WATER WONDERS

STEAM Teacher Resource

From top: G. A. Avery, *A Winter Morning,—Shovelling Out* (detail), 14 Jan. 1871. Wood engraving on newsprint. Clark Art Institute, 1955.2620
Otto Stark, *Down-Town Sketches in New York During Monday's Blizzard (recto)* (detail), 1888. Wood engraving on paper. Clark Art Institute, 1955.4293
Berenice Abbott, *Norris Dam, TN* (detail), 1935, printed 1982. Gelatin silver print. Gift of A&M Penn Photography Foundation by Arthur Stephen Penn and Paul Katz, 2007. Clark Art Institute, 2007.2.148
William Allen Rogers, *Fargo, Dakota—Head of Steamboat Navigation on the Red River* (detail), 1881. Wood engraving on paper. Clark Art Institute, 1955.4243

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Introduction

WATER IS EVERYWHERE!

Filling the rivers. Falling from the sky. Powering hydroelectric plants. Water is all around us, and it is essential to life on Earth. *Water Wonders* encourages PK–Grade 8 grade students to investigate how people depend on, respond to, and impact water—both in liquid and solid forms—based on images from the Clark Art Institute's collection.

Water Wonders is a STEAM-centered curriculum resource designed to help you use the Clark's collection to spark your students' learning. STEAM, an acronym for science, technology, engineering, arts, and mathematics, is an education model which promotes integrated learning among these five subjects. Successful STEAM lessons enhance innovation, critical and creative thinking, and deep comprehension among learners by helping them to see and build rich connections between disciplines. *Water Wonders* emphasizes the disciplines of earth science, engineering, and the visual arts.

In this resource you'll find three distinct lesson plans (for Grades PK–2, Grades 3–5, and Grades 6–8), each complete with background information for educators, discussion questions, primary source prompts (for Grades 3+), learning activities, and lists of relevant Massachusetts standards supported by *Water Wonders*. Images of the featured artworks appear at the beginning of each section, accompanied by links to download high-resolution files from the Clark's website. Feel free to skip ahead to the lesson plan designed specifically for your grade level or read the entire resource to see if other activities could be adapted and integrated into your teaching.

We hope you'll consider extending your learning with an in-person or virtual visit to the Clark. We tailor all of our school tours to suit grade level, learning objectives, and curriculum standards. Please contact education@clarkart.edu to learn more.

Happy innovating,

The Education Department

THE CLARK

GRADES PK–2

G. A. Avery, *A Winter Morning,—Shovelling Out*, 14 Jan. 1871. Wood engraving on newsprint. Clark Art Institute, 1955.2620

Wild Winter Weather

LEARNING OBJECTIVES

Students will explore the relationship between water and weather; consider how living things, including humans, are impacted by the weather; and how precipitation is related to the temperature.

BACKGROUND

Winslow Homer was an American artist born in Massachusetts almost 200 years ago. When Homer was a young man, his job was to make drawings to go along with magazine stories. These drawings or pictures are called illustrations. Photography was still new, so magazines did not have many photographs in them. Instead, they often had illustrations so people could better imagine what the story looked like.

One of the magazines Homer worked for was called *Every Saturday*. People read this magazine to learn more about what was happening in the country.

Before Homer's artwork could be put into a magazine, it needed to be adjusted so that it could be printed over and over in each copy of the magazine. Another type of artist, called a printmaker, helped with this. The printmaker, G.A. Avery, copied Homer's art by carving the image into wood. Ink was then put on the wood, and the picture (called a print) was made using a machine, called a printing press. Many prints could be made from a single carving (called a woodblock).

DISCUSSION

Invite students to look carefully at the illustration. Ask students guiding questions, such as:

1. Does this place remind you of anything or any place you have seen before?
2. What is the temperature like in this picture? What season is it? How do you know?
3. What is snow made of?
4. What will happen when the temperature gets warmer?
5. What would be different about this picture if this were summer?
6. What are the people doing and what are they holding?
7. How do you think the people in this picture feel, and why?
8. Where might the people be shoveling to? To a neighbor's house? To the street? Their mailbox? Why is it important that they make a path through the snow?

STEAM Activity

ACT IT OUT!

Invite students to engage in *pantomime*. Pantomime is a dramatic arts technique where performers communicate through physical gestures, facial expressions, and movement, instead of speech. If you've ever played a game of charades then you've engaged in pantomime!

First, ask students to pretend they are the people in the illustration. What motions can they do with their bodies to pantomime shoveling snow? What is the woman in the back doing? Is the snow heavy or light? How can they show this in their gestures and facial expressions?

Brainstorm a list of other winter activities and have students pantomime ways that people react to winter weather based on the list. Activities could include riding on a sled, building a snowman, ice skating, and bundling up in winter clothing. Students can perform one at a time in front of the class. Remind students to use only their physical gestures and no words. Invite students to guess what their classmates are acting out and share how they figured it out.

