	Classroom Teacher
	Learning About Landforms: https://www.youtube.com/watch?v=KWTDmg8OI_Y.	CMC Website
1 set per group (4 sets)	Landform Pictures	Bin
1 per group (4 sets total)	Large Words for Landform Matching	Bin
1 per student	Landform Pictures	Binder
1 per student	Types of Landforms Worksheet	Binder
1	Landform PowerPoint	CMC Website
1 per student	Graph paper	Bin
1 per student	Scissors	Classroom Teacher
1 per student	Glue	Classroom Teacher
2-3	Google Cardboard (as extension)	Bin

1 per 2 or 3 students	Laptop computers/ iPads	Cart
2	Smartphone	Classroom Teacher

****Items in bold should be returned for use next year****

LESSON DETAILS

Lesson Opening/ Activator

Print and cut out four sets of the landform images and associated words-place each set on a different table. Then, divide up your students and assign them to each table. Ask the students to match the pictures with the word that best describes it. Once finished, ask which pictures were the easiest to match? Which were the hardest? Why were certain images easier to match than others (give an opportunity for student to talk about their experience with landforms)? Please do not provide answers because you will return to this activity later in this lesson. This activity should be helpful in evaluating the students' prior knowledge of landforms.

List of landforms (the pictures are in the order listed below):

- Coast
- Plain
- Canyon
- Peninsula
- Volcano
- Plateau
- Hills

- Valleys
- Dunes
- Deltas
- Mountains
- Islands
- Non-natural landform category

Lesson Details

Teaching Tip

The teacher should create a KWL chart on large poster paper. Students should still fill out their own copies. When reviewing the word, "landforms", the teacher should have the students come up with a class definition.

During the Lesson

1. Watch the "Learning About Landforms" video at https://www.youtube.com/watch?v=KWTDmg8OI_Y. Create a KWL (What You Know, What You Want to Know, and What You Learned) chart and review the definition of "landform". Definition: *Landforms are natural physical features of Earth's surface and can be located both on land and underwater.* Make sure to include the four major types of landforms on the KWL chart. Ask students, "What are other examples of landforms that were not mentioned in the video?"
2. Distribute the Landforms worksheet and have students follow along to the Landforms PowerPoint as they cut out the different landform pictures and glue them next to the correct name and definition. Beside the picture, students should draw the landform.

Landforms "HeadBandz" Activity:

1. Pass out the landform images from the beginning of the lesson and have each student attach it to their forehead by wrapping an elastic band around their head like a headband and inserting the card in-between their head and the band without looking at it. In this way, the rest of the class can see which landform is on each student's forehead, but the student will have no idea. (There will be some duplicate cards.)

Teaching Tip

To keep the students from peeking at their cards, the teacher should have each child put on their headband first. Then, hand the cards out to students in pairs and have each student attach their partner's card for them.

2. Have the students sit in a circle. One of the students will come up to the front of the class and the other students will try to let the student know which landform they are wearing without mentioning it by name. If students are having trouble giving hints, the teacher can try to prompt hints by asking the questions:
    a. What does the landform look like?
    b. Is it next to water?
    c. Is the landform steep? Is it flat?
    d. Is the landform very high or very low?
3. Once a student has guessed their landform, either have that student pick another child to go next or the teacher will decide.
4. **(Science Talk: Class Discussion):** Once all the landforms have been performed, lead a short discussion. Have the students list the landform they were on their worksheets and tell them that they will "be" that landform for this unit (multiple students may have the same landform). Introduce the idea that there are many ways to represent the same thing and that different representations serve different purposes. Pictures can give you a visual representation of what landforms look like. What are other ways we can represent the same information? Which representations do you like best, or find most useful or compelling? Why? Other examples of representation include using technology, physical models and maps. **[SP2: Developing and using models]**

Student Thinking Alert
Students may not understand representation. Explain to students that "representation" is when a symbol or object stands for something else. Use bathroom signs which depict genders or the handicap symbols on parking lots as examples.

Virtual Tour of Landforms:

1. If the teacher wishes to include the Google Cardboard extension, they may flip to the end of the lesson plan and follow the instructions written in the extension up until step 2 of this section. If not, the teacher may break the students into groups of two or three and have them look at the following websites on Google Street View. Alternatively, the teacher can project the websites on the board and do the activity as a class.

2. Have the students explore each of the following websites using whatever method you prefer. After they explore each site, have the students discuss in their groups which type of landform they were looking at and then vote on the answer as a class.
    a. Shi Shi Beach (coast): **http://tinyurl.com/ze7tumr**
    b. Grand Canyon (canyon): **http://tinyurl.com/hnbw2ff**
    c. Arabian Desert (dunes): **https://tinyurl.com/yadwqlpk**
    d. Santa Ana Volcano (volcano): **https://tinyurl.com/ybh8em38**
    e. Monument Valley (plateaus): **http://tinyurl.com/jn2ozuv**

3. **(Science Talk: Think-Pair-Share):** Have students discuss in pairs the different landforms they saw through Google Street View, Google Cardboard, or on the projector. Write leading questions on the board such as, "How was viewing landforms through this 3D representation different from the pictures or charades? What did you notice that you didn't before?" Talk as a class about what the students saw.

Teaching Tip

To help students understand the similarities and differences between the representations, the teacher should draw a venn diagram on the board and fill it in.

Lesson Closing

The following activity can be done outside if the weather permits. Assemble the students in a circle and teach them the following song to the tune of "Head, Shoulders, Knees, and Toes":

Mountains, hills, and plains, and valleys,
and plateaus

The point of this activity is to have the students understand the distinguishing shape of each landform. When the students say the word "mountains", have them reach above their heads and hold their hands in an upwards-pointing triangle. On "hills," the students hold curved hands together in front of their faces. On "plains", the students hold their hands flat, one on top of the other, at waist level with their arms sticking out to the sides. On "valleys", the students bend down and stretch their arms down to their knees, holding their hands together in a downwards-pointing V. On "plateaus" the students straighten up and hold their hands flat at chest level with their elbows hanging down. Repeat the song faster and faster.

If some students have limited motor capabilities and cannot fully participate, modify the song as needed. For instance, the class could do the activity sitting down or the hand gestures could be restricted to the upper body.

Assessment(s)

- Before the class leaves, ask each student to say one thing they like about a landform they learned about today.
- Check students' KWL chart and matching worksheet for understanding.

Extension if students do poorly on their assessments

If students do poorly on the "learning" section of their KWL chart, then the teacher should have students watch the video again. The teacher should remind the students to pay attention to whenever the landforms talk because the landforms tell the students distinctive features of each landform. For instance, the mountain mentioned his pointy top. If the students do poorly on the matching worksheet, then the teacher should project the PowerPoint images again on the board. However, this time the teacher should label the distinctive features of each landform. For instance, for islands, the teacher should draw a circle around the island and write a quick note of how islands are surrounded by water. The students should then label these distinctive features on their matching worksheets.

Extensions

1. **Google Cardboard: Note: This activity may be optional or adapted depending on the software and technology available in the classroom.** This activity will help students visualize landforms using 3-D or alternative technology. Building on the discussion from the previous activities, explain that the students will be working with a different form of representation. Before beginning the activity, make sure to set ground rules for using technology in the classroom. We will be working with Google Cardboard, which is a virtual reality viewer. The viewer uses a smartphone and a corresponding app. Open the app in the smartphone and place the smartphone in the viewer as indicated on the screen.

   Using Google Cardboard: Make sure you have the Google Street View app downloaded on your phone. Open the app and type in the name of the landform you will explore, all of which are listed above. Once at the indicated location, tap on the viewer icon shaped like the Google Cardboard viewer in the right-hand corner and follow the subsequent instructions. Follow the instructions in the part 2 of the Virtual Tour of Landscapes to proceed with the next steps.

2. Field trip: The class can visit Mt. Greylock, one of the most prominent landforms in Western Massachusetts.

Lesson 2: Bodies of Water

BACKGROUND

Overview of the Lesson

In this lesson, students will learn about different bodies of water that exist on Earth. Students will watch a video on bodies of water and will learn how to describe them. Ultimately, students will gain a basic understanding of different bodies of water.
Note: This lesson includes the use of iPads and Google Cardboard. Please ensure that these materials will be available for student use prior to beginning this lesson. Part of this lesson had been adapted from the following source:
http://betterlesson.com/lesson/635801/where-is-water-found-on-earth

Focus and Spiral Standard(s):

Focus Standard: 2-ESS2-2. Map the shapes and types of landforms and bodies of water in an area.
Clarification Statements:

- Examples of types of landforms can include hills, valleys, river banks, and dunes.
- Examples of water bodies can include streams, ponds, bays, and rivers.
- Quantitative scaling in models or contour mapping is not expected.

Spiral Standard: 4-ESS2-2. Analyze and interpret maps of Earth's mountain ranges, deep ocean trenches, volcanoes, and earthquake epicenters to describe patterns of these features and their locations relative to boundaries between continents and oceans.

Focus Standard: 2-ESS2-3. Use examples obtained from informational sources to explain that water is found in the ocean, rivers and streams, lakes and ponds, and may be solid or liquid.

Spiral Standard: K-PS1-1. Investigate and communicate the idea that different kinds of materials can be solid or liquid depending on temperature.

Clarification Statements:

- Materials chosen must exhibit solid and liquid states in a reasonable temperature range for kindergarten students (e.g., 0-80 F), such as water, crayons, or glue sticks.
- Only a qualitative description of temperature such as hot, warm, and cool, is expected.

Spiral Standard: 5-ESS2-2. Describe and graph the relative amounts of saltwater in the ocean; freshwater in lakes, rivers and groundwater; and freshwater frozen in glaciers and polar ice caps to provide evidence about the availability of freshwater in Earth's biosphere.

State assessment boundary:

- Inclusion of the atmosphere is not expected in state assessment.

Social Studies

2.4. Describe how maps and globes depict geographical information in different ways.

2.1 On a map of the world, locate all the continents: North America, South America, Europe, Asia, Africa, Australia, and Antarctica. (G)

2.2 Locate the current boundaries of the United States, Canada, and Mexico. (G)

2.6 Explain the difference between a continent and a country and give examples of each. (G)

NGSS Alignment

Science/Engineering Practice (SP)	Disciplinary Core Idea (DCI)	Cross Cutting Concepts (CCC)
SP2: Developing and using models SP4: Analyzing and interpreting data	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. (2-ESS2-2) ESS2.C: The Roles of Water in Earth's Surface Processes. Water is found in the ocean, rivers, lakes, and ponds. Water exists as solid ice and in liquid form. (2-ESS2-3)	**Engineering Design:** Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem. (2-ESS2-2)

Learning Targets

1. I can identify different bodies of water.
2. I can provide examples of water as a solid or liquid.
3. I can explain how different models can serve to represent the same object.

Assessment(s)

- Student responses in their science journals and drafts of "the perfect island" map
- Exit ticket

WIDA Language Objectives

(Dependent on needs of your ELL students.)

Key Vocabulary

Tier 1: Water
Tier 2: Models, presentation, maps
Tier 3: Hoosic River

RESOURCES AND MATERIALS

Quantity	Item	Source
2 per student	Piece of Paper	Classroom Teacher
	Projector and Computer	Classroom Teacher
1	The Water Bodies: https://www.youtube.com/watch?v=bNWuQD7QHBc	CMC Website
1 per student	Bodies of Water Picture Sheet	Bin
1 per student	Definition Cards	Bin
1 per student	Glue stick	Classroom Teacher
1 per student	Scissors	Classroom Teacher

1 per group of 3-4	iPads	Classroom Teacher
	QR Code sheets (9 total QR codes)	CMC Website *The Classroom Teacher will need to print these prior to the lesson*
9 per student	Stickers	Bin
1 per student	Piece of Paper or labeled worksheet for sticker chart	Classroom Teacher
10 (1 per type of landform)	Laminated images of bodies of water	Bin
2-3	Google Cardboard	Bin
1 or 2 per student	Graph paper	Classroom Teacher
1 per student	"American Crocodiles" Reading and Questions	Binder
1 per student	"Protecting the Wetlands" Reading and Questions	Binder

****Items in bold should be returned for use next year***

LESSON DETAILS

Lesson Opening/ Activator

Ask students where can we find water on the planet? Have students list different places where water can be found. Some of the examples will probably be man-made like the sink or shower. Where can water be found in nature?

Note: The Science Fellow or teacher should state that water can exist in different forms (liquid and solid) and give a few examples before students talk about the bodies of water.

Student Thinking Alert

Since some students may talk about water found indoors, the teacher should emphasize on water bodies. The teacher should ask students where they can find water outside.

