Suspension bridges are a major type of bridge design and, despite an ambiguous history, are especially suited to long spans. In this project, the learner will become familiar with the history of several important suspension bridges in the United States, particularly with the Brooklyn Bridge. The learner will think about why bridges are built and the impact they have on society, even to the point that songs are written about them.
Lesson Plan Template

<table>
<thead>
<tr>
<th>Title of Lesson</th>
<th>Suspension Bridges Spanning the Past to the Present</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit Topic</td>
<td>Suspension bridges, such as the Brooklyn Bridge, allow the crossing of wide bodies of water and change linked communities.</td>
</tr>
<tr>
<td>Enduring Understanding</td>
<td>As a result of this lesson, students will understand that construction projects, such as bridge building are highly complex enterprises and impact people's lives technologically, economically, socially, legally, and personally.</td>
</tr>
<tr>
<td>Content Knowledge</td>
<td>As a result of this lesson, students will know:</td>
</tr>
<tr>
<td></td>
<td>• Suspension bridges are the best design for crossing long spans</td>
</tr>
<tr>
<td></td>
<td>• Suspension bridges have been used extensively in the U.S. since 1849, despite there having been major disasters involving them.</td>
</tr>
<tr>
<td></td>
<td>• Why the following bridges are notable: Delaware Aqueduct Bridge (1849), Covington and Cincinnati Suspension Bridge (1866), Royal Gorge Bridge (1929), Golden Gate Bridge (1933), Oakland-San Francisco Bay Bridge (1936), the Tacoma Narrows (1940), and the Verrazano-Narrows Bridge (1964).</td>
</tr>
<tr>
<td></td>
<td>• The cost to humanity in terms of lives, environment, and money when a bridge is built.</td>
</tr>
</tbody>
</table>
| Skills | As a result of this lesson, students will be able to:  
| What are the specific skills developed by this lesson? |  
| | • Critically evaluate visual information from photographs and diagrams  
| | • Extract important information from print primary sources  
| | • Make connections between technology and its impact on human lives  
| SOLs addressed | U.S. History: 1877 to present  
| POS by number and descriptor | USII.1a – analyzing and interpreting primary and secondary source documents  
| | USII.1b – make connections between past and present  
| | USII.1c – sequence events in U.S. history  
| | USII.5 – demonstrate knowledge of social, economic, and technological changes in the early 20th century  
| | USII.8 – describe the development of new technologies and their impact on American Life  
| Physics | PH.1 – plan and conduct investigations, gathering and analyzing data  
| | PH.2 – investigate and understand how to analyze and interpret data  
| | PH.3 – understand how new discoveries result in modification of existing theories and construction of scientific viewpoint  
| | PH.4 – investigate and understand how applications of physics affect the world  
| Computer Technologies | C/T12.4 – skill in selection and use of appropriate technologies to gather, process and analyze data and to report information related to an investigation  
| Length of Lesson |  
| Approximately how long will this lesson take? |  
| | • One or two ninety minute periods to analyze primary resources on the Brooklyn Bridge  
| | • Two ninety minute periods to search American Memory to locate information pertaining to the history of other suspension bridges and to use other resources, such as NARA, ProQuest Historical Newspapers, and library books.  
| | • One ninety minute session for group presentations  
| Overview of lesson |  
| What will other teachers want to know about this lesson? | Suspension bridges are a major type of bridge design and, despite an ambiguous history, are especially suited to long spans. In this project, the learner will become familiar with the history of several important suspension bridges in the United States, particularly with the Brooklyn Bridge. The learner will think about why bridges are built and the impact they have on society, even to the point that songs are written about them.  
| | These lessons integrate engineering classes, which design and build model bridges, American history from 1849 to the present, information literacy, research and reference skills, American government, sociology, career exploration, and music.  |
### Prior Knowledge
Are there specific knowledge or skills the students must have before they begin this lesson?

Students will have basic computer skills, including knowledge of internet search strategies. Students will previously have seen a brief demonstration of how to access and use the search functions of the American Memory site.