Once students have a solid understanding of pantomime, let the explorations grow! Try investigating how other living things—animals and plants—prepare for and respond to the winter weather. A goose would be migrating south, a bear would be hibernating, and a squirrel would be digging through the snow to get to its stash of food, just to name a few. Can students act out all of these concepts?

Older students can try these variations:

- Make a list of the creatures that live in your area. Consider how each survives the winter. For creatures that the students are not sure about, brainstorm ideas or possibilities about the ways they might prepare for and survive the winter. Research and see what the students got right.
- Write down facts about how other living creatures prepare for and respond to the winter weather on small pieces of paper. Place the paper slips in a hat or bucket. Have students pull out a slip and pantomime what is written there. Can classmates guess what is being dramatized?
- Challenge students to research and find other images of intense weather events. Ask students to work in small groups to bring the image to life through a group performance where each person pantomimes a different part or character in the image. Consider how other animals are impacted by the different types of extreme weather.
- Besides shovels, investigate the varied tools and inventions that people use in weather events, such as umbrellas (both for rainfall and shade) and snowplows. Have students make a list of tools and inventions and incorporate them into their pantomimes.
- Invite students to think more abstractly and pantomime the phases of water changing over time, specifically liquid and solid. How might students show through gestures that they are ice/snow melting into liquid, or vice versa, that they are liquid freezing into solid ice/snow?

- Students can explore other seasons and weather. Have students pantomime what the people in Homer's image might be doing in the spring, summer, and fall after a significant weather event involving water.
- Pantomime is done without speaking, but students can try adding accompanying sound effects. Divide the class into two groups. Have one group engage in a pantomime performance while the other group overlays sound effects (made with found classroom objects, their bodies, or small instruments) to help bring the scene to life.

SHARING

After trying different variations of pantomime, discuss the process as a class. Ask students how they came up with their ideas, what was most challenging, and what was most enjoyable and why. Did acting out weather situations change their understanding of weather? Consider taking photos or filming the students while they perform and then share this back with the students so they can respond to their own work.

MEASUREMENT-THEMED ART

Ask students to notice how high the snow is in the picture. It is higher than the people's shoulders, and the trunk of the tree is barely seen. Can students imagine snow being this deep? How would someone measure the depth of the snow? Send students on a hunt around the classroom to find things in the classroom that come up to their shoulders' heights.

As a class, go outside to make a colorful measurement-themed art installation (a site-specific artwork designed to transform a space). Begin by having each student select a long piece of colorful ribbon. Encourage creativity by having students string beads in a pattern of their choice. Then, go outside and choose a tree. Students should work with a partner to mark on the tree where their shoulder height is against the trunk. Have each student tie their unique ribbon at that spot until all of the students have tied their ribbons to the tree. Step back and look at the result. Can students imagine the snow reaching that height, as seen in the artwork?

Alternatively, if there is snow outside, be sure to bring students outside with measurement tools to measure how deep it is. Select a tree trunk upon which you can measure the snow's height. Have students tie a colorful ribbon to the tree trunk to mark the snow's depth, and continue to tie different ribbons throughout the season to mark the snow's changing depths. Come springtime, the tree will be a colorful documentation of the season's snowfall.

Standards

MASSACHUSETTS SCIENCE AND TECHNOLOGY/ENGINEERING FRAMEWORK

Pre-Kindergarten Content Standards
Earth and Space Sciences: Earth's systems
Provide examples of the impact of weather on living things. (PreK-ESS2-6)

Kindergarten Content Standards
Earth and Space Sciences: Earth and human activity
Obtain and use information about weather forecasting to prepare for, and respond to, different types of local weather. (K-ESS3-2)

Grade 1 Content Standards
Earth and Space Sciences: Earth's place in the universe
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. (1-ESS1-2)

Technology/Engineering: engineering design
Ask questions, make observations, and gather information about a situation people want to change that can be solved by developing or improving an object or tool. (1.K-2-ETS1-1)

Grade 2 Content Standards
Earth and Space Sciences: Earth's systems
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-ESS2-3)

Standards

MASSACHUSETTS MATHEMATICS FRAMEWORK

Pre-Kindergarten Content Standards

Measurement and Data

A. Describe and compare measurable attributes. 1. Recognize the attributes of length, area, weight, and capacity of everyday objects using appropriate vocabulary (e.g., long, short, tall, heavy, light, big, small, wide, narrow). (PK.MD)

Kindergarten Content Standards

Measurement and Data

A. Describe and compare measurable attributes. 2. Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference. For example, directly compare the heights of two children and describe one child as taller/shorter. (K.MD)

Grade 1 Content Standards

Measurement and Data

A. Measure lengths indirectly and by iterating length units. 1. Order three objects by length; compare the lengths of two objects indirectly by using a third object. (1.MD)

Grade 2 Content Standards

Measurement and Data

A. Measure and estimate lengths in standard units. 1. Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.

3. Estimate lengths using units of inches, feet, centimeters, and meters.

4. Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard length unit. (2.MD)

