Shhh! . . . Mum's the Word:
Secret Cities of the Manhattan Project

Author	Jeannine Kuropatkin
Grade Level	High School
Duration	5 class periods

National Standards

GEOGRAPHY

ELEMENT 1: The World in Spatial Terms

1. How to use maps and other geographic representations, geospatial technologies, and spatial thinking to understand and communicate information.

ELEMENT 2: Places and Regions

4. The physical and human characteristics of places.

Element 6: The Uses of Geography

17. How to apply geography to interpret the past

AZ Standards

ELA

Reading

Key Ideas and Details

11-12.RI.1 Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.

11-12.RI.3 Analyze a complex set of ideas or sequence of events and explain how specific individuals, ideas, or events interact and develop over the course of the text.

Writing

Production and Distribution of Writing

11-12.W.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Research to Build and Present Knowledge

11-12.W.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

Language

Vocabulary Acquisition and Use

11-12.L.6 Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness

Arizona Social Science Standards

GEOGRAPHY

The use of geographic representations and tools help individuals understand their world.

HS.G1.1 Use geographic data to explain and analyze relationships between locations of place and regions. Key tools and representations such as maps, remotely sensed and other images, tables, and graphs

Human-environment interactions are essential aspects of human life in all societies.

HS.G2.1 Analyze interactions within and between human and physical systems.

HS.G2.4 Evaluate the use and sustainability of natural resources.

Examining human population and movement helps individuals understand past, present, and future conditions on Earth's surface.

HS.G3.5 Evaluate the impact of social, political, and economic decisions that have caused conflict or promoted cooperation throughout time.

HISTORY

The development of civilizations, societies, cultures, and innovations have influenced history and continue to impact the modern world.

HS.H1.7 Analyze how technological innovation and trade has affected economic development and transformed societies.

Cycles of conflict and cooperation have shaped relations among people, places, and environments.

HS.H2.1 Explain multiple causes of conflict.

	level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression. **TECHNOLOGY** **Strand 1: Creativity and Innovation** **Concept 4: Original Works** PO 1. Create innovative products or projects using digital tools to express original ideas.	HS.H2.3 Evaluate the short- and long- term impacts of conflicts and their resolutions.

SIOP Elements

Preparation **Adapting content** Linking to background **Linking to past learning** Strategies used	**Scaffolding** **Modeling** **Guided practice** **Independent practice** **Comprehensible input**	**Grouping Option** **Whole class** Small groups **Partners** **Independent**
Integrating Processes **Reading** **Writing** Speaking Listening	**Application** Hands on Meaningful **Linked to objectives** **Promotes engagement**	**Assessment** **Individual** **Group** **Written** Oral

Arizona English Language Proficiency Standards

Stage V:
Reading
Standard 4: The student will analyze text for expression, enjoyment, information, and understanding. The student will demonstrate knowledge of reading comprehension by:
B-4: answering literal questions about text. (e.g., who, what, when, where, when, why, which, and how)
B-8: determining the main idea (explicit and implicit) and supporting details in text.
B-21: applying understanding of content area vocabulary within math, science, and social studies texts.
B-25: interpreting external text within nonfiction text for a specific purpose.
Writing
Standard 5: The student will demonstrate research skills by using a variety of reference materials to complete a variety of writing tasks. The student will demonstrate research skills by using a variety of reference materials to complete a variety of writing tasks as evidenced by:
B-2: selecting information from more than one teacher-provided source about a teacher-selected topic.
B-4: summarizing information, from more than one teacher-provided source, in a written report which includes a topic sentence, at least three supporting sentences.
B-7: producing and presenting a report using technology. (e.g., Power Point, interactive whiteboard, etc.)

Overview

One of the most significant events of the 20th century was the dropping of the atomic bombs on Hiroshima and Nagasaki that essentially ended WWII and ushered in the nuclear arms race of the Cold War era.The "top secret" Manhattan Project, that created the first nuclear bombs, was a momentous collaboration between government agencies of the U.S. military, scientific research communities, and private corporations.The evolution of the Manhattan Project is an example of how intricate coordination of resources, cutting edge science, and human ingenuity were shaped by diverse geographical settings.