Do this activity for about 5 minutes, or however much time is needed to prepare for the rest of the lesson. Now watch the video: ("The Water Bodies") https://www.youtube.com/watch?v=bNWuQD7QHBc as an introduction to the main types of bodies of water. The following list includes all the bodies of water we will be learning about in this lesson:

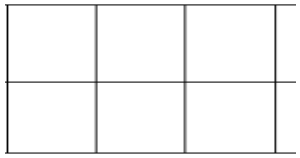
Note: The teacher can give a real example for each body of water.

- Oceans (Atlantic Ocean)
- Lakes (Lake Pontoosuc)
- Streams
- Ponds
- Bays
- Rivers (Hoosic River)
- Wetlands
- Seas
- Glaciers
- Gulf (Gulf of Mexico)

During the Lesson

Bodies of Water Booklet

1. Hand out 2 sheets of blank copy paper to each student. Instruct them on how to fold their paper to make 6 boxes. Then, fold horizontally and cut on the crease lines so they have 6 boxes. When folded, the sheet should look like the image below. Repeat with the second page. After students have finished cutting, staple the boxes/pages together to make a booklet.



2. Now, in small groups of 3-4, students will try and match the bodies of water pictures with their definitions/names. Pass out the bodies of water pictures and definition sheets and let the students work together to try and make matches. Once the students believe they have made the correct matches, the group should raise their hands when they have finished. As a class, go over the matched pictures and definitions. Ask one group what they decided, and if it's incorrect ask if anyone got something different. Then explain why one answer is correct over the other. Once the students have fixed the matched images and definitions, the students should paste the picture and the associated definition on a page in their booklet. It is suggested that the picture is pasted on one side of the paper and the definition/name is pasted on the other side of the paper, so students can quiz themselves and each other later.

Note: The teacher or SF should have the pictures and the definitions pre-cut, so students can just stick them on the paper.

3. In their formed groups, have students take 5-10 minutes to play Headbandz (if the teacher does not have access to the game, then improvise by having the students hold flashcards up on their foreheads). One student will start with an image of a body of water held up to their forehead. They will then start to ask yes or no questions about what kind of body of water they are. Once they guess correctly, it will be the other student's turn. Continue for a few rounds. Sample questions the students can ask each other: Am I surrounded by land? Am I shaped like a snake? Am I made of fresh water? Do I connect to the ocean? If students need help creating questions, have them look back at their definitions.

(**If needed you may break this lesson up into two days.** The best way to do this would be to stop after the activity above and skip to the lesson closing which involves reading passages. On the second day of the lesson, rewatch the video in the lesson opening to remind the students of what they learned and continue with the activities below, skipping the lesson closing since you should have done that on the first day.)

QR Code Scavenger Hunt

1. Split the class into 4-5 groups. Each group should have an iPad. Before starting this activity, set the ground rules for using iPads in the classroom. Students should understand that iPads are tools for research, not toys for playing. Each student should have a QR code worksheet.

2. Spread the QR sheets around the classroom. Students will travel around the classroom in their small groups and scan the different QR codes. The QR codes will take them to different websites about bodies of water. Make sure each group scans all 9 QR codes, so they can look at and learn about each body of water.

3. To maintain and enhance student accountability: Students should report what they learned to a classroom teacher/Science Fellow. Students will also need to collect one sticker per station (nine total) which will be added to the worksheet. The stickers will serve as a check that the students have visited and learned the information.
   [SP4: Analyzing and interpreting data]

If QR Codes are not available: Use landform cards available in the bin to create an Easter egg hunt for the kids. Have students split into groups of 4 or 5 and tell them that each group is to find two landform cards, return to their desks, and review with their group to present to the class the bodies of water they found. Then, have each group present and provide a summary of their findings.

Google Cardboard Exploration + Map Extension
Note: This activity can be done as an extension.

1. Students should be familiar with how to use Google Cardboard from Lesson 1. Before beginning this activity, make sure to reiterate the guidelines and rules for using the Google Cardboard viewers. As we have only 2 Google Cardboard viewers available, this activity will work in tandem with a different activity.

2. **Activity 1: Google Cardboard Viewers**: Students will take turns looking at different examples of bodies of water

through the viewer. Another option is to have the Google street view open on iPads or computers which will allow more students to look at different bodies of water from different perspectives. Have the iPads and viewers set up at one table where it will be easy to help students. Below is the list of bodies of water students will be observing and the corresponding links to view them.

a. Galápagos Islands, Ecuador: **http://tinyurl.com/jucu2mx**
b. Os Caçadores de Cachoeira: **http://tinyurl.com/jymgm2y**
c. Rio Negro: **http://tinyurl.com/jyvpnxg**
d. Ilulissat Saavat glacier: **http://tinyurl.com/gwgb27v**
e. Buraco das Cabras: **http://tinyurl.com/gwgb27v**

Teaching Tip
Connect part B to representations and maps. Ask "how did the pictures depict water bodies compared to the technology? Which one is more accurate? Which one would you use? Why?"

If Google Cardboard viewer is unavailable, or you want to have several viewings going on at once, use the projector and display the websites above to the whole classroom.

3. Students should bring their science journals to the technology table (unless using the projector, then they can stay in their seats) and record their observations. Questions to ask students include:
   a. What do you notice when looking at these bodies of water?
   b. Do the bodies of water look different when using technology compared to just looking at a printed picture?
   c. Which bodies of water have solid water? Which have liquid water?
      Probing Question: How do you know which has liquid vs. which has solid water?

Map Extension: This activity will provide a link to the next lesson which will be on mapping. Create the perfect island! In this activity, students will be creating their vision of a 'perfect island'. Emphasize that this is a draft that will be revised in the next lesson. Explain what a map is; a map is a type of model which serves as a representation of an area of land or water, often including physical features like roads and landforms. As a class, brainstorm different aspects that would make an island perfect. Then, hand out graph paper for students to sketch their drafts for a map. Depending on the needs of your class, students can work on this independently or in pairs. All maps should include at least one landform and one body of water. Encourage

Teaching Tip
Show an example of a "perfect island" map. Explain that sometimes it's easier to show people a representation (a map) of an area instead of describing it through words.

students to label the different parts of their map, including the landforms and body of water.
[SP2: Developing and using models]

Lesson Closing

Call the whole class together and write "Lake Facts" at the top of a piece of chart paper. Explain to the students that throughout the unit they will receive a fun fact about lakes at the end of each lesson. Each fact will be written on the chart paper, so they can refer to it at any time.
Lake Fact: In the summer, the water at the bottom of a lake is cooler than the water at the top.

Students can work in pairs or individually on the "American Crocodiles" and "Protecting the Wetlands" questions.

Assessment(s)

- Students responses in their science journals and drafts of "the perfect island" map
- Exit ticket

Extension if the students do poorly on their assessments

Since the mapping activity and some of the questions for the science journals focus on visual representation, explain the differences between two dimensional and three-dimensional representations. Use the comparison of cartoons versus reality television shows. Ask students how they visually differ. The teacher should guide students to the conclusion that cartoons are flat or 2D. In contrast, reality television shows are realistic or 3D.

To help students learn about water bodies, the teacher should provide students with a list of features to consider when identifying water bodies. The list can include aspects such as whether the water body is landlocked or not, its shape, whether it is moving or not, whether it collects water or not, etc. Then, the teacher should allow the students to revisit their water booklets. Under each water body definition, the students should write a list of distinctive features for each water body. This will help them with identification.

Extension

1. Plan a field trip to the Hoosic River and contact Hoosic River Revival Coalition for curriculum or download the PDF from the website.
2. Plan a field trip to the Hoosic River and have students sketch, photograph, and take videos of the river and surrounding area.
3. Independent research/homework alternative: have students choose a body of water they want to learn more about.
4. Using maps of Massachusetts and the United States, help students identify the rivers and oceans on the map. Have students circle rivers and bracket oceans.

Lesson 3: An Introduction to Landforms (Literacy Lesson)

BACKGROUND

Overview of the Lesson

In this lesson, students will read a rhyming book about landforms. Students will write an acrostic poem for one of the landforms studied.

Focus and Spiral Standard(s):

Focus Standard: Literacy 2. W.7. Participate in shared research and writing projects (e.g. read several books on a single topic to produce a report: record science observations).

NGSS Alignment

Science/Engineering Practice (SP)	Disciplinary Core Idea (DCI)	Cross Cutting Concepts (CCC)
SP8: Obtaining, evaluating, and communicating information	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. (2-ESS2-2) ESS2.C: The Roles of Water in Earth's Surface Processes. Water is found in the ocean, rivers, lakes, and ponds. Water exists as solid ice and in liquid form. (2-ESS2-3)	**Engineering Design:** Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem. (2-ESS2-2)

Learning Targets

1. I can identify different landforms found on our planet.

2. I can describe characteristics of landforms.

Assessment

Students will write acrostic poems, focusing on the characteristics of a specific landform. They will also apply their knowledge of characteristics by creating a physical representation to go along with their poems.

Key Vocabulary

Tier 3: Acrostic

RESOURCES AND MATERIALS

Quantity	Item	Source
1 copy per student	An Introduction to Landforms Reader and Questions (11 pages total)	Binder (teacher to make copies)
	Projector and Laptop	Classroom Teacher
	"Learning About Landforms" https://www.youtube.com/watch?v=KWTDmg8OI_Y	CMC Website
	Various outdoor materials (ex: sticks, bark, leaves, sand)	Classroom Teacher
1 per student	Construction Paper/Cardboard	Bin
	Colored pencils/markers	Classroom Teacher
2 tubs	Air Dry Clay	Bin

****Items in bold should be returned for use next year**

LESSON DETAILS

Lesson Opening/ Activator

Students will watch the 3-minute landform video from lesson 1 as a refresher ("Learning About Landforms") https://www.youtube.com/watch?v=KWTDmg8OI_Y

Ask students to list different landforms they saw in the video and write them on the board.

During the Lesson

1. Give each student a copy of the reader, *An Introduction to Landforms,* and divide the students into groups based on their reading levels. The adults should be in the groups with slower readers. Explain to the students that this is a rhyming story and to pay close attention to the rhymes, italics, as well as information about landforms. After you read about different landforms, you can add them to the list started on the board. If you want to focus on the italics, have the students circle the italicized words on each page. These words are important landform vocabulary. Give the students the opportunity to ask about the different vocab words.

Teaching Tip

Write the italicized words on the board and have students think of definitions based on context clues. Then, have the students match the italicized words with landforms which relate.

2. Once completed, flip to the multiple-choice questions at the end. When answering each question, ask students to show you proof of their answer in the text. The students can underline the information within the story and write the question # it refers to. Discuss any questions or misconceptions that may come up in the multiple-choice section. **[SP8: Obtaining, evaluating, and communicating information]**

3. **Acrostic**

   Explain what an Acrostic poem is. In the same groups you had from reading, come up with a landform for each group to write about. Then, have each student come up with a sentence or a few words for each letter. You should give an example before the students begin.

   Example:

D - dry land
E - extremely hot
S - sweeping sand
E - empty
R - rays of sun
T - tumbleweed

4. **Art integration**
   To compliment the acrostic poems, students will create an art depiction of their chosen landform/body of water (from the poem). Give students the option to create a collage/2D or 3D model representation of their landform/body of water. Explicitly instruct students to depict the adjectives they wrote about in their poems to create an accurate model of their landform/body of water. For example, "How can you show that the desert is really hot and dry?"

***Extension**:* Time and weather permitting, take students outside to collect materials to add texture to their projects -- examples include bark, leaves, dirt, gravel, sticks. Alternatively, the teacher can collect some of these materials ahead of time and give them to the class.

Lesson Closing

Give students a chance to share their poems or art projects with each other. After clean-up, facilitate discussion about how their work, poems and models/drawings, are just more ways that these landforms/bodies of water can be represented (in addition to maps, etc. that we discussed in previous lessons).

Lake Fact: Unlike ponds which have plants growing inside them, lakes often have plants growing near their edges, but not in their middles.

Assessment

Students will write acrostic poems, focusing on the characteristics of a specific landform. They will also apply their knowledge of characteristics by creating a physical representation to go along with their poems.

Extension if students do poorly on the assessment:

If students do poorly on their acrostic poems because they have difficulty describing their landforms, then split students up into groups of 3-4. Each group will be assigned to a specific landform from the book. On poster paper, each group will draw a quick sketch of their landform and brainstorm descriptive words for their landform. At the end, the students will use some of these descriptive words to create one, cohesive definition for their landform. The teacher should write down guiding questions on the board to help students think of descriptive words. Some guiding questions:

- Is it hot or cold on the landform?
- What types of plants are found on the landform?
- Is it rocky or sandy on the landform?
- Are there many animals on the landform?
- Is it sunny or dark on the landform?
- What is the shape of the landform?
- Where is the landform located?