Standards

MASSACHUSETTS ART FRAMEWORK

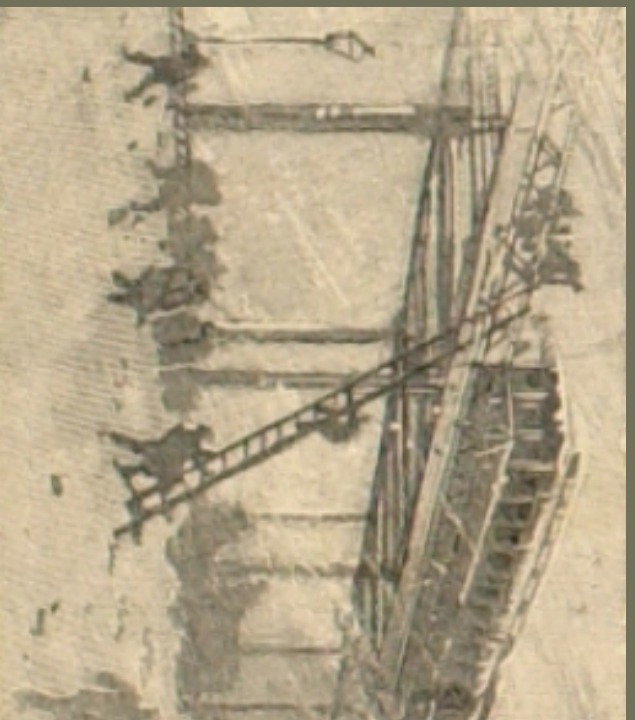
Pre-Kindergarten–Kindergarten Visual Arts
8. Interpret intent and meaning in artistic work. Describe what is seen in an artwork, interpret a possible meaning, and explain why the meaning makes sense. (PK-K.V.R.08)

Grade 1–Grade 2 Visual Arts
7. Perceive and analyze artistic work. With support, identify the basic elements within an artwork (including color, line, shape). (1-2.V.R.07)

Pre-Kindergarten–Kindergarten Theatre
6. Convey meaning through the presentation of artistic work. Portray simple characters in dramatic play. (PK-K.T.P.06)

Grade 1–Grade 2 Theatre
6. Convey meaning through the presentation of artistic work. Portray a character based on an existing plan (e.g., script, improvisation structure). (1-2.T.P.06)

GRADES 3–5



Otto Stark, *Down-Town Sketches in New York During Monday's Blizzard (recto)*, 1888. Wood engraving on paper. Clark Art Institute, 1955.4293

Blazing Through a Blizzard

LEARNING OBJECTIVE

Students will consider how human beings contend with severe weather conditions and the relationship between the natural world and technology. Students will use creative and critical thinking skills to design innovative solutions for blizzard-impeded train travel.

BACKGROUND

This artwork was an illustration in a magazine called *Harper's Weekly*. *Harper's Weekly* was a popular magazine in the 1880s and was one of the ways that people learned about the news in the U.S.

Text on the artwork reads, "Drawn by Charles Graham," but the label below says the artwork is by Otto Stark. In fact, both of these American artists worked to make this illustration!

Charles Graham made art using pencils and paints. He worked for *Harper's Weekly*, and his illustrations appeared in many issues of the magazine. Before his artworks could be put into the magazine, they needed to be adjusted so that they could be printed over and over in each copy of the magazine. That is where Otto Stark came in. When Otto Stark was a teenager he learned how to be a printmaker. A printmaker is someone who makes art by using special materials to carve an image onto stone, wood, or metal. Ink is then put on the stone, wood, or metal, and the image (called a print) can be produced using a printing press machine.

By the 1880s, photography was invented, however the process of reproducing multiple photographs in a magazine made it more time consuming and expensive than prints. Prints were therefore the primary illustrations in books, newspapers, and magazines.

DISCUSSION

Show students the illustration and ask them what kind of natural event is being depicted in the artwork. How might this weather event be different if it were not wintertime? How might an artist's print give different information than a photograph?

Technology—defined as any modification of the natural or designed world done to fulfill human needs or wants—is present in these sketches. What kinds of technology do students see in the artwork that helps humans with their needs? Do we still have these same types of technologies today? How have they changed since 1888? How are the modes of transportation (such as the carriages and the trains) being impacted by the blizzard? What do present-day people do to get through a tough storm?

Primary Source Discussion

Intense weather events are fascinating—and often distressing—to humans. A detailed account of the March 1888 New York City blizzard was compiled in a book the same year as the storm. The book amassed first-hand reports that were originally printed in newspaper columns in *The New York Sun*.

Provide students with copies of PRIMARY SOURCE: SELECTION FROM *NEW YORK IN THE BLIZZARD*. Encourage students to highlight or underline any words they do not recognize so the class can figure out the definitions together (a glossary of uncommon words and phrases is included).