Purpose

Students will analyze both primary and secondary sources as part of an in-depth investigation of the three "secret city" Manhattan Project sites of Oak Ridge, Hanford, and Los Alamos. This will lead to a deeper understanding of the role geography plays in shaping historical events, as well as each site's contributions to the overall mission of creating the world's first atomic weapon.

Key Vocabulary

deploy: to move into a position of readiness for military action
industrial: relating to industry (factories and businesses)
conceived: to form an idea or plan
fission: the process in which the nucleus of an atom splits apart and releases energy
gaseous: consisting of gas, not a solid or a liquid
operating: to work, perform, or function
established: to set up or settle in a position or place
personnel: workers in a business or organization
site: a location on which something is built
concurrently: happening at the same time

Materials

- Access to technology
- 3-4 different color highlighters
- Manhattan Project Powerpoint
- Quickwrite Mind Map: War
- Vocabulary Cards
- Vocabulary Graphic Organizer
- Vocabulary Quiz & Answer Key
- Background: The Manhattan Project and Key to Highlighting
- Background v.2: The Manhattan Project (simplified reading)
- Manhattan Project Worksheet and Answer Key
- Map Analysis Worksheet
- Hanford Engineer Works map (printed in color)
- Clinton Engineer Works map (printed in color)
- Los Alamos Site map (printed in color)
- Trinity Test Site map (printed in color)
- Answer Keys for Map Analysis Worksheets for Hanford, Oak Ridge, and Los Alamos sites
- Paragraph Frame: Geography (simplified writing assignment)
- Checklist: Manhattan Project "Secret City" Digital Poster or Infographic
- Investigation Guide: Manhattan Project "Secret Cities" Hanford
- Investigation Guide: Manhattan Project "Secret Cities" Oak Ridge
- Investigation Guide: Manhattan Project "Secret Cities" Los Alamos
- Rubric: Manhattan Project "Secret City" Digital Poster or Infographic

Objectives

The student will be able to:

1. Analyze a variety of primary and secondary sources, both textual and visual, for informative content relating to the Manhattan Project.

2. Use maps to interpret geographic information.

3. Describe how geographic features influenced the selection of the Manhattan Project "secret city" sites.

4. Collaborate with peers to research and produce a digital exhibit on one of the Manhattan Project secret cities.

Procedures

Prerequisite knowledge*: Students should have background knowledge on the major events of WWII and understand the make up of the Allied and Axis powers and America's role in the Pacific Theater.*

Students should have a working knowledge of basic map components (date, orientation, grid, scale, title, author, legend, & situation) and experience with map analysis of thematic maps, especially historical and topographical.

Students should have a working knowledge of the structure of the atom (nucleus, neutrons, protons, electrons), the Table of Elements, and the definition of isotopes (atoms with the same number of protons & electrons, but a different number of neutrons).

SESSION ONE

Engage

1. Introduce the lesson by distributing copies of the " Quickwrite Mind Map: War and showing Slides 1-4 of the Manhattan Project Powerpoint. The slides guide students through a series of tasks, ranging from individual, to partner, to whole class groupings using the Quickwrite Mind Map: War as the vehicle for generating words/ideas, categorizing, and discussing weapons of war. **(Preparation: Adapting Content & Linking to Past Learning) (Integrating Processes: Writing)**
Slide 1 is the Title Slide.
Slide 2 Students engage in a 2-minute Self-Brainstorm activity, listing words and ideas that relate to "war" on the provided Mind Map. **(Grouping Option: Independent)**
Slide 3 Students pair-share with a partner to discuss, compare and contrast, then color code "war" words/ideas into student-created categories. **(Grouping Option: Partners)**
Slide 4 Students engage in whole class discussion of frequently used and unique categories, then to circle words/ideas that fit within the criteria of a "Weapons of War" category. **(Grouping Option: Whole Class)**

2. Next students discuss the questions on Slides 5-6 with their pair-share partner.
Slice 5 Students discuss their opinions regarding "Weapons of War and the 21st Century."
Slide 6 Students discuss their opinions regarding "Weapons of War and World War II." **(Preparation: Linking to Past Learning)**

3. Tell students that most historians and military strategists believe the creation of the atomic bomb was the most powerful weapon of WWII.