Lesson 4: Mapping

BACKGROUND

Overview of the Lesson

In this lesson, students will learn about maps. Students will learn how to read maps and then use this knowledge to create and improve original maps. The students will then include information about landforms and bodies of water in their map-making.
NOTE: This lesson requires some prep work before beginning. This lesson also includes the use of iPads.

Focus and Spiral Standard(s)

Focus Standard: 2-ESS2-2. Map the shapes and types of landforms and bodies of water in an area.
Clarification Statements:

- Examples of types of landforms can include hills, valleys, river banks, and dunes.
- Examples of water bodies can include streams, ponds, bays, and rivers.
- Quantitative scaling in models or contour mapping is not expected.

Spiral Standard: 4-ESS2-2. Analyze and interpret maps of Earth's mountain ranges, deep ocean trenches, volcanoes, and earthquake epicenters to describe patterns of these features and their locations relative to boundaries between continents and oceans.

Technology K2: 3.1 Use various age-appropriate technologies to locate, collect, and organize information.
Geography 4. Describe how maps and globes depict geographical information in different ways. (G)

NGSS Alignment

Science/Engineering Practice (SP)	Disciplinary Core Idea (DCI)	Cross Cutting Concepts (CCC)
SP2: Developing and using models	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. (2-ESS2-2)	**Engineering Design:** Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem. (2-ESS2-2)

Learning Targets

1. I can understand the different components of a map, including a key and compass.
2. I can use different types of maps (i.e., flat maps, globes, Google Maps, etc.;) for different purposes (i.e., find boundaries, physical features, plan a trip, etc.).
3. I can create a map that represents landforms or bodies of water.

Assessment

Students will be assessed on their answers and observations made in their science journals during the map stations.

Key Vocabulary

Tier 1: map, direction, representation
Tier 2: modeling, revise
Tier 3: globe, compass

RESOURCES AND MATERIALS

Quantity	Item	Source
1	Treasure	Bin
1	*Follow That Map! A Look at First Mapping Skills* by Scot Ritchie	Bin
	Projector and Laptop	Classroom Teacher
	iPads	Classroom Teacher
5	Dry erase markers	Classroom Teacher
2 copies of each	Laminated Maps: (Berkshire County, Massachusetts, United States)	Bin
1	Topographical Map of Massachusetts	Bin
2	Globe	Classroom Teacher/Bin
	Projector and Laptop	
	Map of Massachusetts from: http://www.worldatlas.com/webimage/countrys/printpage/printpage.php?l=/img/areamap/758a6d72b3af3bdb6711863997c9b613.gif	Classroom Teacher
	Access to the following activity: https://www.nps.gov/webrangers/activities/readingmap/	Classroom Teacher
	Markers	Classroom Teacher
4-5 containers	Play Doh	Bin
1 per student	Flat square pieces of cardboard	Bin
1 per student	"Seven Large Lands" Reading and Questions	Binder
1 per student	"The Difference Between Maps and Globes" Reading and Questions	Binder

1 per student	Paired Text Questions	Binder
1 per student	White paper	Classroom Teacher
	Colored Pencils/Markers	Classroom Teacher

****Items in bold should be returned for use next year****

LESSON DETAILS

Lesson Opening/ Activator

Treasure Hunting!

NOTE: Before beginning this activity, the teacher should put up large signs labeled North, South, East and West in the proper locations in the room. In addition, choose a "treasure" to hide somewhere on the playground. It should be small and labeled as "treasure". Find/draw a map of the playground with "X" marking the location of the treasure and print enough copies for the students. This treasure ideally should be plastic coins to maintain consistency with the pirate theme.

Student Thinking Alert

Make sure students do not assume that North is always up, South is always down, East is always right, and West is always left. Have the students change their positions in the room and ask them to point towards a cardinal direction. This wil help students realize that the cardinal directions shift based on one's location.

Once the students have entered the room, ask them if they notice anything different. Point out the compass direction signs and ask the students if they have heard about the directions before. Tell them that these are directions that tell you where you are.

Bring the students outside to the playground and pass out maps of the playground

(with the location of the treasure marked for the students). If the weather does not permit, this activity can be done inside. Tell the students that they will be pirates looking for buried treasure with the help of their captain (the teacher) and the treasure map. Explain that the map is a picture of the playground and point out the locations of several features of the playground in the real world and on the map.

Ask the students to point to where they are in the playground on the map. Check that the students have pointed to the right location and then ask them all to move in a direction. Have the students move their fingers along the map to their new location. Guide them to the location of the treasure, frequently stopping, pointing out their new location, and asking them where to move next.

Teaching Tip

To reinforce the idea of cardinal directions, ask students which direction they should move based on the map. Students should refer to the compass rose on the map.

(Science Talk: Class Discussion): Once the "treasure" is found, lead a discussion with the students. Was it easy or difficult to give directions? Was it easy or difficult to follow these directions? What would make it easier to find the treasure? If it is not brought up, mention the use of maps to help guide the class. Particularly, treasure maps. What are the different ways we can use maps? Different maps, of course, serve different uses and are not perfect because it is difficult to draw a flat map that is completely accurate.

Uses of Maps:

- To "find" treasure
- Find directions
- Follow hiking and biking paths
- Plan road trips
- Plan construction of buildings or roads
- Provide information about things like the weather, location of landforms, and bodies of water

During the Lesson

The teacher can either choose to show a video about maps or to read a book for the students.

1. **Option 1**: As a class read the book, *Follow That Map! A Look at First Mapping Skills* by Scot Ritchie.
   For worksheets and guided ideas for this book visit:
   http://www.socstrpr.org/wp-content/uploads/2013/07/11-Final-Summer-2013-MS06540-Kelley.pdf
2. **Option 2:** Watch the Map Features Song video. It is a 3-min long video, but for the sake of time, the video can be stopped at 1:20. Here is the link to the video:
   https://www.youtube.com/watch?v=A4GMno9p4g4

Teaching Tip
When setting up the centers, each center should be placed under one of the cardinal direction signs. Then, tell the groups to move from one cardinal direction to another, group 1 go North, group 2 go East, etc.

After reading the book or viewing the video, review the three components of a map: the title, legend/key, and the compass. Tell the students that they do not need to know about scale. However, since students will learn about scale in fourth grade, the teacher can hint at the concept of scale by explaining how it allows mapmakers to represent the Earth's surface despite its large scale.

Reading a Map: If the teacher believes that students need more practice with maps or time permits, visit either a computer lab or use the iPads or a projector, to go through the map reading activity at the following link:
https://www.nps.gov/webrangers/activities/readingmap/

1. **Types of Maps Activity:** For this activity, students will rotate between four stations where they will work with different types of maps. Students will use their science journals to record observations. Make sure to give students instructions and expectations for each station.
   a. **Flat Maps:** Students will look at maps of the United States, Massachusetts, and the Berkshires. Using dry erase markers, students should underline the title, draw a box on the legend, and draw a triangle on the compass. In their science journals, students should write down the names of two bodies of water and one landform. Students may need help identifying landforms on a map.

b. **Globe:** Students will touch and look at globes. In their science journals, they will respond to the following questions:
   - How do globes differ from flat maps? (Globes are 3 dimensional, have bumps, are spherical).
   - What are two examples of major bodies of water?
   - Can you see any landforms on the globe?

c. **Google Maps/Street View:** Using the iPads or a computer, students will complete the following activities in Google maps:
   i. Type your home address into the search bar. How long does it take to get to your home from school? How many miles away is it?
   ii. Also pull up this web address on another tab (http://www.worldatlas.com/webimage/countrys/printpage/printpage.php?l=/img/areamap/758a6d72b3af3bdb6711863997c9b613.gif) for a still capture of a map of Massachusetts. Ask the students: What do you think the green color represents? What do you think the grey color represents? The blue color? The yellow and white colors?
   iii. Ask the students what is a landform or body of water that they see. They should write the examples in their science journals.

Teaching Tip
Ask the students "Why does each map focus on certain features of the land? Why do you think there are different maps? Guide the students, so that they understand a model can only represent some aspects of the land.

d. **Topographical Map of Massachusetts:** Students at this station will get the chance to explore and feel a map of Massachusetts, observing the different landforms such as mountains and valleys.

e. **(Science Talk: Partners):** Once students have finished the activity, students should turn and talk to another student who is not in their group and share their thoughts about the different types of maps they used.

Write questions on the board for students to discuss, such as "what maps were hardest or easiest to use? What were the differences in the maps? Does one map tell you something that another can't?"

2. **Revisit Perfect Island Project:** Have students take out their first draft of their perfect island from a previous lesson. Ask them to make a final draft of it by adding in the features of maps that they learned today (key/legend, title, compass etc.) Give them ideas of what could be represented in their maps such as cities, trees, mountains, and buildings. Each item can be represented by simple shapes such as triangles for mountains, squares for houses/buildings, stars for cities. Once the students finished, ask if anyone would like to present their island to the class. **[SP2: Developing and using models]**

Student Thinking Alert

Some students may try to draw the landforms in detail. The teacher should tell them that because maps are models, they do not need to be extremely detailed. Thus, it is better to have symbols to represent landforms and a key to explain the symbols.

Paired Text Passages: In small groups or individually, students will read and complete the questions for the paired text passages "Seven Large Lands" and "The Difference Between Maps and Globes".

Lake Fact: Lake Superior is the largest lake in the US and Canada.

Assessment

Students will be assessed on their answers and observations made in their science journals during the map stations. At the end of the lesson, have the students spin in a circle in the classroom and then ask each student which cardinal direction they are facing in. If they are having a bit of trouble, ask them to look at the signs for clues.

Extension if students do poorly on their assessments:

Students should revisit their responses in their science journals for the Types of Maps activity. Even though students talked in pairs about their observations about the maps, there should be a whole class discussion. The teacher should split the board into columns for each type of map. In each column, the teacher should have students share their observations about the maps. At the end, the teacher should identify similarities and differences between the maps.

Similarities:

- Topographical maps, flat maps, and globes are physical maps
- Topographical, flat, and google maps are 2D

Differences:

- Google maps is a digital map
- Globes are 3D
- Google maps zoom out/in, so you can see streets/roads or just states
- Topographical maps show landforms and bodies of water
- Globes show the countries and oceans

Extension:

The students can do a maze exercise, e.g. helping the mouse find the cheese, the product of which would be a map for the mouse from its starting location to its treasure. Maze Templates will be provided in this unit plan to be photocopied but should be checked over by the teacher before the lesson to assess which ones would be most appropriate for their students.

Teach To Learn
A collaboration between MCLA, Williams College, and North Adams Public Schools
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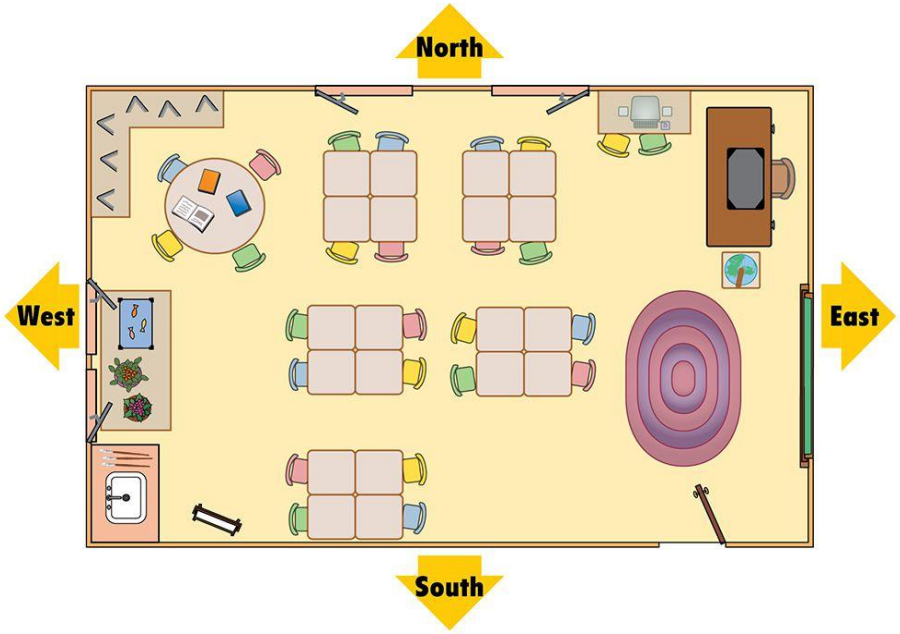
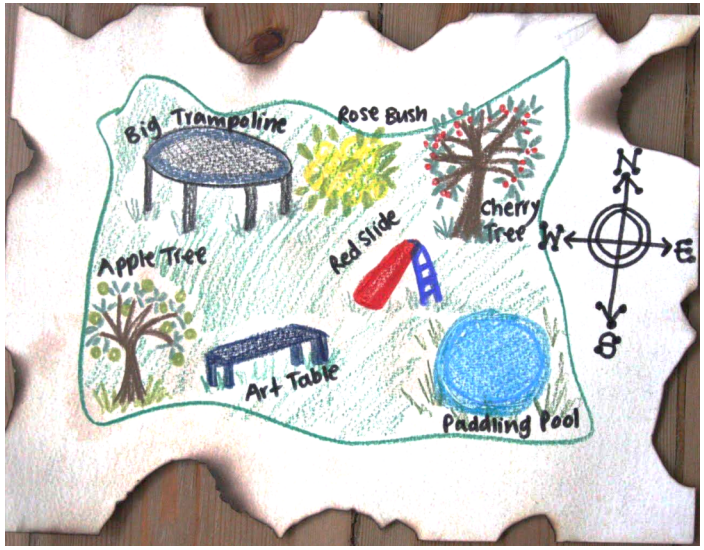




Lesson 5: Shaping the Land

BACKGROUND

Overview of the Lesson

In this lesson, students will be learning about erosion; specifically, how water can change the shape of the land. Students will conduct investigations to discover how water causes erosion. Students will also watch a video on glacial erosion and learn about how glaciers shaped Berkshire County. Then, they will see the effects of glacial erosion through an activity. After, students will learn about valleys. **Note: The activities in this lesson may be split among multiple days if needed. The erosion trays must be saved for the next lesson (however any wet sand or soil can be thrown out). The ice cube aspect of the glacier activity requires teacher set-up at least 1 day in advance.**

Focus and Spiral Standard(s):

Focus Standard: 2-ESS2-4(MA). Observe how blowing wind and flowing water can move Earth materials from one place to another and change the shape of a landform.

