

Teacher's Guide for COBBLESTONE *The Great Bridge*

March 2010

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Goal: to marvel the engineering process, the historical importance, and the personal commitment and dedication required to build the Brooklyn Bridge.

*Always have a parent or adult you trust help you research websites.

"A Bridge to History" by Emily Goodman (Pages 2-3)

Pre-reading: What do you know about the Brooklyn Bridge? What would you like to learn?

Vocabulary Check: boroughs, span, pedestrians, suspension, drawback, convenient, hectic, whizzing, exhaust, links, and inspires.

Comprehension Check:

1. Tell how New York is like five cities in one.
2. Name three or more different types of bridges.
3. Explain the purpose of a bridge.
4. What does the author mean when she says, "It's a beautiful historic monument that is used by ordinary people every day?"
5. What does the author mean when she says, "It fills a need and inspires at the same time?" Would you agree or disagree and why?

Writing Activity:

- Pretend you are visiting New York City and you decide to walk across the Brooklyn Bridge. List three things you would hope to see, smell, and hear.
- Write a creative statement or a short poem about the bridge. For example, choose two more words that begin with "b" and make a statement such as: Brooklyn Bridge benefits barges.

Research/Bulletin Board:

- Locate photos of old bridges. Identify the types, if possible. Post articles, pamphlets, and other information about old bridges on a bulletin board during this study.

"Opening Day!" by Gail Skroback Hennessey (Pages 4-7)

Pre-reading: Look at the pictures, captions and the title. What clues indicate that this was a big event?

Vocabulary Check: captures, spanning, engineering marvel, festive, barely, crammed, glimpse, proceedings, scaled, buntings, dignitaries, tense, proclaimed, presided, eager, illuminate, procession, triumphant, descended, escorted, standard, promenade, spectacular, pyrotechnic, simultaneously, elevated, pedestrians, eliminated, and eventually.

Comprehension Check:

1. Why were people calling the bridge the Eighth Wonder of the World?
2. Why were many area businesses and schools closed at this time?
3. What was the mood of the people? How can you tell?
4. Tell about the tense moment with President Arthur's carriage.

5. Describe some of the sounds that were part of the celebration.
6. Why did the officials attend a reception at the engineer's home?
7. Why were spectators thrilled to see electric lights on the bridge?
8. Tell about the fireworks show.

Math Skills:

- Create some basic math problems that are based on the cost to cross. Animals could be counted by the dozen or the head. Make change for the problems.
- Opening day's special rate for pedestrians was one penny. The standard rate was three cents. Make a chart of opening day rates, standard rates, and rates today.
- The standard toll for pedestrians was _____ times the opening day rate.

Writing Skills:

- Pretend that you were one of the Opening Day special ticket holders on the bridge's roadway. Write what you will do with your ticket stub.
- Survey family members to learn if any have ever visited or lived in New York. Learn if any have ever crossed the Brooklyn Bridge.
- Pretend to have crossed the East River with a load of animals on a ferry. Then pretend to cross on the Brooklyn Bridge with the same load. Tell about the difference in the two trips.

Research:

- When did paying tolls to cross roads and bridges begin?

"Roebbling's Vision" by Marcia Amidon Lusted (Pages 8-10)

Pre-reading: Look at the pictures, captions, and the title. Did Roebbling's vision come true?

Vocabulary Check: relied, frustrating, possessed, confident, alternative, aqueducts, reputation, suspenders, impede, intimidating, finalizing, amputated, tetanus, specifications, ironically, sparked, devoted, and strolling.

Comprehension Check:

1. John A. Roebbling had a frustrating experience while in New York. What did it convince him was needed?
2. In what field had John A. Roebbling been trained in Germany?
3. Why did Roebbling come to America? Do you think he found what he was looking for?
4. Tell what made his company's cable unique.
5. What kind of experience did John A. Roebbling have before beginning the Brooklyn Bridge?
6. What made the bridge special that was built in Cincinnati?
7. Name two of the challenges of New York's East River.
8. Selecting the suspension structure was best for ship traffic. Explain.
9. John A. Roebbling was confident. What did he tell the board of experts who were to review the plans for the bridge?
10. Tell about the injury of John A. Roebbling.
11. The author says Roebbling's strong personality worked against him when he was injured. What caused John A. Roebbling's death?
12. Who completed the bridge project after John A. Roebbling's death? How long did it take?