### Resources needed

|---|---|
| 1. “Brooklyn Bridge, general view across river, Brooklyn, NY”  
URL: [http://memory.loc.gov/cgi-bin/query/r?ammem/alad:@field(DOCID+@lit(h15028))]  
2. “Strolling on the Brooklyn Bridge”  
URL: [http://memory.loc.gov/cgi-bin/query/r?ammem/mussm:@field(NUMBER+@band(sml883+11490))]  
3. “Historic Engineering Record” on the “Brooklyn Bridge, Spanning East River between Brooklyn & Manhattan, New York City, New York County, NY” – HAER No. HY-18  
URL: [http://memory.loc.gov/cgi-bin/ampage?collId=hhdatapage&fileName=ny/ny1200/ny1234/data/hhdatapage.db&recNum=1]  
4. “Grand bird's eye view of the Great East River Suspension Bridge”  
URL: [http://memory.loc.gov/cgi-bin/query/r?ammem/gmd:@field(NUMBER+@band(g3804n+pm006021))]  
5. “Statistics Relating to the New York and Brooklyn Bridge”  
URL: [http://memory.loc.gov/cgi-bin/query/r?ammem/ncpsbib:@field(DOCID+@lit(ABS1821-0014-637_bib))] |

**Other resources:**
**Internet sites other than American Memory**
National Archives and Record Administration  
[www.nara.gov](http://www.nara.gov)
Bridge Building 42 Explore  
[www.42explore.com/bridge.htm](http://www.42explore.com/bridge.htm)
Brooklyn Bridge Historic Overview  
[www.nycroads.com/crossings/brooklyn](http://www.nycroads.com/crossings/brooklyn)

**Print resources**

**Videotape**

Brooklyn Bridge. Produced by Florentine Films in Association with the Dept. of Records and Information Services of the City of New York and WNET/Thirteen; Ken Burns. PBS Videodatabase v. 125. (60 minutes)

**Process of lesson**

Explain how lesson will unfold. Write this section so that another teacher could follow your instructions. Be sure to include a hook or warm-up and student performance tasks.

**Introduction:**

Before you begin, find books about bridges in your library, both fiction and nonfiction. Display these when you introduce the lesson.

Introduce the topic by noting the old nursery rhyme. “London Bridge is falling down” and ask what superstitions or trivia students know about bridges. What famous bridges have they seen? Mention that in ancient times a human sacrifice was often buried in the bridge’s foundation to keep the bridge strong.

Note that suspension bridges hang from cables anchored at each of its ends and from regularly placed towers. Suspension bridges are considered the best choice for long spans.

Remind students that primary sources are used in Database Research and that American Memory and the National Archives are the best sources for items from U.S. history. Provide a handout of “What Do You See: Photo Analysis Guide” from The Learning Page at the American Memory site and discuss it briefly.

**Lesson 1** – Explain that the first lesson will require individuals to interpret primary resources about the Brooklyn Bridge, a major suspension bridge. For human interest, mention that chief engineer, John Augustus Roebling, had his toes crushed during construction of the bridge, which led to tetanus, from which he died in June 1869. His son, Washington A. Roebling, completed the bridge.

Students will look at the five documents/photos listed and will write a two page description of the Brooklyn Bridge and include how the construction
impacted people's lives.

**Lesson 2** – Students will divide into six groups and each group will search the American Memory site for information on one of the following bridges:

- Delaware Aqueduct Bridge (1849)
- Covington and Cincinnati Suspension Bridge (1866)
- Royal Gorge Bridge (1929)
- Golden Gate Bridge (1933)
- Oakland-San Francisco Bay Bridge (1936)
- Tacoma Narrows Bridge (1940)
- Verrazano-Narrows Bridge (1964)

Following their investigations, each group will share their information and interpretations in a ten minute presentation. They will include the history of the bridge, the importance and impact on society and speculate what would happen if the bridge was no longer there.

Another option would be to do JIGSAW PRESENTATIONS where students present to 3 or 4 small groups comprised of one member of each of the other bridge groups.