Clarification Statement:

- Examples of types of landforms can include hills, valleys, river banks, and dunes.

Spiral Standard: 3-LS4-4. Analyze and interpret given data about changes in a habitat and describe how the changes may affect the ability of organisms that live in that habitat to survive and reproduce.

Clarification Statements:

- Changes should include changes to landforms, distribution of water, climate, and availability of resources.
- Changes in the habitat could range in time from a season to a decade.
- While it is understood that ecological changes are complex, the focus should be on a single change to the habitat.

Spiral Standard: 4-ESS2-1. Make observations and collect data to provide evidence that rocks, soils, and sediments are broken into smaller pieces through mechanical weathering and moved around through erosion.

Clarification statements:

- Mechanical weathering can include frost wedging, abrasion, and tree root wedging.
- Erosion can include movement by blowing wind, flowing water, and moving ice.

State assessment boundary:

- Chemical processes are not expected in state assessment.

NGSS Alignment

Science/Engineering Practice (SP)	Disciplinary Core Idea (DCI)	Cross Cutting Concepts (CCC)
SP2: Developing and using models SP3: Planning and carrying out investigations SP8: Obtaining, evaluating, and communicating information	ESS2.A: Earth Materials and Systems. Wind and water can change the shape of the land. (2-ESS2-4(MA))	**Cause and Effect:** Cause and effect relationships are routinely identified, tested, and used to explain change (2-ESS2-4, 2-PS1-2, 2-PS1-4)

Learning Targets

1. I can define erosion.
2. I can explain how water shapes the land.

Assessment

Students will be assessed on participation in the erosion presentation and class discussions, as well as the accuracy of their answers to the paired text questions.

WIDA Language Objectives

Write two sentences using sentence starters that describe the effect of moving water.

Key Vocabulary
Tier 1: water, land
Tier 2: flood, erosion
Tier 3: weathering

RESOURCES AND MATERIALS

Quantity	Item	Source
1 per student	Science Journals	Classroom Teacher
1 per student	Plastic Straw	Bin
1 per student	Plastic Bowl	Bin
1	Spray Bottle	Bin
2	Plastic Cups	Bin
1	Empty plastic bottle (10-20 oz.)	Bin
1 Large bag	Sand	Bin
1 Large bag	Soil	Bin
3	Aluminum foil cake pan	Bin
4	Aluminum foil sheet tray (at least 3 inches deep)	Bin
	Pencils	Classroom Teacher
1 per student	Erosion Data Sheet	Binder
1	Computer and Projector	Classroom Teacher

	"Why Do Rivers Curve?" https://www.youtube.com/watch?v=8a3r-cG8Wic&feature=youtu.be Grand Canyon Video https://youtu.be/t8_AclTA0pw Glacier Video https://youtu.be/lTNnw0btcLI V-Shaped Valley https://www.youtube.com/watch?v=FIn0UoeDyVg U-Shaped Valley https://www.youtube.com/watch?v=prf7Xon0hJQ	CMC Website
1 per student	Berkshire Topographic Map	Bin
An assortment	Markers	Classroom Teacher
3	Ice Cube Tray	Bin
2 medium bags	Sand	Bin
Small bag	Small Rocks	Bin

****Items in bold should be returned for use next year****

LESSON DETAILS

Lesson Opening/ Activator

(Science Talk: Think-Pair-Share): Project photos of the Hoosic River flood on to the whiteboard. Ask the students "what do you think is happening in the photos?" After a few students share their ideas, guide the conversation, so that students understand that a flood happened. Clarify the vocabulary word, flood, if students are confused. Then, project present photos of the flood area. Ask the students "how did the water movement affect the shape of the land?" Have students think-pair-share. After, tell students that they will be learning about weathering and erosion which happened in the flood pictures.

During the Lesson

1. **Introducing the idea of Erosion**

   (Science Talk: Think-Pair-Share): Pose this question: how do rivers form? Have students think in pairs and share their thoughts with the whole class.

   Then, show the video https://www.youtube.com/watch?v=8a3r-cG8Wic&feature=youtu.be. In their science journals, students should write down the answer to these questions: Were you surprised by how rivers change shape? How could you create a model of a river? Do you know any river located in your town or community? Have a few students share their responses, and then talk about what students know about the Hoosic River. How does a river differ from an ocean? What do you think of when you imagine a river or an ocean? Do they look different? Is the water in a river different from that in an ocean?

2. **Erosion in a Tray**

Introduce the vocab words, weathering and erosion, to students before this activity. Tell the students that they will explore the process and effects of weathering and erosion.

Definitions:

- Weathering is the process of rocks being broken down into smaller pieces and erosion is the process of these smaller pieces of rock, soil, and sand being carried to new locations by water, ice, or wind. These are processes that occur slowly over time.

  Note: Help from other adults is highly recommended during this activity. Please save all materials from this activity (except any wet soil or sand) for the next lesson. In this activity, students will be working in three groups to perform self-directed exploration on water erosion. After the students have had the opportunity to explore their type of erosion, they will perform a demonstration in front of the class to teach others about their topic. The students in the audience should fill out their Water Erosion Data sheet where they will draw before and after pictures of the trays and write a sentence describing what happened. **[SP2: Developing and using models]**

This activity requires the setup of aluminum baking trays prior to the lesson. The trays will be cake pans that should be filled about ¾ the way full of soil. Pick one side of the tray and cut halfway down along the right and left side. Fold down the flap you cut and position the tray on a slight angle (using a book or similar) into the sheet tray. See the diagram below to set up the trays.

Setup: http://www.sciencebuddies.org/science-fair-projects/project_ideas/EnvEng_p037.shtml#procedure

Divide students into three groups: rain erosion, flood erosion, and river erosion. Tell students that today they will be scientists who are investigating how their form of water causes erosion. Depending on the availability of adults in the classroom, adults may be assigned to each group or they can move around the classroom providing support. Adults should serve as guides to keep students on track when conducting their investigations, but they should also give students freedom to test out their ideas.

After students have completed the data/finished worksheet, the teacher can provide guiding questions for the students to explore their own curiosities: "What happens if you change the landform slightly in this area? What would happen if the water came from a different spot?" Explicitly tell them they have opportunity to try out different ideas. **[SP3: Planning and carrying out investigations]**

A description of suggested procedures for each group is written below.

- **Rain Erosion**
  - Procedure: This group will receive one soil tray and a spray bottle filled with water. Spray the soil with water to simulate rain.
- **Flood Erosion**
  - Procedure: This group will receive one soil tray and a plastic cup full of water. Dump the entire cup down the soil- which should be formed into a mound.
- **River Erosion**
  - Procedure: This group will receive one soil tray, a pencil, and a cup of water. Using the pencil, carve a deep and narrow "riverbed" into the soil. Slowly pour the cup of water down the river, pouring only from the top of the soil tray if possible. If the water does not flow down well, either make the riverbed deeper or pour water from slightly below the top of the soil tray.

Pass out the Erosion Data Sheet to each student and instruct them to sketch the tray before the experiment and after the experiment. In addition, have them write a sentence describing what happened. Let the students look over their materials, giving them time to experiment and make discoveries. Once each group has completed their data sheet for their erosion station they are read to present.

The groups should take turns coming up to the front of the room and demonstrating their erosion process (This may be done under the ELMO, so students can get a better view). Depending on the condition of the soil and sand, you may need to refill the trays before the demonstrations. After the demonstration, students should share their observations from the experiment (what were their results) and teach their classmates how their type of erosion works (why did they obtain those results). Sample explanations are written below. If students are having a difficult time with the explanation, the Classroom Teacher should ask leading questions. **[SP8: Obtaining, evaluating, and communicating information]**

Teaching Tip

Explain to students that the erosion trays model the erosion process in nature. However, they are on a smaller scale, so it's easier for students to observe erosion. Furthermore, it is sped up because erosion can take a while.

Rain Explanation: Splashing raindrops can cause movement of soil and other land particles. Water from rain can form small streams, which can carry soil away.

Flood Explanation: Flooding causes heavy flows of water which can carry away everything in its path.

River Explanation: Flowing water from rivers can break pieces of the bottom of the river and carry them away.

If time allows, play this video on the formation of the Grand Canyon: https://youtu.be/t8_AclTA0pw but if not have the teacher or science fellows show the students a picture of the Grand Canyon and explain that the Grand Canyon was formed by river erosion. Project an image of the Nile River, and ask the students how they think fertile soil could exist so close to the sand. Explain that in the past it flooded every year, depositing fertile soil from the mountains in Egypt. If the Nile hadn't eroded the soil, then Egypt would be a desert and its ancient civilization wouldn't exist.

(If this lesson needs to be split up into two lessons, right now would be the best time to split the lesson.)

End of Day One

Day 2 Lesson Opening/Activator:

Glacial Erosion:

Teaching Tip

Tell students that glacial erosion actually takes years to happen. Since this is a model, the process is sped up.

Tell the students that they will be learning about another form of erosion call glacial erosion. Glaciers are giant, slow moving sheets of ice. Although most glaciers are now found near Antarctica or the Arctic, Berkshire County was once covered by a glacier 14,000 years ago. When glaciers move, they carve out valleys, shape hills and mountains, and form lakes. When a glacier melts, it can form a large flood of water that can wash the land away.

a. Play the video on glaciers: https://youtu.be/lTNnw0btcLI

b. Put the topographic map of Northern Berkshire County on the ELMO and pass out a map to each student. Remind students that they learned about maps in the previous lesson and how maps can represent an area. Explain that this type of map shows us the location of mountains and valleys. It may be helpful to put a star on North Adams to show students where they live. Explain that as the glacier moved through the Berkshires it carved out the valley.

c. Use a colored marker to trace the valley and have students do the same to their copy. Explain to students that most houses, schools, and businesses are in the valley. How might this area be different if the glacier hadn't eroded the land? Students may paste these maps into their science journals.