Writing Activity:

- Pretend to be on the board of experts who reviewed John A. Roebbling's plans for the bridge. Pretend to be speaking to another board member. Write your reaction to Roebbling's comments about his plans. (See the first paragraph of page 10)
- Pretend to be John A. Roebbling's doctor. Write what you would tell him about treating his injury.

- Pretend to be John A. Roebling after being infected with tetanus. You know your disease is fatal. Write a letter to Washington, encouraging him to complete the bridge. What would you say?

Research:

- The Covington-Cincinnati Suspension Bridge (renamed the John A. Roebling Suspension Bridge in 1983).

Art:

- Illustrate your way of defining Roebling's Vision.

"New York City, 1869" by Marcia Amidon Lusted (Page 11)

Pre-reading: Look at the picture, the caption, and the title. What looks modern in the picture and what looks old?

Vocabulary Check: dominated, teetering, residents, metropolis, accomplished, transcontinental, commercially, relieve, link, emerged, feats, and consisting.

Comprehension Check:

1. Tell how transportation was changing.
2. How did people travel between New York and Brooklyn, before the bridge was built?
3. What method of communication was soon to come?
4. Name two engineering feats in other parts of the world.
5. How did the structure of New York City change as it grew?

Art/Social Studies:

- Draw a seesaw. Place "Old" and "New" on opposite sides of the seesaw. Read the article and look for signs of old and new. Write them on the appropriate side of the seesaw.
- Draw a picture that shows Brooklyn's main reason for the bridge. Draw a picture that shows New York's main reason for the bridge. Are these the same or different? Why?

Research:

- Suez Canal in Egypt
- Mont Cenis tunnel in France
- The Transcontinental Railroad in the United States

"The Work Continues" by Peg Lopata (Pages 12-14)

Pre-reading: Look at the pictures, captions, and the title. How would you describe the work required for building the bridge?

Vocabulary Check: surveyor, aqueducts, fascinating, interrupted, complained, bitterly, distinguishing, gallant, caisson, tragedy, obvious, progressed, pressurized, astounding, collapsed, exhausted, endured, fatigue, eerie, capable, superhuman, thoroughness, eventually, swirled, invalid, determination, dignitaries, endured, petty, and legacy.

Comprehension Check:

1. When Washington was a child, he did not see his father very much. How did that change when he became a young man?
2. What interrupted the father-son team's work? Did the team ever resume working together?
3. What skills did Washington need to learn for constructing the Brooklyn Bridge? Where did he learn this?
4. What ended the father-son team's work? What did Washington do next?

5. The author describes Washington as a “hands-on engineer.” Explain what that means.
6. Tell how Washington used writing in his work.
7. What caused Washington to become ill? Did he recover? Did he experience illness later?
8. What was Washington’s way of coping with the possibility that he might die before the bridge was completed?
9. Washington’s job was threatened. Why?
10. Who stepped in to keep Washington from losing his job? Tell about it.
11. Tell about the way Washington spent his time during the opening ceremonies for the bridge.
12. When did Washington first walk across the completed bridge?

Art:

- Draw a likeness of the Brooklyn Bridge. Draw wire cables and suspenders free hand. Redraw with ruler. Which is more like Washington Roebling’s way? Why?
- How did Washington use art for workers who could not read? Draw an example.

Writing Activity:

- Write three statements or questions that Washington might have shared with his father if he were living during the bridge’s construction.

Research:

- Washington A. Roebling—during the Civil War: suspension bridges and Little Round Top at the Battle of Gettysburg.

“An American Triumph” by Kathiann M. Kiwalski (Page 15-19)

Pre-reading: Look at the pictures, the captions, and the title. What does this article focus on—people or process? Explain why you think so.

Vocabulary Check: stupendous, immigrants, majority, excavated, aspects, caisson, triumph, hindered, caisson disease, compacted, undisturbed, constant, anchorages, counterbalance, riggings, enormous, simultaneously, suspenders, initial, labor-intensive, continuously, unraveled, substituted, defective, margin, calculations, margin, faulty, vertical, diagonal, stability, elevated, decades, distinctly, trolley, and aerial.