After the students finish reading, ask them the following guiding questions:

1. What would cause the rain to change to sleet?
2. What might have happened if it kept raining?
3. Specifically, what were some of the challenges trains faced when moving through the city?
4. How were people trying to clear away the snow and ice?
5. This blizzard happened over 130 years ago; how and when do you think people today would learn about a blizzard like this? How would that change the impact of the blizzard?
6. How might a primary source document from today be different from this selection from the 1800s?
7. Compare the two primary source documents—the report and the illustration. What is described in the writing and also shown in the artwork? How do they each offer different information?

Primary Source

SELECTION FROM NEW YORK IN THE BLIZZARD[1]

At little after 12 o'clock on Sunday night, or Monday morning, the severe rain that had been pelting down since the moment of the opening of the church doors suddenly changed to a sleet storm that plated the sidewalks with ice… trains were obliged to move slowly and with added caution on account of the blinding, whirling snow…[Snow drifts] had to be cleared away before anything could be done … the snow was packed by the wind into the crevices between the rails like solid ice, and it required a special force of men with brooms and pails of salt water to keep the movable rails in working order… The passengers on the trains south of Twenty-third street who were imprisoned in cars … waited for hours for progress or relief. [Long ladders] were placed against the trestle, and by means of these the passengers were slowly taken to the ground.

Glossary

SEVERE
hard or extreme

PELTING
falling quickly and heavily

PLATED
covered with a thin coating

OBLIGED TO
forced to

CREVICES
small, narrow cracks or openings

IMPRISONED
kept in a place like a jail

TRESTLE
a structure like a bridge that helps support a heavy train

1. Jennings, N. A. & Lingan, M. (1888) *New York in the blizzard: being an authentic and comprenhensive recital of the circumstances and conditions which surrounded the metropolis in the great storm of March 12, 1888*. New York: Rogers & Sherwood. [Pdf] Retrieved from the Library of Congress, https://www.loc.gov/item/01014687/.

STEAM Activity

TIME-TRAVELING ENGINEERS

Encourage students to look carefully at the entire image. Notice how there are three smaller images imposed on the larger one. Consider why the artist chose to make the image like this—do the smaller rectangular images remind them of anything? Why might the artist choose to make these parts of the image look like photographs?. Have the students share details that caught their attention. What kinds of technologies can they identify? (ladder, bridge, carriages, shovels, streetlights, utility pole, and electrical wires—electricity would have been brand new in the city in 1888). Why might the artist have included this detail? Does the image with the utility pole feel different from the rest of the picture? How do students interpret this artistic choice? Which technologies are working the way they should, and which are not?

Have students pretend that they can time travel back to 1888 and imagine they are engineers—people who design and build new and/or better products, machines, structures, and systems. What kinds of improvements to the technologies (innovations) or new technologies (inventions) can they imagine would better help the train navigate through a blizzard? Encourage creativity; no idea is too wild or far-fetched! Brainstorming as a class can help students get idea flowing.

Then provide art materials, such as colored pencils and markers, so that students can develop a drawing or diagram of their invention or innovation. The following considerations can guide students in making their drawings as strong as possible:

- Have students think about how a diagram is different from an illustration.
- Point out that Charles Graham/Otto Stark's engraving is black, white, and gray. How would the artwork be different for the viewer if it were printed in colors? Challenge students to use colors in their drawings to convey meaning effectively.
- Encourage students to draw details into their artworks or use text to highlight the specific features of their inventions or innovations. Just as Charles Graham/Otto Stark uses rectangles to call out distinct parts of the scene, students can emphasize elements in their drawings this way too.
- Direct students' attention to the way that Charles Graham/Otto Stark used a hand drawn font to title the artwork. How does the style impact the drawing? How would using a type-font feel different?
- Ask students to include the title of their invention or innovation somewhere on their artwork.

Extend students' thinking with this investigation:

- Does anything like the student's idea for their invention or innovation exist?
  - ⟶ If yes, when was it created? What features are similar to the student's design? Has the design and/or function evolved over time?
  - ⟶ If not, do we have the technology to make it work? What are some of the reasons that their idea might not be practical?

PRESENT

Have students share the drawings of their inventions or innovations with the rest of the class. Students can introduce their ideas with a playful statement such as: “Greetings people of 1888! I am an engineer from the future, and I have traveled through time to help you get your trains through the next blizzard. Let me present to you my invention.” Allow students to give feedback and ask questions of each presenting student.

SELF-REFLECT

After hearing classmate’s thoughts and questions, ask each student to complete a self-reflection to evaluate their design on how well they believe it will assist a train in navigating through a blizzard. Have students note what changes—if any—they would make to their invention based on their classmates’ feedback.