Slide 7 Students view the short videoclip showing the first ever Trinity atomic bomb test blast on July 16, 1945. Access the (1:08) videoclip at:
https://edpuzzle.com/media/59303bb2a563392760ad7220
Post-viewing, ask students to flip over their Quickwrite Mind Map. On the back, direct students to write down 1-2 words that describe how this test blast made them feel? What emotions did it touch? **(Scaffolding: Comprehensible Input)**

Slides 8-15 Address how in early August 1945, the US dropped atomic bombs on the Japanese cities of Hiroshima and three days later on Nagasaki. Have students view the short videoclip showing footage of the A-bomb blasts of the two Japanese cities.Access the (2:13) videoclip at:
https://edpuzzle.com/media/593059bb406c124f703b30af
Post-viewing direct students to create an original emoji to express their reaction to the bombings of Hiroshima and Nagasaki. Direct students to draw the emoji on the back of the Quickwrite Mind Map.

Slides 16-18 address how the atomic bombing led to Japan's surrender and initiated an immediate post-war era known as the Cold War in which the world's two superpowers (USA & USSR) engaged in a 45-year aggressive "Nuclear Arms Race." Many argue the atomic bomb has left a chilling legacy in today's world in which nations that possess nuclear missiles can dangerously tip the global balance of power. Have students discuss the questions on Slide 18 about the political cartoon with their pair-share partner. **(Application: Promotes Engagement)**

Explore
4. Inform students that this lesson focuses on the mission of the Manhattan Project and the roles of the three main secret cities. Have students view a videoclip giving a brief overview of the Manhattan Project. Access the (3:01) videoclip at:
http://www.history.com/topics/world-war-ii/trinity-test

Slide 19 poses the questions to be addressed. The lesson activity will consist of a close read of both primary source excerpts and an informative article on the Manhattan Project. Students will employ "mark the text" strategies that will enable them to accurately answer comprehension questions on a follow up worksheet.

5. **Special Instructions for Diverse Learners**
Consider front-loading academic vocabulary with diverse learners at this time. Distribute one set of Vocabulary Cards per pair-share partners.
Slides 20-24 The teacher performs the following:

- Pronounce each word and ask students to repeat two times.
- Read the definition out loud and clarify its meaning.
- Discuss how the card images serve as examples of the word meanings.

Note To better demonstrate the concept of fission, consider showing the brief videoclip at:
https://edpuzzle.com/media/5931c1f510a91d6c027223ac
(Integrating Processes: Reading) (Scaffolding: Comprehensible Input)

6. Allow time for students to practice reading the vocabulary words and definitions with their pair-share partner. Be mindful to pair up more proficient students with pre-emergent students for this activity.

(Scaffolding: Independent Practice) (Grouping Option: Partners)

7. To reinforce the academic vocabulary, distribute copies of the Vocabulary Graphic Organizer, one copy per student.
Slide 25 The teacher goes over the format of the graphic organizer and student tasks, using the first two vocabulary words as models. Call on students to pronounce the word, explain its part of speech, and review the definition. Direct students to use a highlighter to underline the vocabulary word in the "Teacher Example." Discuss how the word is used in the sentence. Assist students with writing their own sentence, using the vocabulary word accurately. **(Scaffolding: Guided Practice)** Explain that students should work with their pair-share partner to alternate reading the "Part of Speech" and "Teacher Example" to one another. BUT each student must craft his/her own sentence. **(Scaffolding: Independent Practice) (Integrating Processes: Reading & Writing)**

Consider assessing students with the Vocabulary Quiz, preferably after Session Two or Three. This will to allow students time to read and apply the vocabulary words in context of the Manhattan Project background reading and worksheet. **(Assessment: Individual)**

SESSION TWO

8. Distribute the reading Background: The Manhattan Project, one copy/student. Consider using Background v.2: The Manhattan Project with Diverse Learners. **(Preparation: Adapting Content)** The reading begins with two primary source quotes from people who were directly involved in the Manhattan Project and are their eyewitness accounts of the Trinity Blast Test. Note that both quotes are challenging as they are written in a poetic fashion, use elaborate language, and involve similes and metaphors. Teacher assistance with interpreting the text is to be expected, especially for diverse learners.

