

Lesson at a Glance

The Great Inka Road: How can a road system be an example of innovation?

Grades

- 5–8

Subjects

- Geography, History, Economics, Environmental Science, STEM (Science, Technology, Engineering, Mathematics)

Length

- Three 50-minute class periods

Key Message

The Inka developed a sophisticated empire during the fifteenth century in the challenging geographical environments of South America, spanning large parts of current-day Colombia, Ecuador, Peru, Bolivia, Chile, and Argentina. To support the empire, the Inka built a vast road system applying innovative engineering techniques to address the challenges of transportation and communication and to facilitate the integration of distant communities. One such innovation is the suspended grass bridge, an Inka engineering solution that is attuned to the natural environment and focuses on tension vs. compression forces. Only one suspended grass bridge—*Q'eswachaka*¹—remains from Inka times and is rebuilt every year by *Quechua*²

¹ *Q'eswachaka* (q'eswa meaning “braided grass” and chaka meaning “bridge” in the Quechua language) is pronounced khes wah CHAH kah.

² *Quechua* [pronounced KHEH choo WAH] is the post-conquest name for the Inka language *Runasimi* and the name of an ethnic group living northwest of Cusco at the beginning of the Inka expansion.

communities in the Andes using knowledge passed down through the generations for the past 600 years.

Student Outcomes

Students will know that:

- In less than 100 years and without the use of the wheel, metal tools, or animals to carry heavy burdens³, the Inka built a sophisticated and vast empire that they called *Tawantinsuyu*⁴.
- To expand and support their empire, the Inka built the *Qhapaq Ñan*⁵, an extensive road system that spanned 25,000 miles (40,000 km) down the Pacific coast of South America from Ecuador to Chile, traversing one of the most extreme physical geographies on the planet.
- The Q’eswachaka suspension grass bridge is an example of Inka engineering and the only surviving suspension bridge from the time of the Inka Empire.
- Different bridges can withstand different kinds of forces, and two of the most common forces used in bridge building are tension and compression. The Inka developed suspension grass bridges using the idea of tension.

Students will understand that the Q’eswachaka is an important example of innovation and sustainability from environmental, cultural, and engineering perspectives.

Students will be able to evaluate sources in order to construct an argument about how people can use innovations to address difficult problems and find solutions to challenging situations.

A Note to Teachers: NMAI Education Approach

- This online lesson offers a new way to teach and think about the Inka Empire. Exploring a variety of sources, students evaluate information and use evidence to answer the question, “How can a road system be an example of innovation?” The lesson is structured yet flexible and respects an educator’s own knowledge and expertise. As such, teacher materials offer suggestions rather than prescriptions for classroom implementation.
- Following a C3 inquiry design, the lesson begins with a compelling question to anchor students’ investigations. Supporting questions develop the academic content necessary to engage students with the concept of innovation in the context of the Inka road system. Featured sources include maps, videos, illustrations, images, quotes, and objects from the

³ While llamas can carry up to 60 pounds, they were not used by the Inka in the road construction process as load-carrying animals. The road was built for llamas and foot traffic, not by llamas.

⁴ Tawantinsuyu [pronounced tah wahn teen SOO yoo] means “four parts together” in the Quechua language.

⁵ Qhapaq Ñan [pronounced “KHAH pahk NYAN”] means “Great Inka Road” in the Quechua language.

NMAI collection to generate student curiosity and build knowledge. Students craft conclusions about the significance of the Inka Road, especially with respect to innovation, and use this knowledge to take informed action with direct relevance to the present time.

<p>The Great Inka Road: How can a road system be an example of innovation?</p>		
<p>Staging the Question</p>	<p>Students begin their inquiry by watching an opening video “Inka Innovative Engineers—The Great Inka Road.” This video animation features innovative practices used by the Inka for engineering roads and bridges to support their empire and is presented from the perspective of two middle school students.</p> <p>Students can delve more deeply into the significance of the word “innovation” with an activity that explores the meaning of the word through definitions, characteristics, examples, and non-examples.</p>	
<p>Supporting Question 1</p>	<p>Supporting Question 2</p>	<p>Supporting Question 3</p>
<p>Who were the Inka?</p>	<p>How is the Inka Road an example of innovation?</p>	<p>How is the Q’eswachaka an example of innovation?</p>
<p>Formative Performance Task</p>	<p>Formative Performance Task</p>	<p>Formative Performance Task</p>
<p>Students engage in a thematic source exploration of the geography, ways of living, and history of the Inka Empire.</p>	<p>Students explore the Inka road system in the Andes using a variety of resources and complete a worksheet along three topics describing the road system: Characteristics, Purpose(s), and Innovation.</p>	<p>Students learn about the Q’eswachaka bridge and write a description of the steps needed to construct the grass bridge, describing why the bridge is innovative.</p>
<p>Featured Sources</p>	<p>Featured Sources</p>	<p>Featured Sources</p>
<ul style="list-style-type: none"> • Geography: map, “fly-out” video, and photo galleries • Ways of Living: narrated slide show, interactive, and lithographs • History: Timeline 	<ul style="list-style-type: none"> • A Road in the Andes (map and fly-outs) • Impressions of the Road (lithographs, quotes, and paraphrased quotes) • Inka Bridge Types (slide show) 	<ul style="list-style-type: none"> • “The Bridge at Q’eswachaka” Video • “Explore Tension and Compression” Hands-on Activity • Quotes • “Explore Tensile Strength”