<table>
<thead>
<tr>
<th>Evaluation</th>
<th>Lesson 1</th>
</tr>
</thead>
</table>
| How will you know that the lesson was successful? Describe what type of student assessments you will use to evaluate understanding. Include the criteria you will use or attach rubric. | Each paper will be evaluated based on the inclusion, appropriateness, and thoroughness of the following:  
- Inclusion of ten relevant facts  
- Demonstrates understanding of the bridge’s impact on social lives  
- Includes mention of impact on city, state or federal government  
- Compares, with examples, two statistical documents  
- Uses descriptive language to convey personal reactions |

| Lesson 2 | Each group presentation will be evaluated based on the following:  
- Clear presentation of adequate number of relevant facts  
- Clear tie-in of bridge to social life, with examples  
- Clear tie-in of bridge to government activities  
- Use of pertinent visuals  
- Good verbal presentation and evidence of preparation  
- Handout, which includes basic facts, web resources from American Memory, NARA or educational web sites |

| Extension Activities | What further activities might be done to increase student understanding on  
- The problem of failed technology, i.e. disasters, can be explored, with a search for solutions for the future and how we learn from failure.  
- A timeline of suspension bridge building will help put the development of bridges into perspective.  
- Biographical activity to learn about major bridge engineers will add a human face to the activity.  
- An examination of past and current laws on bridges, particularly safety |
Students may look at the politics of bridge building, such as who decides what will be built and where and by whom and who pays for it. What students learn during this project can be used to look at the Wilson Bridge construction project in Virginia/Maryland, or at other local projects.

<table>
<thead>
<tr>
<th>Possibilities for Differentiation</th>
<th>Engineering classes – Provide background information on bridges and what has been learned over time. Investigate architectural characteristics. Explore what natural and manmade stresses are put on bridges.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>American Government – Discuss who decides where a bridge will be built. Who selects the architect/engineer? How is a budget determined? Who protects the public from unsafe bridges?</td>
</tr>
<tr>
<td></td>
<td>Biology or environmental sciences – Explore the impact that the building of a bridge has on the environment. Look at the Wilson Bridge or other recent projects in a student’s community.</td>
</tr>
<tr>
<td></td>
<td>Career exploration – Investigate what education and skills are needed to be employed on a bridge project.</td>
</tr>
<tr>
<td></td>
<td>American history – Explore the importance of specific bridges and how they impacted the communities they connected. Safety issues for society are also pertinent.</td>
</tr>
<tr>
<td></td>
<td>Music – Research what kinds of music and songs have been composed about bridges. Do they cover only specific periods in history, or is there a common theme?</td>
</tr>
</tbody>
</table>
SUSPENSION BRIDGES SPANNING THE PAST TO THE PRESENT

Student Page – Lesson 1

In this lesson you will explore how the building of the Brooklyn Bridge impacted people’s lives technologically, environmentally, economically, and personally. You will acquire a solid basis of facts about the bridge, the engineer who designed it, community and government involvement, and primary sources that have resulted from the bridge’s construction.

The Task
You will have one or two class periods to look at and analyze five items from the American Memory collection. Critically analyze photographs and carefully read print materials as you look for ties between the technological feat of the building of the bridge and its effect on mankind. Write a two page paper describing the Brooklyn Bridge and its impact on human lives.

The Process
Analyze and interpret the five items from the American Memory Collection listed below to answer the posed questions and any questions you might have. Consider what is important, interesting, and useful in making connections between technology and human impact.

1. Study the photo: “Brooklyn Bridge, general view across river, Brooklyn, NY”
   URL: http://memory.loc.gov/cgi-bin/query/r?ammem/alad:@field(DOCID:@lit(h15028))
   What do you already know about this bridge?
   What exactly do you see in the photo?
   When would you guess this photo was taken?
   Can you tell why this bridge was built or where?
   What feelings are prompted when you look at this photo, e.g. a sense of size, accomplishment, architectural beauty?
   What architectural elements do you see?
   How would you describe this bridge?