Slides 26-30 To assist students with understanding the primary source quotes, the teacher should:

- Tackle one quote at a time.
- Read each quote aloud to the class with emphasis on pronunciation and inflection.
- Review the differences between a primary and secondary source. **(Preparation: Linking to Past Learning)**
- Share that both quotes are from men who worked on the Manhattan Project and witnessed the Trinity Test Blast. **(Application: Linked to objectives)**
- Demonstrate how to "chunk the text" to aid with understanding difficult phrases and sentences. **(Scaffolding: Comprehensible input)**
- Direct students to draw boxes around unfamiliar words **(Scaffolding: Comprehensible input)**
- Model how to use a dictionary to find meanings of unfamiliar words & assigns students tasks for doing so **(Integrating Processes: Reading) (Scaffolding: Independent practice)**
- Demonstrate how to paraphrase difficult passages into meaningful text **(Scaffolding: Comprehensible input)**

9. Have students work with their pair-share partner to read the rest of the "Background: The Manhattan Project" reading. Point out that definitions for bolded vocabulary words within the reading are featured in the sidebar boxes. **(Preparation: Adapting content) (Integrating Processes: Reading)**

Slide 31 Instruct students to "mark the text" while reading: **(Scaffolding: Comprehensible input)**

- Draw brackets around geographic locations.
- Underline names of people in red.
- Highlight key points about the Manhattan Project.

10. **Slide 32** Distribute the Worksheet: Background: The Manhattan Project. Direct students to first discuss, then answer the worksheet questions with their pair-share partners. **(Grouping Option: Partners)**

Slide 33 Using the Worksheet Answer Key: Background: The Manhattan Project, the teacher will share the correct answers with the class. Particular attention should be given to Questions 6,7, & 9 as they pertain specifically to the three "secret cities" of Hanford, Oak Ridge, and Los Alamos. **(Grouping Option: Whole class)**

SESSION THREE

Explain
11. **Slide 34** Divide the class evenly into three groups. Within each group, students work with a pair-share partner. Assign each group to one of the three Manhattan Project "secret cities" of Hanford, Oak Ridge, and Los Alamos. **(Grouping Option: Partners)**

12. Explain to students that they will become "experts" about their assigned "secret city," starting with a Map Analysis of the site. Distribute copies of the three maps, each to their respective groups, one copy per student. (Note: Color copies of the maps are preferable in order to correctly analyze map features. If unavailable, give access to color versions of the maps via computer or color copies in clear sleeve protectors.) **(Preparation: Adapting Content)**

- Hanford – Hanford Engineer Works map
- Oak Ridge – Clinton Engineer Works map
- Los Alamos – Los Alamos Site map

13. Distribute copies of the Map Analysis Worksheets. Point out to students that the maps lack legends, so it is essential to use both observation and inference skills to interpret the map lines, color, and symbols. Preview the questions on the Map Analysis Worksheet. If necessary, review the concept of contour lines and how to use contour line intervals to interpret elevation and terrain on maps. **(Preparation: Linking to past learning)** To assist students, model some of the Map Analysis Worksheet using the Trinity Test Site map. **(Scaffolding: Modeling)**

14. Give pair-share partners adequate time to analyze their maps and complete their Map Analysis Worksheets. **(Scaffolding: Independent practice)**

Slide 35 Have student partners meet with members of their group to discuss and compare answers. Allow students to revise their answers based upon group feedback. **(Application: Promotes engagement)** The teacher rotates between groups to offer feedback, particularly on Question 6 (map legend) and Questions 9-12 (physical and human geographic features of the site).

SESSION FOUR

15. **Slide 36** Using knowledge gained from the map analysis, direct students to write a paragraph answering the question: "What geographic features influenced the site's selection?" The paragraph should consist of a topic sentence, three supporting statements, and a conclusion. (Note: Allow students who may need additional support with writing to use the Paragaph Frame: Geography.) **(Integrating Processes: Writing) (Scaffolding: Comprehensible input)**

Elaborate

16. **Slide 37** Explain to students that they will collaborate with their pair-share partner to create a digital project: a poster or infographic featuring their "secret city" site. Distribute copies of the Checklist: Manhattan Project "Secret City" Digital Poster or Infographic, one per student. Explain the Checklist criteria for the project. **(Application: Linked to objectives) (Scaffolding: Comprehensible input)**

The poster or infographic will consist of images and text that answer the following three questions:

- Geography: What geographic features influenced the "secret city" site's selection?
- Contributions: What was the "secret city" site's major contribution(s) to the Manhattan Project?
- Past to Present: To what extent did the development of this "secret city" site produce lasting changes to the region?