		<p>Animation</p> <ul style="list-style-type: none"> • “Be a Bridge Maker” Hands-on Activity
Additional Sources		
<ul style="list-style-type: none"> • “The Inka Empire—Tawantinsuyu:” An essay offers additional background and context. • Resistance and Adaptation: Images, videos, and text showcasing the resiliency of Inka descendant cultures in the Andes today. • The Inka Empire’s Impact on the World: Examples of how Inka foods, minerals, medicines, and engineering have affected our world. • Inka Innovation in Masonry: 3D viewer interactives showcasing Inka innovations in stone work. 		
Summative Task	<p>Using evidence from the featured sources and hands-on activities, students build an argument from what they’ve learned about the Inka road system and engineering innovations in the Inka Empire.</p> <p>To support students’ application of evidence in building an argument, this culminating activity features an interactive digital news-article generator, <i>The Andean Messenger: Making the Case for Innovation</i>. Students can build a news article by constructing a written argument to answer the compelling question: How can a road system be an example of innovation? After selecting a predesigned template, students determine what featured sources from the inquiry best support their argument. Students will be able to write captions, quotations, headlines, body text, and bylines.</p>	
Taking Informed Action: Preserving Traditions <i>Optional but recommended</i>	<p>Students reflect on why it is important to preserve cultural traditions by discovering how indigenous groups and organizations in the Andes are honoring their customs to protect their culture from the pressures of globalization.</p>	

Suggested Pacing

Standard Inquiry: Three 50-minute class periods.

Taking Informed Action (Optional but Recommended): One (50-minute) class period

	Stage of Inquiry	Sources
Day 1	<p>Engaging with the Compelling Question: How can a road system be an example of innovation?</p> <p>Supporting Question 1: Who were the Inka? (Formative Performance Task and Featured Sources)</p>	<p>Featured Resources: The video “Inka Innovative Engineers—The Great Inka Road” provides background on Inka innovative practices presented from the perspective of two middle school students.</p> <p><i>Student Worksheet:</i> <u>The Meaning of Innovation</u></p> <p>Explore the meaning of “innovation” through definitions, characteristics, examples, and non-examples.</p> <p>Featured Sources on three themes—Geography, Ways of Living, and History: Map, Photo Galleries, “Fly-out” Video, Origin Story, History Timeline, Astronomy Interactive, Lithographs, and quotes. Additional resources, including a background essay on the Inka Empire, provide additional context.</p> <p><i>Student Worksheet:</i> <u>Who Were the Inka?</u></p>
Day 2	<p>Supporting Question 2: How is the Inka Road an example of innovation? (Formative Performance Task and Featured Sources)</p>	<p>Featured Resources: Map and video fly-outs; lithographs, quotes, paraphrased quotes; and Inka Bridge Types slideshow.</p> <p><i>Student Worksheet:</i> <u>How Is the Inka Road an Example of Innovation?</u></p>

<p>Day 2</p>	<p>Supporting Question 3: How is the Q’eswachaka Bridge an example of innovation? (Formative Performance Task and Featured Sources)</p>	<p>Featured Resources: “The Bridge at Q’eswachaka” video; lithographs; “Tension vs. Compression” activity; “Explore Tensile Strength” animation; and “Be a Bridge Maker” activity.</p> <p><i>Student Worksheet:</i> <u>Building the Q’eswachaka</u></p>
<p>Day 3</p>	<p>Summative Task: Using an interactive newspaper, students build an argument from what they’ve learned about the Inka road system and engineering innovations in the Inka Empire to answer the Compelling Question: How can a road system be an example of innovation?</p>	<p>Source Material Bank with a compilation of all lesson photos, illustrations, maps, interactives, videos, quotes, lithographs, etc.</p> <p>After selecting a predesigned newspaper template, students determine what featured sources from the inquiry best support their argument. Students will be able to write captions, quotations, headlines, body text, and bylines.</p>
<p>Day 4</p>	<p>Taking Informed Action (Optional but recommended)</p>	<p>Students reflect on why it is important to preserve cultural traditions by comparing and contrasting two indigenous-led organizations in the Andes.</p>

Checking for Understanding

After completing this lesson, students will have a richer understanding of the remarkable empire built by the Inka in South America in the fifteenth and sixteenth centuries. They will be familiar with the innovative techniques in road and bridge construction that enabled the Inka to connect disparate cultures across a vast empire for unification, communication, and trade. Moreover, students will have an appreciation for the fact that these innovations, developed by Native people more than five hundred years ago, can be applied today to contemporary engineering projects.