1. **Glacier:** Adapted from: http://eu.montana.edu/pdf/outreach/msuscizone28.pdf
   Note: This activity requires teacher set up at least one-day prior.
   a. In this activity, students will be making their own glaciers and seeing how glaciers erode the land. For the setup, the classroom teacher should add a spoonful of soil and rocks to each compartment of the ice cube trays and then add water and freeze overnight. There should be one ice cube per student. During the lesson, pass out one ice cube and a small amount of sand to each student. Tell the students that the ice cubes are glaciers and the sand is the land. Allow the ice cubes to melt for a few minutes so the soil/rocks become exposed. Tell the students that they will be moving their glaciers (rock/soil side down) through the land to see how erosion happens. Have students gently push down on the ice cube. Ask students, "How did the glacier change the surface of the land? Did it form the valley into a particular shape (maybe in the shape of a particular letter)?" "Did the glacier leave anything behind?" **[SP3: Planning and carrying out investigations]**

2. **The Alphabet of Valleys -** V Shaped and U-Shaped valleys worksheet
   a. Preface the videos by telling the class that they are now going to focus on a common product of erosion over very long periods of time: valleys! *Sometimes* bodies of water can create valleys that form a shape if the duration and environmental conditions are right.
   b. Play the following YouTube videos in order:
      i. V-shaped valley video: https://www.youtube.com/watch?v=FIn0UoeDyVg
      ii. U-shaped valley video: https://www.youtube.com/watch?v=prf7Xon0hJQ
   c. Using the worksheet as a template, draw a Venn diagram and roughly sketch the images of the U and V shaped valleys on the board to match those on the worksheet. Provide students with one worksheet each to be put in their science journal or folder when completed.

i. First, ask the students what type of landform is shown in the two pictures (answer: valley), write this down as the title of the worksheet. Then, ask them which alphabet letter each valley's shape looks like and tell them to write the letter next to the word 'shape' in each side of the Venn diagram.
ii. Ask the students to raise their hands to answer the question: What body of water might have caused the valley shape of Image A/B? Write the answer down on the board and tell students to do the same next to the word 'cause.'
iii. Then, ask the class: What state was the water in (solid or liquid)? Instruct them to write the answer next to 'state of water.'
iv. **(Science Talk: Small Groups and Class Discussion):** Last, ask the students to form groups of 3-4 to think of some similarities between glacier-formed valleys and river-formed valleys. Reconvene as a class and ask students what they came up with in their groups, writing the suggestions on the board.
    - Some examples of similarities include: both are caused by bodies of water, both form over very long periods of time, and both are shaped by erosion.
v. Make the connection to the glacier erosion and river erosion experiments by asking students to go back to the before and after sketches in their science journals to see if they can see the difference in the shapes.

Lesson Closing

(Science Talk: Think-Pair-Share): Tell students that they're standing in a body of water. Have the students guess what type of body of water. Give the students hints that the body of water is surrounded by land. When a student says it's a lake, tell the students it is Lake Bascom. Have the students think-pair-share and discuss these questions among themselves: How do you think this area/town was filled up with water?
What do you think happens to the melted water when a glacier melts?
Where does the melted water go?"

Lake Fact: Lake Bascom used to exist in the space we live in and was formed when a glacier melted.

Assessment

Students will be assessed on participation in the erosion presentation and class discussions.

Extension if students do poorly on their assessments

Gather the class and have each student group explain their erosion process by drawing on the board what they saw. If students have trouble explaining, ask questions to the class about they think should happen next. Guide them until they come up with the proper explanation.

Lesson 6: Cracking Up — A Story About Erosion (Literacy Lesson)

BACKGROUND

Overview of the Lesson

In this lesson, students will read about erosion and then predict the outcome of a cookie erosion activity that will take place over the next week or so.

Focus Standard(s):

Focus Standard: 2-ESS2-4(MA). Observe how blowing wind and flowing water can move Earth materials from one place to another and change the shape of a landform.
Clarification Statement:

- Examples of types of landforms can include hills, valleys, river banks, and dunes.

Spiral Standard: 3-LS4-4. Analyze and interpret given data about changes in a habitat and describe how the changes may affect the ability of organisms that live in that habitat to survive and reproduce.
Clarification Statements:

- Changes should include changes to landforms, distribution of water, climate, and availability of resources.
- Changes in the habitat could range in time from a season to a decade.
- While it is understood that ecological changes are complex, the focus should be on a single change to the habitat.

Spiral Standard: 4-ESS2-1. Make observations and collect data to provide evidence that rocks, soils, and sediments are broken into smaller pieces through mechanical weathering and moved around through erosion.
Clarification statements:

- Mechanical weathering can include frost wedging, abrasion, and tree root wedging.
- Erosion can include movement by blowing wind, flowing water, and moving ice.
- State assessment boundary:
- Chemical processes are not expected in state assessment.

Focus Standard: 2-ESS2-1. Investigate and compare the effectiveness of multiple solutions designed to slow or prevent wind or water from changing the shape of the land.
Clarification Statements:

- Solutions to be compared could include different designs of dikes and windbreaks to hold back wind and water, and different designs for using shrubs, grass, and trees to hold back the land.
- Solutions can be generated or provided.

Spiral Standard: 3-ESS3-1. Evaluate the merit of a design solution that reduces the impacts of a weather-related hazard. *
Clarification statement:

- Examples of design solutions to a weather-related hazard could include a barrier to prevent flooding, a wind-resistant roof, and a lightning rod.

NGSS Alignment

Science/Engineering Practice (SP)	Disciplinary Core Idea (DCI)	Cross Cutting Concepts (CCC)
SP8: Obtaining, evaluating, and communicating information	ESS2.A: Earth Materials and Systems. Wind and water can change the shape of the land. (2-ESS2-4(MA))	**Cause and Effect:** Cause and effect relationships are routinely identified, tested, and used to explain change (2-ESS2-4, 2-PS1-2, 2-PS1-4)

Learning Targets

1. I can explain the process of erosion from a cliff to sand.
2. I can predict the outcome of the cookie erosion activity.
3. I can explain how wind shapes the land.

Assessment

Students will be assessed on their participation and their science journal entries.

WIDA Language Objectives

(Dependent on the needs of ELL students.)

RESOURCES AND MATERIALS

Quantity	Item	Source
1 per student	Science Journals	Classroom Teacher
1	Cracking Up- A Story About Erosion	Bin
	Projector and Computer	Classroom Teacher
1	Large clear glass jar	Bin
1 package	Chocolate chip cookies	Bin
1	Sand & cliff image	Bin
1 set	Laminated character cards on popsicle sticks	Bin
1 per student	Straws	Bin
1 per student	small bowls	Bin
	bag of sand	Bin

****Items in bold should be returned for use next year****

LESSON DETAILS

Lesson Opening/ Activator

The teacher will show the class a picture of a cliff and then a picture of a sandy beach. After the students have had time to think about the pictures, ask what students know about them. The teacher could also ask if there is a connection between the two pictures. In their science journals, students will write a sentence or two stating what they know about the pictures.

During the Lesson

1. **Cracking Up- A Story About Erosion:** The teacher will read the book out loud to the class.
   In this story, the class will follow how a cliff erodes into sand step by step. The teacher should spend some time on each page, discussing the new vocabulary terms. Here are some discussion questions teachers could use: (page 6) How long has the cliff been there? When did the erosion start? (page 7) How did the roots help the soil? (page 8) What happens to water when it freezes? What will this do to the cracks? (page 10) What 4 things cause erosion? (page 16) What are rocks made of? (page 19) Are all rocks the same? What is the connection between the picture of the cliff and the sand? **[SP8: Obtaining, evaluating, and communicating information]**

2. **Cookie Erosion Activity**

> **Teaching Tip**
> Tell students that the shaking mimics the wind and the cookies represent the soil/earth.

Give each student a cookie that they can eat at the end of the discussion. In a plastic see-through container (jar) put in 4 chocolate chip cookies. Ask the students what they think will happen if you shake the container 2-3 times a day. Shake cookies in a jar daily to show kids the change from rocks to sand/dirt, mimicking erosion. You can also sprinkle some water into the container. Have students record the results in their science journals.

Lesson Closing

In their science journals, students should record 2-4 facts that they learned in the lesson. Encourage the students to draw pictures of the cliff or cookie erosion activity.

The lesson should split up after this activity for the sake of time.

End of Day One

Day 2 Lesson Opening/Activator: Pick a couple of volunteers to read the parts of Ricky Rock, Billy Boulder, Rushing River, Wind, Tiny Billy Boulder, and Tiny Ricky Rock. Ask the class if they'd prefer to perform in front of the class or just read from their seats. After reading the play, ask some questions such as: How long do you think it takes for a boulder to erode into dirt? Who are the agents of erosion? What helps to prevent erosion? What are the effects of erosion? They can look back in the text if needed.

During the Lesson:

1. **Wind Erosion Bowls**

   (Science Talk: Class Discussion): Wind causes erosion by picking up dust, dirt, soil, and other particles and carrying them elsewhere. Explain to students that they will be investigating to see how wind causes erosion. Give each student a straw and a bowl with enough sand to cover the bottom. Tell students that now they will pretend to be the wind. Give them a few minutes to experiment, using the straws to blow around the sand. Ask the questions; What happens to the sand if they blow lightly? What happens if they blow harder? Remind the students that it is their job to clean up any mess they make during the investigation.

2. **Windy Windy (Erosion Tag)**
   Tell the class that they will be playing a game of tag called Windy Windy. Ask for students to volunteer to be "it" (these students will represent the wind in the erosion process). The other students will represent one large landform and their goal will be to cross to the other side of the room without being tagged. Explain to the wind students that in order to get landform students to cross from one end of the room to the other they should say "Windy Windy, I'll blow you away if you are wearing _____". Tell the landform students that if the wind students call out something that describes them, they must run to the other side of the room. When students are tagged, they must freeze by standing still. The game ends when all of the landform students are frozen. Teachers can choose to ask the following questions as each round of the game progresses or at the end of the activity.
   a. What happened to the number of students who were unfrozen? Did it get bigger or smaller?
   b. How did the wind change the size of the landform?
   c. How long did it take to freeze everyone?
   d. Explain that wind erosion makes landforms smaller and that it takes a long time before landforms are very small or gone.

Optional Extension: Assign a student to be a "barrier" who can unfreeze frozen landform students during the game.

Prep for Next Lesson

Plant rye grass seeds in an aluminum foil cake pan and water every other day**.** This will be for the demonstration of how plant roots help prevent erosion.

Lesson Closing

Have the students draw comic strips in their science journals, illustrating how landforms erode over time through wind erosion.

Lake Fact: At its peak, Lake Bascom covered 115 square miles of space.

Assessment

Students will be assessed on their participation and their science journal entries.

Lesson 7: Preventing Erosion

BACKGROUND

Overview of the Lesson

In this lesson, students will learn how humans prevent erosion and what types of structures are used. Students will view an interactive PowerPoint about the different types of barrier structures. Then, students will go on a scavenger hunt on school property to look for examples of erosion and barriers. The teacher will also perform a demonstration on how plants prevent erosion by growing ryegrass in an erosion tray. Finally, students will use the knowledge they have acquired to work in groups to build and test their own barriers. **Note: The Erosion Scavenger Hunt includes the optional use of iPads. If you would like to have these for use, please reserve them for the lesson. The Plant Barrier Demonstration activity requires the classroom teacher to grow the ryegrass at least 1 week prior to teaching the lesson.**

Focus and Spiral Standard(s):

Focus Standard: 2-ESS2-1. Investigate and compare the effectiveness of multiple solutions designed to slow or prevent wind or water from changing the shape of the land.

Clarification Statements:

- Solutions to be compared could include different designs of dikes and windbreaks to hold back wind and water, and different designs for using shrubs, grass, and trees to hold back the land.
- Solutions can be generated or provided.

Spiral Standard: 3-ESS3-1. Evaluate the merit of a design solution that reduces the impacts of a weather-related hazard. *

Clarification statement:

- Examples of design solutions to a weather-related hazard could include a barrier to prevent flooding, a wind-resistant roof, and a lightning rod.

NGSS Alignment

Science/Engineering Practice (SP)	Disciplinary Core Idea (DCI)	Cross Cutting Concepts (CCC)
SP3: Planning and carrying out investigations SP6: Constructing explanations and designing solutions] SP7: Engaging in argument from evidence	ESS2.A: Earth Materials and Systems. Wind and water can change the shape of the land. (2-ESS2-4(MA)) ETS1.C: Optimizing the Design Solution. Because there is always more than one possible solution to a problem, it is useful to compare and test designs.	**Influence of Engineering, Technology, and Science on Society and the Natural World:** Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands (2-ESS2-1)

Learning Targets

1. I can identify barriers for erosion and explain how they work.
2. I can construct my own barriers for erosion and then, test them and evaluate their efficiency.

Assessment(s)

Students will be assessed on their participation and discussion in all activities and the written work in their science journals.