Comprehension Check:

1. How did Washington Roebling get the assignment of the bridge building project? How do you think he felt about it?
2. Describe a caisson and how to get inside.
3. Why were workers able to remain dry inside a caisson?
4. What were workers inside the caisson trying to accomplish?
5. Who were most of the bridge laborers? Why do you think this was true?
6. What were some of the hazards of working in caissons?
7. Tell what helped Washington Roebling decide to stop digging on the New York side.
8. What hazards did workers face when building the tall towers?
9. What job did sailors do?
10. What happened as a result of an inferior wire product being supplied?
11. Discuss the margin of safety in the cables.
12. How could pedestrians cross the bridge safely?
13. Roebling was not required to build the bridge for train travel. What did he do just in case trains were later added?
14. Why do you think Brooklyn mayor Seth Low called this an American triumph?

Art:

- Think of immigrants building this bridge. How can their search for freedom and opportunity be included in an illustration of this bridge project?

Math Activity:

- Draw a cable sixteen inches wide and the full length of the paper. Line up nineteen markers across the sixteen inch width to represent the 19 strands inside a cable. Imagine 278 wires inside each strand. All together over 5,000 wires made up one cable.

Research:

- J. Lloyd Haigh

“Build a Bridge” by Nick D’Alto (Page 22-23)

Vocabulary Check: sags, compress, stresses, and apply.

Comprehension Check:

1. Explain what it means to test the strength of the bridge.
2. What makes the bridge get stronger?
3. Why does the author say it is all about teamwork?

Writing Activity:

- Write about a time teamwork made a difference for you.

Art/Creative Play:

- Plan and build a bridge or tower with a friend. Use building blocks, old lumber, cans, or whatever you’d like.

“Did You Know?” illustrated by Chris Ware (Pages 24-25)

Vocabulary Check: reconnaissance, saturated, vault, anchorage, publicity, accompanied, witnessed, accommodate, and manufacturing.

Comprehension Check:

1. How did Roebling learn that Robert E. Lee was moving his troops?
2. Who constructed the caissons used during the bridge building?
3. How was the Brooklyn anchorage space used in the past?
4. What day received a large celebration?
5. Name a bridge built with wire from the Roebling sons.
6. What city did the Roebling family build?

Writing Activity:

Which would you rather do: spy on the enemy, design a caisson, make wire cable, build a bridge, or build a city? Tell why.

Art:

- Draw you participating in the activity you chose for the writing activity.

“The Dreaded Bends” by Peg Lopata (Pages 26-27)

Pre-reading: Look at the photographs and the title. According to this information, who gets the Bends?

Vocabulary Check: substantial, atmospheric, decompression, formation, intense, paralysis, apparatus, investigate, symptoms, dismissed, convinced, theorize, triggered, incrementally, acclimate, compressed, and varying.

Comprehension Check:

1. What causes the Bends? What is another name for it?
2. What are symptoms of the Bends?
3. What damage can the disease cause?
4. What professions today are very aware of decompression sickness? How do they guard against it?
5. What did Roebing do when workers began to experience pain and sickness?
6. Because the disease was still a mystery, what did Roebing hire Dr. Smith to do?
7. A French professor offered a theory about the cause of the disease. What was Dr. Smith's reaction? Who was right?
8. What did Dr. Smith recommend, that is still done today, to prevent this disease?

Writing Activity:

- Pretend to be Dr. Smith. Write a letter to another physician explaining what you are trying, what symptoms patients are having, and how you are feeling about treatment.
- Pretend to be the French professor. Write a letter to Dr. Smith telling him that you believe nitrogen bubbles are causing the workers to get sick.

Research:

- Dr. Andrew H. Smith
- Decompression sickness
- Scuba divers equipment

"Right Woman at the Right Time" by Martha Sias Purcell, illustrated by John Gordon Swogger (Pages 28-30)

Pre-reading: Look at the pictures and the title. What can you tell about the woman?

Vocabulary Check: prominent, idolized, harpsichord, catastrophe, determination, astonishing, independence, roles, politicians, arrangement, mistakenly, impressed, dignitaries, superstructure, formally, defense, approach, applauded, request, self-sacrifice, remarkable, supervised, organizations, succumb, infinite, tact, counsel, plaques, and dedicated.

Comprehension Check:

1. Why does the author say that "Emily Warren Roebling was not a typical Victorian-era woman?"
2. How did Emily's early studies help her as an adult?
3. How did Emily learn about caissons?
4. What did Emily do to help Washington keep his job after he became ill?
5. In what way was Emily a link between her husband and the bridge project?
6. Tell about Emily leading dignitaries and assistant engineers across the bridge while it was under construction.
7. What mistaken impression did some people have of Emily?
8. Near the end of the bridge construction, some people tried to have Emily's husband removed as chief engineer. What did she do?
9. Who did Washington Roebling insist be the first passenger to cross the bridge when it was completed? What was carried along and why?
10. What was the workers' reaction to Emily's ride?
11. How was Emily honored at the opening day celebration?
12. How was Emily memorialized in 1953?