2. Read the words to the song “Strolling on the Brooklyn Bridge”
   URL: http://memory.loc.gov/cgi-bin/query/r?ammem/mussm:@field(NUMBER:@band(sml883+11490))
   What changes have occurred in how a young man once courted a girl now that the bridge exists?
   What personal feelings does the bridge seem to prompt in the young man singing the song?
   Is a story being told?
   Is there slang or dialect in the words?
   How do you react to the song?
3. Read the first few pages of the “Historic Engineering Record” on the “Brooklyn Bridge, Spanning East River between Brooklyn & Manhattan, New York City, New York County, NY” – HAER No. HY 18
URL: http://memory.loc.gov/cgi-bin/ampage?collId=hhdatapage&fileName=ny/ny1200/ny1234/data/hhdatapage.db&recNum=1
Look for answers to the following questions?
Why do you think so many details are given in this document?
Who was this written for?
What river does the bridge span?
Why was it built in that location?
When was the bridge built; how long did it take?
Why was the bridge notable in 1883?
Why was it called “The Controversial Miracle”?
Who designed or engineered the bridge?
What kind of bridge is this?
What innovations were used?
What is the length? Are there different ways to measure the length?
What was the total cost of the bridge?
What are your feelings about the statistics regarding this bridge compared to the visual aesthetics you determined from the photograph?

4. Study the photo “Grand bird’s eye view of the Great East River Suspension Bridge.”
URL: http://memory.loc.gov/cgi-bin/query/r?ammem/gmd:@field(NUMBER+@band(g3804n+pm006021))
How does this photo compare to the one in the first photo “Brooklyn Bridge, general View Across River”?

5. Read the paragraph “Statistics Relating to the New York and Brooklyn Bridge.”
URL: http://memory.loc.gov/cgi-bin/query/r?ammem/ncpsbib:@field(DOCID+@lit(ABS1821-0014-637_bib))
What periodical was this published in and when?
Does the information support or contrast with that found in source 3 from the “Historic Engineering Record?”
Final Task and Evaluation:
After reviewing the primary sources above, write a two page description of the bridge that contains the answers to many of the questions, specifically including how the construction of the Brooklyn Bridge impacted people’s lives technologically, economically, environmentally, and personally. Papers will be evaluated for inclusion of facts that support personal statements, evidence of empathy, logical explanations, application of knowledge from the subject matter, and perspective.
In this lesson you will continue to explore how the building of bridges impacts people’s lives. You will work in groups of three to five to learn about another notable suspension bridge and will again note the technology involved and the effect of the building of the bridge on humankind.

**The Task**
You will have two or three class periods to research your bridge. You should discuss with your group how you want to divide the tasks required for this project. You must use appropriate educational web sites, databases and print resources to acquire your information. At the end of the project, your group will present your findings to the class, being sure to give examples. Use at least one pertinent visual and one handout containing the basic facts and resources used.

**The Process**
Search the American Memory site (www.loc.gov) for primary documents related to your bridge.
Once you have thoroughly searched the American Memory site, you should explore the National Archives site (www.nara.gov) for additional primary resources.
**The Historical Newspapers** database found in ProQuest Direct should be your third research stop.
Lastly, you may use educational web sites and print materials pertinent to your topic.
One site that is recommended is : Bridge Building 42 Explore – www.42explore.com/bridge.htm

**Final Task and Evaluation:**
Each group will give a ten minute presentation in which they will share their information and interpretations of the documentary evidence they have found. Assessments of the impact of the building of the bridge should include clear examples and analyses that tie it to social life, government activities, environmental impact, technological advances, and general effect on society. Each group should use at least one visual and provide a handout for other students which includes basic facts and resources used.
What Do You See: Photo Analysis Guide

<table>
<thead>
<tr>
<th>Observation</th>
<th>Knowledge</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Describe exactly what you see in the photo.</td>
<td>Summarize what you already know about the situation and time period shown, and the people and objects that appear.</td>
<td>Say what you conclude from what you see.</td>
</tr>
<tr>
<td>What people and objects are shown? How are they arranged? What is the physical setting? What other details can you see?</td>
<td>What's going on in the picture? Who are the people and what are they doing? What might be the function of the objects? What can we conclude about the time period?</td>
<td></td>
</tr>
</tbody>
</table>

**Further Research:** What questions has the photo raised? What are some sources you can use to find answers?