Standards

MASSACHUSETTS SCIENCE AND TECHNOLOGY/ENGINEERING FRAMEWORK

Grade 3 Content Standards
Earth and Space Sciences: Earth and human activity
Evaluate the merit of a design solution that reduces the damage caused by weather. (3-ESS3-1)

Grade 4 Content Standards
Earth and Space Sciences: Earth and human activity
Evaluate different solutions to reduce the impacts of a natural event such as an earthquake, blizzard, or flood on humans. (4-ESS3-2)

Grade 5 Content Standards
Technology/Engineering: technological systems
Use informational text to provide examples of improvements to existing technologies (innovations) and the development of new technologies (inventions). Recognize that technology is any modification of the natural or designed world done to fulfill human needs or wants. (5.3-5-ETS3-1)

Standards

MASSACHUSETTS ARTS FRAMEWORK

3rd–4th Grade Visual Arts

3. Refine and complete artistic work. Respond to an artistic challenge and draft possible resolutions. (3-4.V.Cr.03)

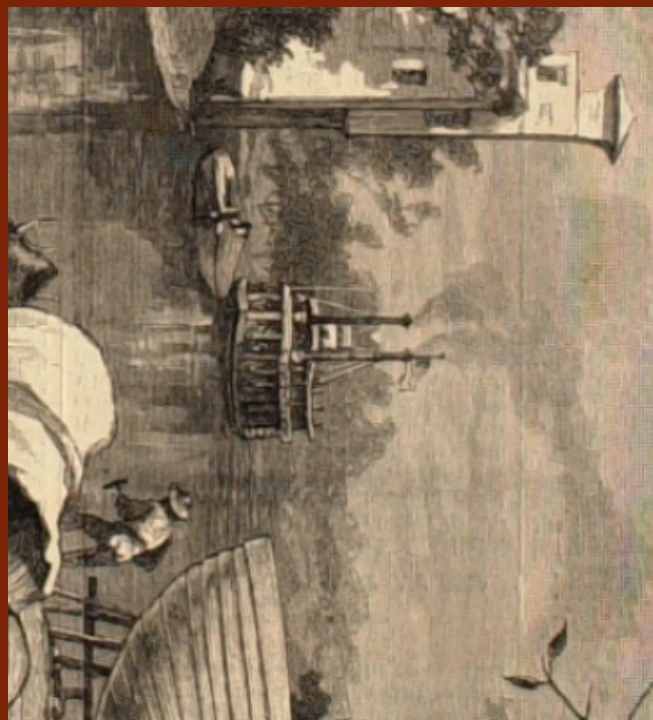
6. Convey meaning through the presentation of artistic work. Share a work that expresses, evokes, or communicates a selected idea. (3-4.V.P.06)