WIDA Language Objectives

Use sentence frames to explore ideas about what can/cannot happen when a natural barrier is or is not present and why:
"If _____ is there then _____ will/will not happen because…"
"If _____ is not there then _____ will/will not happen because…"

Key Vocabulary

Tier 2: man-made, natural, barrier
Tier 3: dike, windbreak

RESOURCES AND MATERIALS

Quantity	Item	Source
1	Erosion Barriers PowerPoint	CMC Website
1	Computer and Projector	Classroom Teacher
1	Nature Scenes Video (optional) https://youtu.be/xbyTIw0bQ0o	CMC Website
	iPads (optional)	Classroom Teacher
1 per student	Science Journals	Classroom Teacher
1 per student	Barriers and Erosion Picture Sheet	Binder
1 per student	Preventing Erosion: Erosion Barriers (3 pages total)	Binder
1 per student	Scissors	Classroom Teacher
1 per student	Glue sticks	Classroom Teacher
3	Aluminum foil cake pans (from lesson 4)	Bin
4	Aluminum foil trays (3 from lesson 4)	Bin
1 packet	Rye grass seed	Bin
1 large bag	Soil	Bin

1 large bag	Sand	Bin
2	Plastic Cups (from lesson 4)	Bin
1	Spray bottle (from lesson 4)	Bin
1	Empty plastic bottle (from lesson 4)	Bin
1 container	Q-Tips	Bin
	Small Rocks	Bin
	White Glue	Classroom Teacher
	Tape	Classroom Teacher
2 balls	String	Bin
2 bags	Popsicle Sticks	Bin
1 box	Straws	Bin
1	Aluminum foil	Bin

****Items in bold should be returned for use next year****

LESSON DETAILS

Lesson Opening/ Activator

(Science Talk: Think-Pair-Share): Project again on the whiteboard, images of the North Adams floods in the 1920's and 30s and tell the students that one of the reasons it rained so much is because of hurricanes. Then, tell them that it rained a lot in 2011 too, when Hurricane Irene blew through North Adams. Show them images of areas in North Adams, including the Hoosic, around this time. Ask them to point out the differences in the images and ask them why they think the river flooded in the 1900's, but not in 2011. (Differences might be there are walls around the river, more trees on the hills, etc.). Have students Think about their answers, Pair up with another student, and discuss the topic. Then, students will Share their thoughts with the class. Tell students that today they will be learning about how humans prevent erosion using barriers. Barriers are different structures that prevent water and wind from meeting areas that humans want to protect. At the end of the lesson, students will create their own barriers.

Teaching Tip

If possible, project the images on the whiteboard at the same time, so the teacher can circle the differences. The teacher should also point out the walls and have students try to come up with a definition for the word barrier based on the wall's purpose.

During the Lesson

1. **Erosion Barriers PowerPoint**: Show your class the erosion barriers PowerPoint (notes for the PowerPoint can be seen under the notes panel of the presentation. Slides 2-8 run through examples of different natural and manmade barriers. While showing these slides, ask students whether the structures shown in the pictures are natural or manmade. Slides 9-12 show some images with barriers and some without. Ask students whether a barrier is present in each image. If it is, ask students how the barrier prevents erosion? If no barrier is present, ask how is the area at risk for erosion?

Student Thinking Alert

Students may not understand what's manmade or natural. Therefore, the teacher should explain that natural barriers are found in nature (they are a part of nature) while mademade barriers are barriers that humans constructed.

2. **Erosion Barriers Packet**: Have students complete the Erosion Barriers packet/worksheet. Students will cut out a picture of the barrier from the Barrier Pictures Worksheet and paste it into the appropriate spot which lists the name of the barrier. This is an important student resource for the Preventing Erosion Designs activity. Students may reference these packets when brainstorming ideas for their designs
.
3. **Erosion Scavenger Hunt:** In this activity, students will be going on a scavenger hunt to look for examples of erosion and barriers against erosion. Before going outside, tell students that today they are science detectives and will explore the surrounding area to look for erosion and erosion barriers. Have students bring their science journals and their pencils outside, so they can record their findings. Students may refer to their erosion barriers packet to look for barriers. Walk students around the school grounds for 10-15 minutes. Some good areas to observe include the playground and parking lot. Examples of erosion evidence include channels in the ground from runoff and sediment deposited in the parking lot. Examples of barriers include storm drains, parking lot curbs, and structures holding mulch on the playground. If students are having a difficult time, it may be helpful to point out some of these examples.
    a. If erosion/barriers are accessible and obvious to students, ask them to evaluate the ones they observe in their science journals- which ones are working well? How can you tell? Which ones are not working well? How would you improve them?

4. **Technology Integration:** Allow students to bring iPads outside, instead of their science journals, and instruct students to take pictures to document the examples they find. (If weather does not permit outside activity, then postpone this activity or skip it.)

Lesson Closing:

(Science Talk: Small Groups): After coming back to the classroom, split students up into groups of 4-5. In each group, students should share the answers to the questions they answered in their science journals. Then, each group should share their answers with the class to create a class list of examples of erosion and barriers that were found and ways to improve these barriers.

***The teacher should end the lesson for the day after this activity for the sake of time. ***

End of Day One

Day 2 Lesson Opening/ Activator

1. **Plant Barrier Demonstration**: **(Science Talk: Class Discussion): Note: This activity requires teacher set up at least 1 week prior. Plant rye grass seeds in an aluminum foil cake pan. Water every other day.** This activity is a teacher demonstration on how plants prevent soil erosion. On the day of the lesson, set up the ryegrass pan and a drainage tray, just like the erosion trays from the 5th lesson. Set up an additional erosion tray and fill the cake pan with soil. Fill 2 plastic cups with water. Tell students that we will be pouring water down both hills. Which tray do they think will lose the most soil? Why? Slowly pour the cup of water down each tray. Have students note how much soil is in each collection tray. What happened? Why? The roots of the grass helped anchor the soil, which prevented erosion, so less soil was collected in the tray beneath the plant. **[SP3: Planning and carrying out investigations & SP6: Constructing explanations and designing solutions]**

> **Teaching Tip**
> Connect it back to real world. Explain how similar to grass roots, tree roots prevent soil erosion on mountains and hills.

During the Lesson

1. **Preventing Erosion Designs**: In this activity, students will be using information previously acquired about erosion and barriers to test their own structures. Project images of the fallen concrete barrier by the Hoosic River and ask students to think about what made this barrier ineffective. Explain that they will be designing a new barrier to help prevent North Adams from flooding again. Students will be divided into three groups and each group will receive a set of erosion trays, corresponding to the types of water erosion used in the 5th lesson. Give students access to popsicle sticks, q-tips, small rocks, tape, string, glue, straws, aluminum foil (all in the bin) and any other materials from the classroom you would like the students to use.

   Start the activity with a 5-10-minute brainstorming period where students will discuss what structures they may be able to build with the materials. Have students draw out their designs in their science journals. Students should be able to explain and defend their decisions for their designs. Encourage students to look back at their Erosion Structures Packet to review what structures they learned about. Next, give students 15-20 minutes to build their structure; have students pile up their sand or soil at one end of the tray- this is what the water will be poured down. When all the groups have constructed their model, have each group come up to the front of the room to explain what they built to their classmates. Then, each group will test their barrier by either pouring water down the hill or spraying water at the hill. **[SP3: Planning and carrying out investigations]**

Lesson Closing

In their science journals, have students sketch a picture of the structure that they built. Then, they should write a few sentences that addresses the following: Why did they choose this design? How did it work and how do you know? What would they do differently next time? **[SP7: Engaging in argument from evidence]**

Lake Fact: Lake Bascom dried up because the glacier holding it in melted and the water was released into the ocean.

Assessment

Students will be assessed on their participation and discussion in all activities and the written work in their science Journals.

Extension if students do poorly on their assessments

As a class, review the Erosion Barriers PowerPoint. Then ask students to take turns talking about the barriers they built and why they worked or didn't. Have students give each other feedback and how their barrier might be improved.

Lesson 8: Research Project

BACKGROUND

Overview of the Lesson

Note: These activities can be spread over multiple days, as not to overwhelm students and teachers with this project. In this lesson, students will do a research project on landforms and bodies of water in groups of 2-3. Students will fill out an info sheet on their topic, doing guided research with the teacher. They will also be provided with resources such as books and videos on landforms and bodies of water that they can research. Next, students will independently write one paragraph about their topic and produce a creative depiction. Finally, students will regroup to make a poster or brochure (with the help of a teacher), which they will then present to the class, along with their creative depictions. **Note: Activity 3 includes an open ended creative project. Depending on how much time you want to spend on this activity, you may need chart paper, crayons, miscellaneous art supplies, clay, paper mache, or iPads.**

Focus and Spiral Standard(s):

Technology K2: 3.1 Use various age-appropriate technologies to locate, collect, and organize information.
Technology K2: 3.4 Use a variety of age-appropriate technologies (e.g., drawing program, presentation software) to communicate and exchange ideas.
Literacy 2. W.7. Participate in shared research and writing projects (e.g. read several books on a single topic to produce a report: record science observations).

NGSS Alignment

Science/Engineering Practice (SP)	Disciplinary Core Idea (DCI)	Cross Cutting Concepts (CCC)
SP4: Analyzing and interpreting data SP8: Obtaining, evaluating, and communicating information	**2-ESS2-4(MA).** Observe how blowing wind and flowing water can move Earth materials from one place to another and change the shape of a landform. (2-ESS2-4(MA))	**Patterns:** Patterns of change can be used to make predictions (2-ESS2-2).

Learning Targets

1. I can perform group research on landforms and bodies of water using assigned sources.
2. I can write a paragraph about my research topic with the support of examples provided by my teacher.
3. I can produce and present a poster or brochure.

Assessment(s)

- Participation in group research.
- The content in the brochure/poster, presentations, and the written paragraphs.

RESOURCES AND MATERIALS

Quantity	Item	Source
1 set per group	Bodies of Water Research Resources	Bin and Classroom Teacher
1 set per group	Landforms Research Resources	Bin and Classroom Teacher
1 per water student	Bodies of Water Data Collection Sheets (2 total)	Binder (teacher to make copies)
1 per landform student	Landforms Data Collection Sheets (2 total)	Binder (teacher to make copies
1 per student	Laptops	Classroom Teacher
1 per student	Science Journals	Classroom Teacher
	Choice of materials for creative depictions (tissue paper, colored paper, crayons, miscellaneous art supplies, clay)	Bin
1	Projector and computer for presentations	Classroom Teacher

****Items in bold should be returned for use next year****

LESSON DETAILS

Lesson Opening/ Activator

In front of the whole class, the students will present the landforms they have been assigned throughout the unit. They will give a symbol for their landform using a hand gesture or body movement, and then give a quick fact about their landform/body of water.

During the Lesson

Note: These activities can be spread over multiple days, as not to overwhelm students and teachers with this project. In this lesson, students will be doing a research project on landforms and bodies of water in groups of 2-3. The research options for landforms are: canyons, peninsulas, volcanoes, plateaus, hills, valleys, mountains, and islands. The research options for bodies of water are: lakes, ponds, rivers, wetlands, ocean, and glaciers. The landforms with the easiest articles are canyons, mountains, peninsulas, and volcanoes, while students looking for a challenge might pick islands, valleys, rivers, and wetlands. Once students are in their groups, you should outline the project. The students will fill out info sheets on their landform or body of water. First, they will do guided research and then move on to independent research if the skill level of the students seems agreeable. Next, students will independently write one paragraph about their topic and produce a creative depiction. Finally, students will regroup to make posters or brochure, which they will then present to the class, along with their creative depictions.

Teaching Tip

Assign student group roles during the research aspect of the lesson especially to keep everyone on task and focused and engaged throughout the activity. These roles could be the materials collector, the summarizer, the organizer, etc.

1. **Guided Research**
   The students will begin the project by doing guided research using the resources on landforms and bodies of water located in the bin and supplemented by the teacher. Pass out an info sheet to each student; make sure that students get either the Landform copy or the Body of Water copy, depending on their research focus. Give each group of students their research resources and have them read through them while they fill out their info sheets. With the variety of materials, students should be able to fill out most, if not all their info sheets. Make sure to model how to use the resources, going through and demonstrating how to find certain facts in the article for the students. **[SP4: Analyzing and interpreting data]**.

2. **Writing**
   Students will be taking the information they learned from their research and independently writing a paragraph about their landform or body of water. This can be done in either their science journals or on lined paper. Encourage students to use information from their info sheet questions, as well as some of the fun facts they learned. This assignment must

be heavily scaffolded for students who have low writing skills. It should be modeled on the board and students should be encouraged to follow a format that includes sentence starters the teacher will provide.

Scaffolding:

The landform that I have been studying is _____. It is __(tall/deep) ____ with __ (many/few trees, fish, animals, etc.) ____. (Do many people live around or on one of these landforms? write a sentence about that.) (What else lives there, major animals or fish or ecosystem.) The climate usually __ (varies, is warm, is temperate) ____. A fun fact about _____ is _____. This landform can be found _____.
The most famous one is _____.

3. **Creative Depiction**
   For this activity, students will be making a creative depiction of their landform or body of water. You can either have students work independently or in groups. The depth of this activity will depend on the amount of time you have and materials available in the classroom. A simple depiction would be having students make drawings of their landform or body of water. If you want to go a little more in-depth, have students make a sketch and then cover their drawing with art supplies like scrapbook paper, pompoms, beads, and popsicle sticks. If you want to spend even more time, students could create 3D models using clay or paper mache, or they could make videos using iPads.
4. **Poster or Brochure**
   Note: This may take some prep, as there should be an example that the students get to look at to compare their finished product to. Teacher may have to make a quick poster and brochure to provide a visual. See Rubric.