Writing Activity:

- If Emily's childhood had been like the typical Victorian-era female, tell how her adult life would have been different. Tell what probably would have happened concerning the completion of the bridge. Tell why.

Art:

- Create a poster to celebrate Emily Warren Roebling.
- Create a collage using magazine pictures that tells about Emily's life.

Research:

- Emily Warren Roebling
- Dedication to the memory of Emily Warren Roebling—plaque on each tower of the Brooklyn Bridge

"Bridge Stories" by Marcia Amidon Lusted (Pages 31-33)

Pre-reading: Read the statement at the top of page 31 to determine what type stories will be told.

Vocabulary Check: boatswain, admiring, swayed, insist, nuisance, refused, undisturbed, rescued, trampled, panicked, reassured, publicity stunt, impact, survived, self-promoter, pretending, distributed, demonstrated, halting, protest, hijacked, and enabling.

Comprehension Check:

1. Read "A High Honor." Tell about the first bridge crossing.
2. Read "The Footbridge."
 - a. Why were all requests to cross eventually refused?
 - b. Would you have applied for a permit in order to cross the footbridge?
 - c. What reason for crossing do you think would have been allowed?
 - d. What reason would probably have been denied?
3. Read "Tragedy Hits." What was the result of the rumor that spread?
4. Read "Testing the Load." P.T. Barnum's arranged a win-win situation. Explain how.
5. Read "Taking the Plunge." Tell about the three different scenarios that were selected.
6. Read "Making a Statement." Why do you think this site was chosen for the strike?
7. Read "The Saddest Day." Tell how the bridge was helpful during a panic.

Writing/Research Activity:

- Interview family members and ask if they have ever crossed the Brooklyn Bridge. Write their story. If no one has a story, research at the public library, online, or at an old newspaper company. Research stories about opening day-May 24, 1883.

Art/Drama:

- Read "The Footbridge." Draw signs to post at the bridge. Create signs that show the change of rules. Original rules are stated in the article. Next, permits were required. Eventually, no one was allowed to cross. Post completed signs. Dramatize pedestrians crossing the bridge while it was under construction. Use the article to guide your role play.

"Still Going Strong" by Emily Goodman (Pages 34-36)

Pre-reading: Look at the photographs, captions, and title. Why do you think the Brooklyn Bridge is still going strong?

Vocabulary Check: maintenance, elevated, robust, analyze, shore up, structural, trusses, suspenders, inclined stays, stabilize, environmental hazard, graffiti, lubricated, corrosion, enormous, anchored, penetrates, corrode, soaring arcs, efficient, light-emitting diodes (LEDs), unique, spall, and rappel.

Comprehension Check:

1. The author says, "John A. and Washington A. Roebling probably would be pleased to see how well their bridge has stood the test of time." True, yet these men were engineers, who look for ways to make changes or improvements. If they were living today, what changes or improvements do you think they might suggest for the bridge? Read the entire article before giving an answer.
2. Why do engineers need to be on call 24/7 for the bridge?
3. What is a common problem involving tall trucks?
4. What must be done before repairs can be made to the steel on the bridge?
5. Explain why the steel parts change length on the bridge.
6. What does the author say is the bridge's enemy? Why?
7. Tell about the members of the team that help keep the bridge in good working condition.
8. Did any of the maintenance jobs sound like one you would enjoy? Which one?

Math Activities:

- If 127,000 vehicles cross the Brooklyn Bridge on a typical weekday, how many cross in one work week?
- If 2,500 pounds of structural steel is used in a year, how much is used on an average per month?
- If 2,000 bolts are replaced a year, how many would that average per day?
- If five oilers use a total of 350 gallons of oil and 1,100 pounds of grease per year on the bridge, how much oil and grease does each worker average using?

Art:

- Illustrate one of the bridge maintenance workers doing his job.
- Illustrate a feature from the bridge and compare to a more common item. For example: compare the size around a cable to a gallon of paint. Or compare oiling the bridge to oiling a bicycle chain.