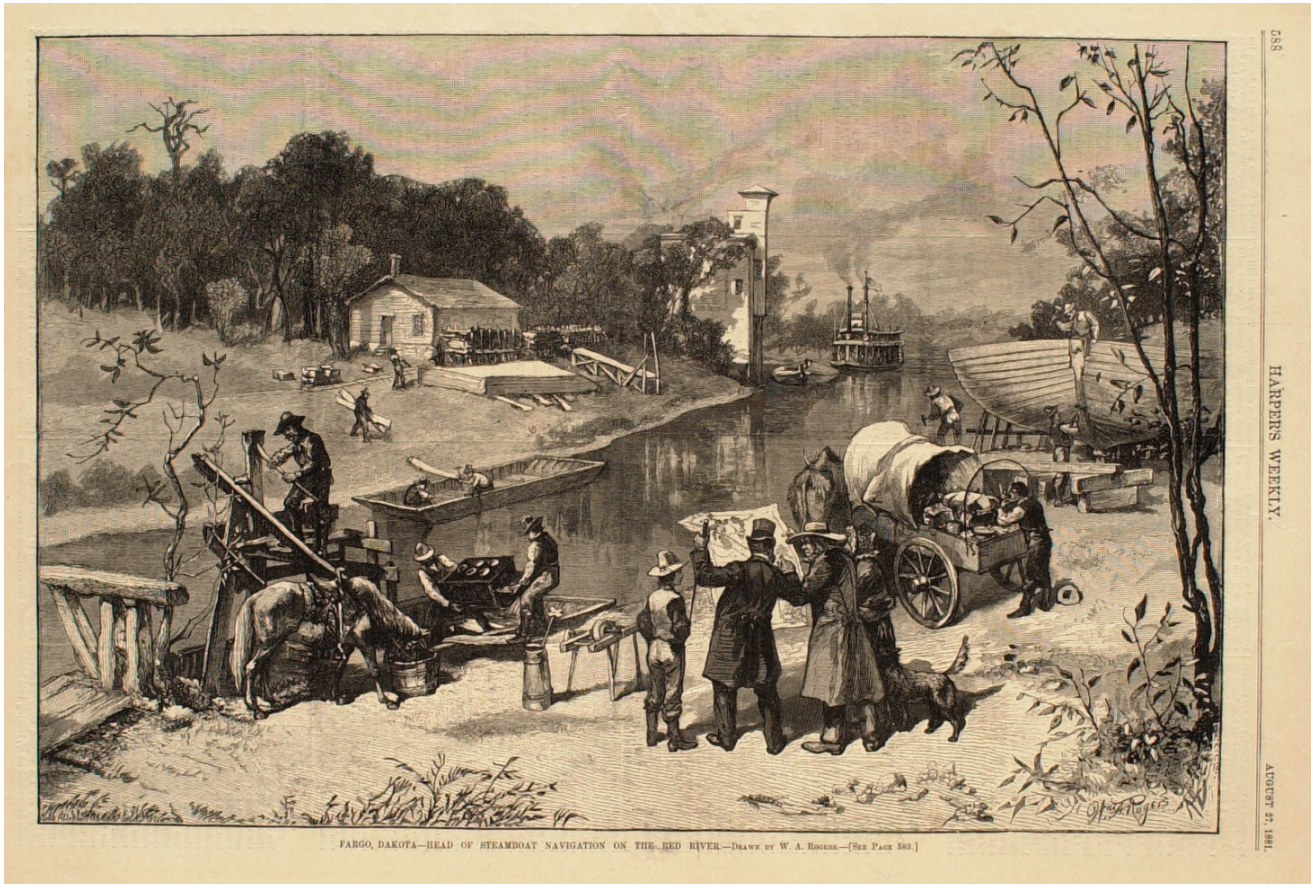
5th–6th Grade Visual Arts

3. Refine and complete artistic work. a). Refine an artistic work by making changes to specific elements, such as color, form, or space. (5-6.V.Cr.03.a)

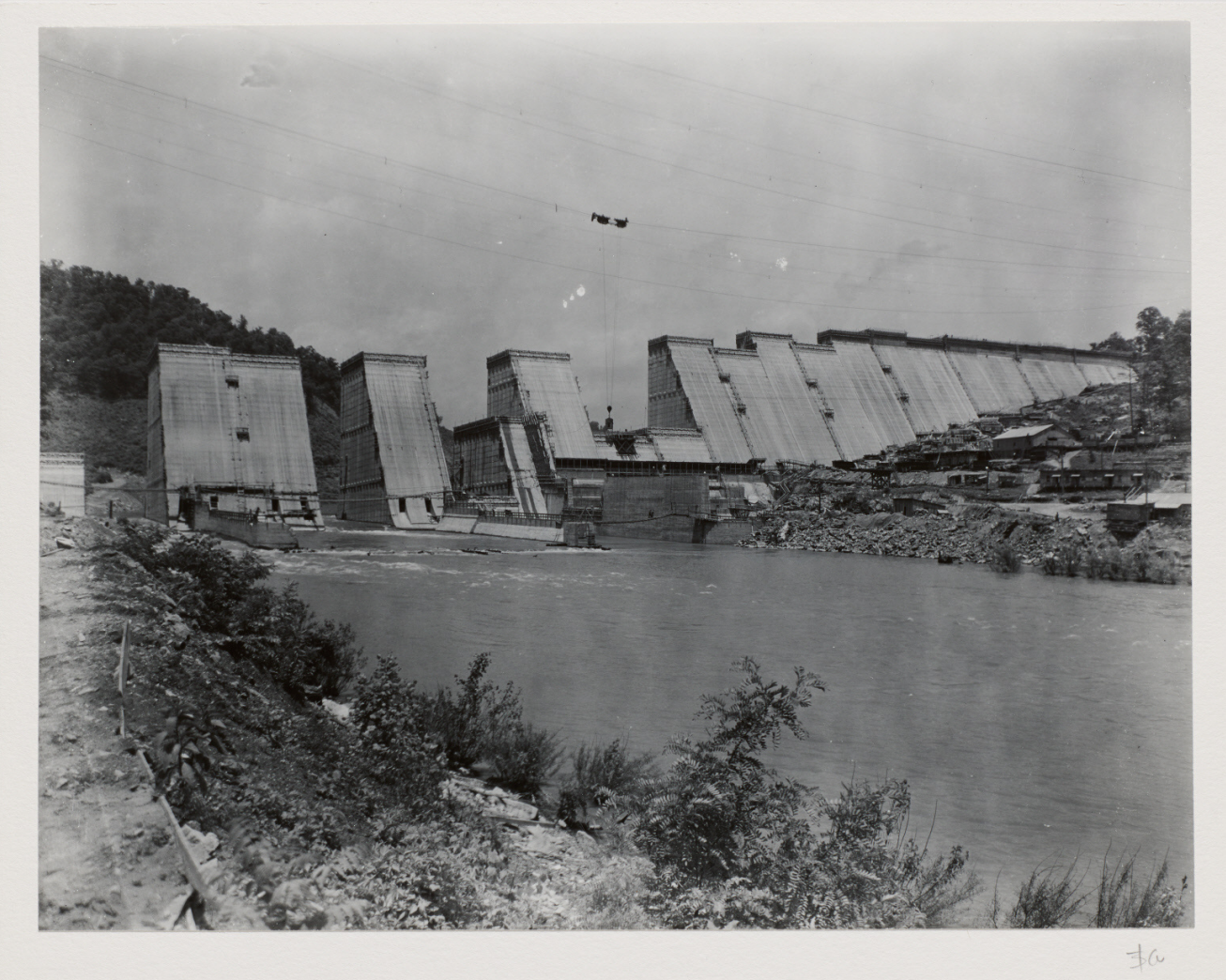
6. Convey meaning through the presentation of artistic work. Formally present a piece of artwork (i.e., personally speak about the artwork, as opposed to just having the work displayed) that makes connections to other disciplines. (5-6.V.P.06)