Students will get back into their groups to create a poster or brochure on their topic. Each group can share a laptop, even the groups who are making posters get one. Using their info sheets, they should aim to create 3-5 categories on the poster/brochure and should include both text and images. Encourage students to use the information from their info sheets, as well as some of the fun facts they learned, and to format the text into bullet points. Show the students an example of a good poster and brochure that they can aim to make theirs look alike. **[SP8: Obtaining, evaluating, and communicating information]**.

Lesson Closing

Have each group present their posters or brochures to the class. Encourage students in the audience to ask questions at the end of each presentation. Make sure at least two questions are asked at the end and have examples of questions listed. These could be:

- What landform is similar to yours and why?
- Have you seen an example of this landform in your life, was it local?

Assessment(s)

- Participation in group research.
- The content in the brochure/poster, presentations, and the written paragraphs.

Rubric

Requirements:	Points: /25
Research: Students should have at least one fact from the guided research they did with the teacher.	**/5**
Writing: Students should have a fully developed paragraph about their landform to hand in with their presentation. It should include many/all aspects that are included in the example paragraph.	**/5**
Creative Depiction: Students should have a visual creative representation of their landform that is labeled with the title of the landform and labels of major features; it should be an accurate depiction of the landform.	**/5**
Fun Fact: Students should have at least one fun fact about their landform, whether that be an example of a famous landform or a news article about their landform and how it is relevant in their lives.	**/5**
Real-Life Example: Students should include a real-life example of the landform that they are researching. It should include a picture of the landform to put on the poster or brochure.	**/5**
Each requirement will be scored out of 5 based on the quality of work. See next page for full rubric.	**Total:** **/25**

Requirements	1	2	3	4	5
Research	**The student mentions a fact that is not from the guided research and is not backed up by a fact they can provide.**	**The student mentions a fact from their personal experience but doesn't refer to guided research.**	**The student presents a fact from the guided research that somewhat relates to their landform or body of water but does not directly refer to it.**	**The student mentions a fact from the guided research that directly refers to their landform or body of water. It is presented as an incomplete sentence or is not correctly punctuated.**	**The student presents a fact from the guided research in a complete sentence. It relates directly to their landform or body of water and is well punctuated.**

Writing	**The student writes a small piece for their presentation that has little or no relation to the guided paragraph presented. Mentions few or no facts about their landform or body of water.**	**The student writes a paragraph that has little relation to the guided paragraph requirement. It mentions few facts about the landform or body of water.**	**The student writes a paragraph that has some elements from the required guided paragraph, with few facts about their landform or body of water throughout.**	**The student writes a paragraph that has most of the elements from the required guided paragraph with many facts about their landform or body of water. Sentences may not be fully developed and/or punctuation could be off.**	**The students write a paragraph that has all the elements from the required paragraph in their own writing, with many facts about their landform or body of water presented in full sentences that are well punctuated.**

Creative Depiction	**The student puts little to no effort into a creative depiction of their landform or body of water. It has no title and no labels. It is not colorful.**	**The student puts little effort into their creative depiction of their landform or body of water; it has no title, possibly a label, and may be colorful.**	**The student puts some effort into their creative depiction of their landform or body of water. It has a title, few labels, and may be colorful.**	**The student puts a fair amount of effort into their creative depiction; it has a title, a few labels, and is colorful.**	**The student puts a lot of effort into their creative depiction of their landform or body of water; it has a title, labels of major features, is colorful, and creative.**
Fun Fact	**The student presents a fact that may not be true and is written in an incomplete sentence. It is incoherent and not labeled.**	**The student presents a fact that may be true but provides no evidence. It is written in an incomplete sentence.**	**The student presents a fact that is written in an incomplete sentence. It is not labeled on the presentation.**	**The student presents a fact that is labeled on the presentation but is written in incomplete sentences and/or is not properly punctuated.**	**The student presents a fact that is labeled on the presentation. It is written in full and complete sentences with proper spelling and punctuation.**

Real-Life Example	**The student gives an example of an imaginary or fantasy example of the landform or body of water. This may come from a video game or movie they have seen. There is no picture.**	**The student gives an example of a landform or body of water but does not label it or give a picture to represent it.**	**The student gives an example of a landform or body of water but does not label it or they do not give a picture to represent it. However, at least one example is present.**	**The student gives an example of the landform or body of water that is labeled and has a picture, but the picture may not represent the actual example that is given. Ex: a picture of Mt Everest when Mt Greylock is the example.**	**The student gives an example of a landform or body of water that is labeled and has a picture that represents the given example. It is written in an exciting way and has proper punctuation and is a complete sentence.**

Teach To Learn
A collaboration between MCLA, Williams College, and North Adams Public Schools
Funded by NSF DUE-IUSE Award #1432591

Travel Brochure

_____

(name of place)

_____

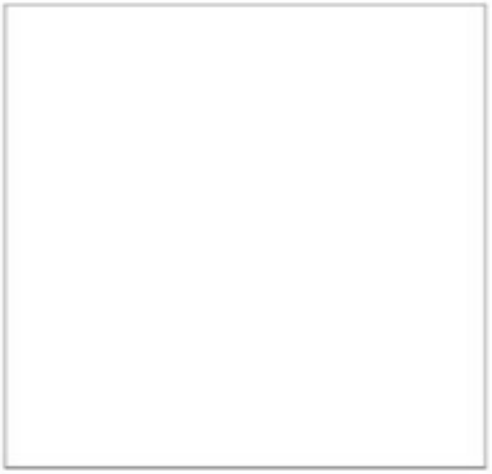
_____

_____

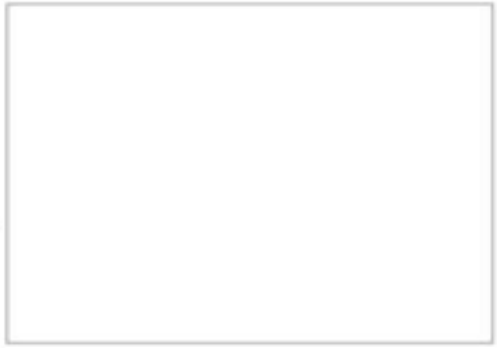
_____

Fun Things To Do!

- _____
- _____
- _____
- _____
- _____



I would like to vacation here because...



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Unit Activity Planner

Activity	Learning Targets	Science Connection to Phenomena	MA Standards
Lesson 1 **Activity 1:** Landforms "HeadBandz" Activity **Activity 2:** Virtual Tour of Landforms	I can identify different types of landforms. I can describe different landforms using appropriate language.	Landforms are classified based on their size, shape, and relationship with bodies of water.	**2-ESS2-2.** Map the shapes and types of landforms and bodies of water in an area. Clarification Statements: Examples of types of landforms can include hills, valleys, river banks, and dunes. Examples of water bodies can include streams, ponds, bays, and rivers. Quantitative scaling in models or contour mapping is not expected.
Lesson 2 **Activity 1:** Bodies of Water Booklet	I can identify different bodies of water I can provide examples of water as a solid or liquid	Water exists in nature in both solid and liquid forms and can be flowing or still. Maps are a way to represent these bodies of water and	**2-ESS2-2.** Map the shapes and types of landforms and bodies of water in an area. Clarification Statements: Examples of types of

Activity 2: QR Code Scavenger Hunt **Activity 3:** Google Cardboard Exploration + Map Extension	I can explain how different models can serve to represent the same object	landforms, and intentionally highlight things and leave things out.	landforms can include hills, valleys, river banks, and dunes. Examples of water bodies can include streams, ponds, bays, and rivers. Quantitative scaling in models or contour mapping is not expected. **2-ESS2-3.** Use examples obtained from informational sources to explain that water is found in the ocean, rivers and streams, lakes and ponds, and may be solid or liquid
Lesson 3 **Activity 1:** Create an Acrostic poem	I can identify different landforms found on our planet. I can describe characteristics of landforms.		**Literacy 2. W.7.** Participate in shared research and writing projects (e.g. read several books on a single topic to produce a report: record science observations).
Lesson 4	I can understand the	Maps are made for a purpose;	**2-ESS2-2.** Map the shapes

Activity 1: Treasure Hunt **Activity 2:** Types of Maps Activity **Activity 3:** Revisit Perfect Island Project	different components of a map, including a key and compass. I can use different types maps (i.e., flat maps, globes, Google Maps, etc.;) for different things (i.e., find boundaries, physical features, plan a trip, etc.). I can create a map that represents landforms or bodies of water.	therefore, some maps depict different key features and leave others out. Maps include special features and labels to provide information about an area, such as keys, titles, and scale.	and types of landforms and bodies of water in an area. Clarification Statements: Examples of types of landforms can include hills, valleys, river banks, and dunes. Examples of water bodies can include streams, ponds, bays, and rivers. Quantitative scaling in models or contour mapping is not expected.
Lesson 5 Day 1 **Activity 1:** Erosion in a Tray Day 2 **Activity 2:** Glacial Erosion	I can define erosion I can explain how water shapes the land I can explain how wind shapes the land	Erosion is the process by which soil, rock, and sand is worn away over time by wind and water. Water wears away rock by rubbing other rocks against it, freezing and crack it open, and dissolving it.	**2-ESS2-4(MA).** Observe how blowing wind and flowing water can move Earth materials from one place to another and change the shape of a landform. Clarification Statement: Examples of types of landforms can include hills,

		Wind blows dust across the land, forms dunes, and scars rocks	valleys, river banks, and dunes.
Lesson 6 **Activity 1:** Cracking Up- A Story About Erosion **Activity 2:** Wind Erosion Bowls **Activity 3:** Windy Windy (Erosion Tag)	I can explain the process of erosion from a cliff to sand. I can predict the outcome of the cookie erosion activity.	Water seeps into a cliff face, freezes, and expands. this forms cracks, and eventually pieces of rock break off the cliff face. When blown by wind or pushed by flowing water, the rocks break down into even smaller pieces and then into sand.	**2-ESS2-4(MA).** Observe how blowing wind and flowing water can move Earth materials from one place to another and change the shape of a landform. **Clarification Statement:** Examples of types of landforms can include hills, valleys, river banks, and dunes. **2-ESS2-1.** Investigate and compare the effectiveness of multiple solutions designed to slow or prevent wind or water from changing the shape of the land. Clarification Statements: Solutions to be compared could include different

			designs of dikes and windbreaks to hold back wind and water, and different designs for using shrubs, grass, and trees to hold back the land. Solutions can be generated or provided.
Lesson 7 **Activity 1:** Erosion Barriers PowerPoint **Activity 2:** Erosion Barriers Packet **Activity 3:** Erosion Scavenger Hunt Day 2 **Activity 1:** Preventing Erosion Designs	I can identify barriers to erosion and explain how they work. I can construct their own barriers to erosion, test them, and evaluate their efficiency.	Flooding occurs when the ground cannot absorb enough water and can sometimes be prevented by growing plants and setting up rain catchers to absorb more water. When flooding does happen, it can be diverted through drains, ditches, and rain-chutes and can be kept away from sensitive areas by concrete barriers and dikes. Erosion occurs when there	**2-ESS2-1.** Investigate and compare the effectiveness of multiple solutions designed to slow or prevent wind or water from changing the shape of the land. Clarification Statements: Solutions to be compared could include different designs of dikes and windbreaks to hold back wind and water, and different designs for using shrubs, grass, and trees to hold back the land. Solutions can be generated or

		aren't enough barriers to keep soil and rocks in place, and can be prevented by putting in natural barriers, like trees, or man-made barriers, like fences and walls.	provided.
Lesson 8 **Activity 1:** Guided Research **Activity 2:** Writing Activity **Activity 3:** Creative Depiction **Activity 4:** Poster or Brochure	I can perform group research on landforms and bodies of water using assigned sources. I can write a paragraph about my research topic with the support of examples provided by my teacher. I can produce and present a poster or brochure.	Scientific research is essential.	**Technology K2: 3.1** Use various age-appropriate technologies to locate, collect, and organize information. **Technology K2: 3.4** Use a variety of age-appropriate technologies (e.g., drawing program, presentation software) to communicate and exchange ideas. **Literacy 2. W.7.** Participate in shared research and writing projects (e.g. read several books on a single topic to produce a report: record science observations).