Research:

- Deputy Chief Engineer Russell Holcomb (maintains the four big bridges that cross the East River)
- Brooklyn-Queens Expressway (tall trucks cause collisions to underside of the bridge)

"At Your Service" by Meg Chorlian (Page 37)

Pre-reading: Look at the photographs, captions, and title. What has improved over the years?

Vocabulary Check: connecting, boroughs, accommodating, cantilever, suspension, spanning, and granite.

Comprehension Check:

1. What was it that the Brooklyn Bridge began? How can a bridge begin something?
2. Name two other major bridges that cross the East River today.
3. Brooklyn Bridge no longer holds a world record. What record did it once hold?

Writing Activity:

- Write a riddle or a joke about a bridge. You might want to include all the things a bridge carries.
- Pretend to live in New York during the building of bridges. Write a letter to a friend telling about the changes it brought about.

Research:

- Cantilever bridges
- Queensboro Bridge

“The Bridge” by Hart Crane (Pages 38-39)

Vocabulary Check: pivot, tumult, rippling, inviolate, apparitional, sleights, implicitly, stride, scuttle, bedlamite, parapets, caravan, acetylene, girder, obscure, guerdon, accolade, anonymity, reprieve, pariah, unfractioned idiom, immaculate, condense, submerges, vaulting, boardinghouse, muse, and curviship.

Comprehension Check:

1. What does the poem mean to you?
2. Tell favorite parts of the poem.

Writing Activity:

- Even if you do not live near the Brooklyn Bridge or may never have seen it, you can still write about it. Look back at the photographs in this issue and review the facts you’ve learned from each article. Brainstorm and write down key words, phrases, or emotional responses to the photos and/or words. Read your comments and create a poem that will link your words together just as a bridge links one side to another.
- Notice bridges near where you live. Is there one you have walked across? If not, ask if a parent will walk across it with you. Write a poem about crossing the bridge. You can focus on the view, the traffic, or how you felt as you crossed.

“Just Hanging Around” by Marcia Amidon Lusted, illustrated by Bryan Langdo (Pages 40-41)

Vocabulary Check: conducted, flex, proposed, estimated, cancelling, access, precision, awkwardly, and unique.

Comprehension Check:

1. Read “The Longest Bridge...For Now” How long is it? How strong is it? What proof is there?
2. Where is a longer suspension bridge being planned? How long will it be?
3. Read “On Again, Off Again.” Where is this proposed bridge? Would it be the longest, if completed?
4. Why is the article called “On Again, Off Again?” What happened?
5. What is the conflict about building the bridge?
6. At this point, is it on again or off again?
7. Read “Flying Cables?” Tell how Chinese engineers got the cable across the deep canyon.

Writing Activity:

- Pretend to be a bystander when the precision rockets were fired across the canyon in China. Afterwards, write a postcard message to your best friend.
- Pretend to have been in Japan when the suspension bridge was being built. Write about what you expected to see the day after an earthquake hit during construction. What did you see instead?
- Have you ever built a footbridge? Did it cross a creek? Tell about it.

Art:

- Draw a footbridge you could create or one that you have already designed. Will you use available materials, like fallen trees, or buy your supplies. Discuss the idea with your parents. Perhaps you can create your design.

“The Man Behind the Camera” by Dennis Denenberg (Page 47)

Vocabulary Check: documentary, technique, fascinating, marvel, and groundbreaking.

Comprehension Check:

1. What did David McCullough's book *The Great Bridge* motivate this month's mystery hero to do?
2. What filming technique made this documentary unique?
3. The bridge building engineers inspired an author who inspired a film producer. What do you think the Roebling's would think of that?
4. Guess where the mystery hero was born.
5. Guess who narrated the documentary.

Art:

- Draw a poster or banner that shows the progress from bridge to documentary.

Research:

- Locate a copy of the documentary. It may be available through the online research that your public library offers. If so, watch it with your family on your own computer screen.
- See if you can locate other documentaries by this month's mystery hero.

Creature Feature--"Long Live the Rooster" (Back Cover)

Vocabulary Check: chanticleer, emblem, haughtiness, symbolic, faithlessness, inspiration, and completion.

Comprehension Check:

1. A rooster means different things to different cultures. Which meanings had you heard before?
2. If Washington Roebling is represented by a brave cock, what would that make Emily Roebling?
3. Have you ever tried to carry a rooster? What would have been your animal choice for the first trip across the completed bridge?

Art:

- Draw a picture of animals crossing the bridge when it was first completed. What animals do you think cross it today?