GRADES 6–8





William Allen Rogers, *Fargo, Dakota—Head of Steamboat Navigation on the Red River*, 1881. Wood engraving on paper. Clark Art Institute, 1955.4243



Berenice Abbott, *Norris Dam, TN*, 1935, printed 1982. Gelatin silver print. Clark Art Institute, Gift of A&M Penn Photography Foundation by Arthur Stephen Penn and Paul Katz, 2007.2.148

Time & Technology

LEARNING OBJECTIVE

Students will investigate what drives humans to develop new technologies and the impact of technological developments on natural resources.

BACKGROUND

William Allen Rogers was an artist from Ohio. He become know for his political cartoons. A political cartoon is an artwork that makes a statement or critique (through exaggeration and humor) on current events and the government. William Allen Rogers' artwork was featured in a magazine called *Harper's Weekly*. *Harper's Weekly* was a popular magazine in the 1880s and was one of the ways that people learned about the news in the U.S. At the time this artwork was created, North Dakota's population was growing tremendously and new developments, such as a railroad, were springing up to fulfill all of the peoples' needs.

Berenice Abbott was an American photographer who was also from Ohio. During her career, Berenice Abbot took photographs as part of the Works Progress Administration (WPA) project. The WPA was started during the Great Depression, as a way to give more people jobs. The Tennessee Valley Authority (TVA) was the largest single venture of the WPA and the Norris Dam was the first major project completed by the TVA. It was constructed in 1936 to control the widespread flooding in the Tennessee Valley and to help keep the river safe to navigate year-round. It also provided electricity to the region. The dam brought many changes—both technological and cultural (it was even the subject of a 1941 photography exhibit at the Museum of Modern Art in New York City!).

DISCUSSION

Begin by showing students the engraving by William Allen Rogers. Without revealing the label of this artwork, can students guess where and when this artwork takes place? How do they know? Ask students to look closely and list all of the human activities that are happening on and in this busy river. How might the activities be different if the water were in a different condition, such as frozen ice? How are natural resources being used here? Why does the river seem to be so important to human life? How might these human activities impact the environment and the natural river habitat? Today, more than 140 years later, how are people dealing with the effects of these kinds of human activities?

Show students the second artwork by Berenice Abbott. Do they think this photograph was created before, after, or at about the same time as the first? Why or why not? How are natural resources being used in the photograph? Challenge them to compare and contrast the two artworks. How has the way humans use rivers changed over time? Why do they think rivers continue to be such important places for humans to build and develop new technologies?

Primary Source Discussion

Technology—defined as any modification of the natural or designed world done to fulfill human needs or wants—can have both pros and cons. Provide students with copies of PRIMARY SOURCE: SELECTION OF INTERVIEW EXCERPTS FROM *FOR THE GREATER GOOD: NORRIS DAM AT 80*. Encourage students to highlight or underline any words they do not recognize so the class can figure out the definitions together (a glossary of uncommon words is included).

In the 1930s most people living in the state of Tennessee did not have electricity in their houses. The people were very poor and farming was difficult because of frequent floods, which made the soil bad. Few people even had running water in their homes. The Tennessee Valley Authority (an electric power company) planned to build a dam on the Clinch River. A dam is a structure that holds back and controls the flow of water. It can be used to prevent floods, to store water, and to channel the power of the water's movement to make electricity.

TVA saw the dam as a way to help the Tennessee residents and give them a better, more modern life. However, before the dam could operate to bring electricity to the people, a human-made lake needed to be built. The lake would go right where the people where living! Therefore, 14,000 people, along with their houses, businesses, and cemeteries, would need to be moved to make room for the construction of the Norris Dam. People's opinions were split—some wanted the dam, and some didn't. People had to sacrifice their rural way of life in order to receive electricity and see technological progress in their area of the country.

A documentary film from 2016 called *For the Greater Good: Norris Dam at 80* contains interviews of people who were alive when the dam was being built.

After the students finish reading, ask them the following questions:

1. How do you think you might have felt if you were one of the Tennessee residents who was told to move in order to make room for the dam? Do you think you would have agreed to do so right away, or would you have resisted the change?
2. What were some of the benefits of having electricity for these Tennessee residents? What were some of the disadvantages?
3. People were impacted by the building of the dam; how do you think other elements in nature, such as plants and animals, were affected?
4. What kinds of modern-day technologies make living easier for you? How do you think people felt about them when they were newly created and introduced to the public?