NGSS Unit Alignment Table

Performance Standard	Science/Engineering Practice (SP)	Disciplinary Core Idea (DCI)	Cross Cutting Concepts (CCC)
2-ESS2-2. Map the shapes and types of landforms and bodies of water in an area. **2-ESS2-3.** Use examples obtained from informational sources to explain that water is found in the ocean, rivers and streams, lakes and ponds, and may be solid or liquid. **2-ESS2-4(MA).** Observe how blowing wind and flowing water can move Earth materials from one place to another and change the shape of a landform. **2-ESS2-1.** Investigate and compare the effectiveness of multiple solutions designed to slow or prevent wind or water from changing the shape of the land.	**SP2: Developing and Using Models** Distinguish between a model and the actual object, process, and/or events the model represents. Compare models to identify common features and differences. (2-ESS2-2) **SP3: Planning and Carrying out Investigations** Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question. 2-ESS2-4(MA). **SP7: Engaging in Argument from Evidence** Make a claim about the merit of a solution to a problem by citing relevant evidence about how it	ESS2.A: Earth Materials and Systems. Wind and water can change the shape of the land. (2-ESS2-4(MA)) 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. (2-ESS2-2) ESS2.C: The Roles of Water in Earth's Surface Processes. Water is found in the ocean, rivers, lakes, and ponds. Water exists as solid ice and in liquid form. (2-ESS2-3)	**Cause and Effect:** Cause and effect relationships are routinely identified, tested, and used to explain change (2-ESS2-3), (2-ESS2-4) **Influence of Engineering, Technology, and Science on Society and the Natural World:** Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands (2-ESS2-1) **Science is a Human Endeavor:** Science affects everyday life (2-ESS2-1), (2-ESS2-2)

Technology K2: 3.1 Use various age-appropriate technologies to locate, collect, and organize information. **Technology K2: 3.4** Use a variety of age-appropriate technologies (e.g., drawing program, presentation software) to communicate and exchange ideas. **2.W.7.** Participate in shared research and writing projects (e.g., read several books on a single topic to produce a report: record science observations).	meets the criteria and constraints of the problem (2-ESS2-1) **SP8: Obtaining, Evaluation, and Communicating Information:** Obtain and combine information from books and other reliable media to explain phenomena (2-ESS2-4), (2-ESS2-2)		

5 E Instructional Model Background

As one of the exemplar components of this unit, we created Essential Question Conceptual Maps that align to the 5 E model. This instructional model exists as a set of phases for science instruction that starts with students' prior knowledge in order to reconstruct a new knowledge with deeper understanding. The *Engagement* phase is first, in which teachers and students begin to mull over questions, prior knowledge and understanding, and potential frustrations they might have with a topic. This phase is meant to be informal – this is the start of the lesson. The second step involves *Exploring* phenomena, which acts as an introduction to the larger concepts that engages students in a hands-on approach. After exploration, *Explanation* of scientific concepts begins. To further student understanding, *Elaboration* is next, in which students are presented with even more challenging activities and problems. Following the learning process comes *Evaluation*, as deemed necessary by learning goals and defined achievements. The model is based on scientific research about how children learn and is meant to be followed chronologically, although some steps may be repeated.

Science Talk and Oracy in T2L Units

Science Talk is much more than talking about science. In line with the science and engineering practices, students are expected to make a claim that can be supported by scientific evidence. The MA STE Standards (and the NGSS) value the importance of engaging in an argument from evidence. NGSS defines how this practice takes form in the real world: *"In science, reasoning and argument are essential for identifying the strengths and weaknesses of a line of reasoning and for finding the best explanation for a natural phenomenon. Scientists must defend their explanations, formulate evidence based on a solid foundation of data, examine their own understanding in light of the evidence and comments offered by others, and collaborate with peers in searching for the best explanation for the phenomenon being investigated."*

Students are asked to participate in articulate and sensible conversations in which they can communicate their ideas effectively, listen to others to understand, clarify and elaborate ideas, and reflect upon their understanding. These forms of talk can be developed using scaffolds such as the A/B Talk protocol (below) and strategies for class discussions (from the Talk Science Primer, link below). Oracy is developed in the physical, linguistic, cognitive, and social-emotional realms; each of these realms can be expanded upon over time in order to develop a thoughtful speaker. Being able to display appropriate body language, use proper tone and grammar, be thoughtful and considerate thinkers, and allow space for other thoughts and opinions are all important facets of oracy to work on and through with students. Incorporating the appropriate scaffolding is an important aspect of fostering these skills. Techniques for teaching effective science talk often include modeling, discussion guidelines, sentence-starters, and generating roles, while gradually putting more responsibility on students to own their thinking and learning.

Part of creating a safe school environment for students is allowing them a space that is comfortable enough for them to express ideas and ask questions, while being validated for their thoughts and questions; students should be feel comfortable and confident when speaking and listening for understanding. Effective talk is an important part of being an active, intelligent member of a community and society. Successful development in oracy is important for future employability and general well-being of adults.

The following resources should be helpful examples of how to employ effective use of progressive oracy and science talk in your classrooms.

- Oracy in the Classroom: https://www.edutopia.org/practice/oracy-classroom-strategies-effective-talk
- Science Talk Primer: https://inquiryproject.terc.edu/shared/pd/TalkScience_Primer.pdf

A/B Talk Protocol

Adapted from https://ambitiousscienceteaching.org/ab-partner-talk-protocol/

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1. Share your ideas

Partner A

- I think _____ happened because…
- Evidence that supports my idea is…
- The activity we did with _____ helps me know more about _____ because…
- One thing I'm wondering about is…

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2. Listen to Understand

Partner B

- I heard you say _____. What makes you think that?
- I heard you say _____. What if _____?
- Can you explain the part about _____ again?
- What do you mean when you say _____?

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3. Clarify and elaborate

Partner A

Answer partner's questions or ask for clarification in order to understand a question.

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4. Repeat steps 2 & 3 until all questions are answered

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5. Switch roles and repeat steps 1-4

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6. Reflect on your understanding in writing

- My idea about _____ changed when my partner said _____.
- I will add _____ to my idea about _____ because…
- I still have questions about…
- I may be able to answer my question(s) if I could investigate _____.

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List of Unit Resources

Lesson 1

Quantity	Item	Source
1	Projector and Computer	Classroom Teacher
	Learning About Landforms: https://www.youtube.com/watch?v=KWTDmg8OI_Y.	CMC Website
1 per group (4 sets total)	Landform Pictures	Bin
1 per group (4 sets total)	Large Words for Landform Matching	Bin
1 per student	Landform Pictures	Binder
1 per student	Types of Landforms Worksheet	Binder
1	Landform PowerPoint	CMC Website
1 per student	Graph paper	Bin
1 per student	Scissors	Classroom Teacher
1 per student	Glue	Classroom Teacher
2-3	Google Cardboard	Bin
2	Smartphone	Classroom Teacher

Lesson 2

Quantity	Item	Source
2 per student	Piece of Paper	Classroom Teacher
	Projector and Computer	Classroom Teacher
1	The Water Bodies: https://www.youtube.com/watch?v=bNWuQD7QHBc	CMC Website
1 per student	Bodies of Water Picture Sheet	Bin
1 per student	Definition Cards	Bin
1 per student	Glue stick	Classroom Teacher
1 per student	Scissors	Classroom Teacher

1 per group of 3-4	iPads	Classroom Teacher
	QR Code sheets (9 total QR codes)	CMC Website *The Classroom Teacher will need to print these prior to the lesson*
9 per student	Stickers	Bin
1 per student	Piece of Paper or labeled worksheet for sticker chart	Classroom Teacher
10 (1 per type of landform)	Laminated images of bodies of water	Bin
2-3	Google Cardboard	Bin
1 or 2 per student	Graph paper	Classroom Teacher
1 per student	"American Crocodiles" Reading and Questions	Binder
1 per student	"Protecting the Wetlands" Reading and Questions	Binder

Lesson 3

Quantity	Item	Source
1 copy per student	An Introduction to Landforms Reader and Questions (11 pages total)	Binder (teacher to make copies)
	Projector and Laptop	Classroom Teacher
	"Learning About Landforms" https://www.youtube.com/watch?v=KWTDmg8OI_Y	CMC Website
Dependent on student need	Various outdoor materials (ex: sticks, bark, leaves, sand)	Classroom Teacher
1 per student	Construction Paper/Cardboard	Bin
	Colored pencils/markers	Classroom Teacher
2 tubs	Air Dry Clay	Bin

Lesson 4

Quantity	Item	Source
1	Treasure	Bin
1	*Follow That Map! A Look at First Mapping Skills* by Scot Ritchie	Bin
	Projector and Laptop	Classroom Teacher
	iPads	Classroom Teacher
5	Dry erase markers	Classroom Teacher
2 copies of each	Laminated Maps: (Berkshire County, Massachusetts, United States)	Bin
1	Topographical Map of Massachusetts	Bin
2	Globe	Classroom Teacher/Bin
	Projector and Laptop	
	Map of Massachusetts from: http://www.worldatlas.com/webimage/countrys/printpage/printpage.php?l=/img/areamap/758a6d72b3af3bdb6711863997c9b613.gif	Classroom Teacher
	Access to the following activity: https://www.nps.gov/webrangers/activities/readingmap/	Classroom Teacher
	Markers	Classroom Teacher
4-5 containers	Play Doh	Bin
1 per student	Flat square pieces of cardboard	Bin
1 per student	"Seven Large Lands" Reading and Questions	Binder
1 per student	"The Difference Between Maps and Globes" Reading and Questions	Binder
1 per student	Paired Text Questions	Binder
1 per student	White paper	Classroom Teacher
	Colored Pencils/Markers	Classroom Teacher

Lesson 5

Quantity	Item	Source
1 per student	Science Journals	Classroom Teacher
1 per student	Plastic Straw	Bin
1 per student	Plastic Bowl	Bin
1	Spray Bottle	Bin
2	Plastic Cups	Bin
1	Empty plastic bottle (10-20 oz.)	Bin
1 Large bag	Sand	Bin
1 Large bag	Soil	Bin
3	Aluminum foil cake pan	Bin
4	Aluminum foil sheet tray (at least 3 inches deep)	Bin
	Pencils	Classroom Teacher
1 per student	Erosion Data Sheet	Binder
1	Computer and Projector	Classroom Teacher

	"Why Do Rivers Curve?" https://www.youtube.com/watch?v=8a3r-cG8Wic&feature=youtu.be Grand Canyon Video https://youtu.be/t8_AclTA0pw Glacier Video https://youtu.be/lTNnw0btcLI V-Shaped Valley https://www.youtube.com/watch?v=FIn0UoeDyVg U-Shaped Valley https://www.youtube.com/watch?v=prf7Xon0hJQ	CMC Website
1 per student	Berkshire Topographic Map	Bin

Lesson 6

Quantity	Item	Source
1 per student	Science Journals	Classroom Teacher
1	Cracking Up- A Story About Erosion	Bin
	Projector and Computer	Classroom Teacher
1	Large clear glass jar	Bin
1 package	Chocolate chip cookies	Bin
1	Sand & cliff image	Bin
1 set	Laminated character cards on popsicle sticks	Bin
1 per student	Straws	Bin
1 per student	small bowls	Bin
	bag of sand	Bin

Lesson 7

Quantity	Item	Source
1	Erosion Barriers PowerPoint	CMC Website
1	Computer and Projector	Classroom Teacher
1	Nature Scenes Video (optional) https://youtu.be/xbyTIw0bQ0o	CMC Website
	iPads (optional)	Classroom Teacher
1 per student	Science Journals	Classroom Teacher
1 per student	Barriers and Erosion Picture Sheet	Binder
1 per student	Preventing Erosion: Erosion Barriers (3 pages total)	Binder
1 per student	Scissors	Classroom Teacher
1 per student	Glue sticks	Classroom Teacher
3	Aluminum foil cake pans (from lesson 4)	Bin
4	Aluminum foil trays (3 from lesson 4)	Bin
1 packet	Rye grass seed	Bin
1 large bag	Soil	Bin

1 large bag	Sand	Bin
2	Plastic Cups (from lesson 4)	Bin
1	Spray bottle (from lesson 4)	Bin
1	Empty plastic bottle (from lesson 4)	Bin
1 container	Q-Tips	Bin
	Small Rocks	Bin
	White Glue	Classroom Teacher
	Tape	Classroom Teacher
2 balls	String	Bin
2 bags	Popsicle Sticks	Bin
1 box	Straws	Bin
1	Aluminum foil	Bin

Lesson 8

Quantity	Item	Source
1 set per group	Bodies of Water Research Resources	Bin and Classroom Teacher
1 set per group	Landforms Research Resources	Bin and Classroom Teacher
1 per water student	Bodies of Water Data Collection Sheets (2 total)	Binder (teacher to make copies)
1 per landform student	Landforms Data Collection Sheets (2 total)	Binder (teacher to make copies
1 per student	Laptops	Classroom Teacher
1 per student	Science Journals	Classroom Teacher
	Choice of materials for creative depictions (tissue paper, colored paper, crayons, miscellaneous art supplies, clay)	Bin
1	Projector and computer for presentations	Classroom Teacher