Primary Source

SELECTION OF INTERVIEW EXCERPTS FROM FOR THE GREATER GOOD: NORRIS DAM AT 80[2]

"We didn't have electricity, nor indoor plumbing and electricity... I was five years old. TVA came around and started talking about buying and purchasing the land for this great dam that was going to be built... [Relocating buried people] was big concern to the people. The graves of their ancestors would be forever covered with water."
—John Rice Irwin

"We used to have to study at our lessons and do our homework under kerosene... When we finally got the [electricity] line in and I came in that night, and there was just one light bulb hanging down on a socket, and it was the brightest thing that I'd seen in a long time... I would probably have not had, or foreseen, the opportunities that were going to be available for the future as a result of having that dam."
—Carl Stiner

"...[the people in the community] would have electricity and they all agreed that it was going to help more people than it would hurt... I just wonder what would have happened had the Norris Dam not have been built. Would I have been farming, or would I have gone? Would I have gotten an education? I feel like it was for the best."
—Carlock Stooksbury

Glossary

PLUMBING

a system of pipes that moves water for drinking, bathing, and flushing toilets

KEROSENE

an oil that catches on fire easily and is often used to provide light or heat

FORESEEN

to have predicted

2. Dean, S. (Producer). (2016). *For the greater good: Norris Dam at 80* [Film]. WBIR-TV, The Heartland Series, and 10 News.

STEAM Activity

JUXTAPOSING PHOTOGRAPHS

The two artworks show the evolution of human relationships with water and technologies on a grand scale, but there are many instances of changing technologies all around us. Just as artist Berenice Abbott liked contrasts in her pictures, invite students to become a photographer for the day and draw inspiration from her.

Ask them to capture images in the school and/or surrounding neighborhood which highlight development of human technologies. Challenge the students to work with a partner to discover and photograph evidence of older technology and newer technology. For example, inside the school there might be a phone booth/pay phone. Students could photograph this phone and then capture a picture of a cell phone to show the old and new. Or, students may photograph a traditional gas-powered car in the parking lot alongside a newer electric vehicle. Have students share their photographs in a platform of your choice (like a Google Slide Show, for example) where the two photos can be displayed side by side.

The following hints can guide student pairs in taking meaningful photographs:

- Lighting can affect the mood and visibility of a photograph. Encourage students to think about whether or not the lighting allows the subject (the main thing that is being dealt with) to be seen clearly by the viewer. Is there a creative way to investigate the lighting?
- Is the subject overwhelmed by other objects in the background? Point out to students that it should be obvious what the subject of the photograph is. Is there a creative way to emphasize the subject?

PEER SHARING

Ask students to join another pair to form a group of four. In their small groups, students should share their photographs and explain their thought processes. Critical thinking can be promoted by asking each other rigorous questions.

Peer questions could include:

1. Why did you decide to photograph those two objects/technologies?
2. What were some of the ways the new technology changed human behavior and habits? Was anything lost in shifting one technology to a newer one? What informs your opinion?
3. Were there any challenges in capturing these objects in a photograph? If so, what where the obstacles?
4. How are these technologies produced? In a factory? Somewhere else? Do you know anything about how the production of these technologies impacts people and the natural environment? Where can we find out this information?

EXTENDED RESEARCH

Challenge students to conduct research based on the conversations they had in their small peer group. Where and when are the technologies that they photographed made? What did they replace? How are people and the natural environment impacted by the production of these technologies? Does the production cause pollution or is it made in a "green" way? Ask students to share the results of their research and discuss it as a class.

Standards

MASSACHUSETTS SCIENCE AND TECHNOLOGY/ENGINEERING FRAMEWORK

Grade 6 Content Standards

Technology/Engineering: engineering design

Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution. Include potential impacts on people and the natural environment that may limit possible solutions. (6.MS-ETS1-1)

Grade 7 Content Standards

Earth and Space Sciences: Earth and human activity

Construct an argument supported by evidence that human activities and technologies can mitigate the impact of increases in human population and per capita consumption of natural resources on the environment. (7.MS-ESS3-4)

Grade 8 Content Standards

Earth and Space Sciences: Earth and human activity

Examine and interpret data to describe the role that human activities have played in causing the rise in global temperatures over the past century. (8.MS-ESS3-5)

Standards

MASSACHUSETTS ARTS FRAMEWORK

5th–6th Grade Visual Arts
1. Generate and conceptualize artistic ideas and work. Generate artworks that integrate ideas with new materials, methods, and approaches. (5-6.V.Cr.01)

11. Relate artistic ideas and works to societal, cultural and historical contexts to deepen understanding. Identify influential works of art from different periods and their impact on the artistic world. (5-6.V.Co.11)

7th–8th Grade Visual Arts
1. Generate and conceptualize artistic ideas and work. Generate artistic ideas that demonstrate differences in composition principles (e.g., balance, proportion, emphasis) and push the boundaries of what materials can do. (7-8.V.Cr.01)

11. Relate artistic ideas and works to societal, cultural and historical contexts to deepen understanding. Identify visual ideas from a variety of cultures connected to different historical populations. (7-8.V.Co.11)