Showcase the two websites for creating digital posters or infographics:

- **Slide 38** Popplet
- **Slide 39** Canva

SESSION FIVE

17. Distribute copies of the respective Investigation Guide: Manhattan Project "Secret Cities."

Slide 40 Explain that each Investigation Guide has vetted websites to assist students with their research to meet the criteria for the poster or infographic project. Remind students that they are to collaborate with their pair-share partner to create one digital poster or infographic. Partners should give careful consideration to dividing the workload for the project in an equitable manner. Allow adequate time for students to research and create their digital projects. This might entail two class sessions as well as homework. **(Integrating Processes: Writing) (Integrating Processes: Reading) (Scaffolding: Comprehensible input) (Application: Promotes engagement)**

Evaluate

18. **Slide 41** Distribute copies of the Rubric: Manhattan Project Poster or Infographic and explain how the "Secret City" poster or infographic will be scored. Consider asking partners to self-assess their own project using the rubric. **(Assessment: Group) (Assessment: Written)**

Assessment

For mastery, students will score 80% or higher on:

- Vocabulary Quiz
- Manhattan Project
- Map Analysis Worksheet
- "Secret City" Poster or Infographic

Extensions

Through an investigation of oral histories, examine the extent to which "secrecy" impacted the lifestyle of families living and working at the Manhattan Project "secret cities." An excellent resource of oral histories can be found on "Voices of the Manhattan Project." http://manhattanprojectvoices.org/oral-histories

Research and create digital posters or infographics on additional sites connected to the Manhattan Project, including:

- Trinity Test Site, New Mexico
- Tinian Island
- University of Chicago Met Lab
- Columbia University
- University of California, Berkeley
- Hiroshima, Japan
- Nagasaki, Japan
- Wendover AFB, Utah

Create a timeline featuring major events that occurred in the evolution of the Manhattan Project. A chronology of major events can be found on: http://nuclearweaponarchive.org/Nwfaq/Nfaq10.html as well as in the E-book: "The Manhattan Project: Making the Atomic Bomb" F.G. Gosling. Refer to the chapter "Manhattan Project Chronology" (p 107-115) https://energy.gov/sites/prod/files/Manhattan_Project_2010.pdf Interactive digital timelines can be created using Sutori: https://www.sutori.com/

Sources

Videoclip from EdPuzzle: Excerpt from "Trinity and Beyond" showing Trinity Test Blast (1:08) https://edpuzzle.com/media/59303bb2a563392760ad7220

Videoclip from EdPuzzle: Excerpt from "Trinity and Beyond" showing the A-bomb blasts of Hiroshima and Nagasaki (2:13) https://edpuzzle.com/media/593059bb406c124f703b30af

Videoclip from EdPuzzle: Excerpt from "Nuclear Fission and Nuclear Fusion – What exactly happens in these processes" explaining nuclear fission (1:12) https://edpuzzle.com/media/5931c1f510a91d6c027223ac

Videoclip from History Channel: Overview of Manhattan Project (3:01) http://www.history.com/topics/world-war-ii/trinity-test

E-Book "Manhattan: The Army and the Atomic Bomb" Vincent C. Jones, US Army Center of Military History Publications, 1985 http://www.history.army.mil/html/books/011/11-10/CMH_Pub_11-10.pdf

E-Book "The Manhattan Project: Making the Atomic Bomb" F.G. Gosling, United States Department of Energy, 2010 https://energy.gov/sites/prod/files/Manhattan_Project_2010.pdf

The Manhattan Project: An Interactive History, US Department of Energy, Office of History & Heritage Resources http://web.archive.org/web/20101111232821/http://www.cfo.doe.gov/me70/manhattan/index.htm

http://www.atomicarchive.com/
Atomic Archive, Nuclear Pathways Project, National Science Digital Library

http://www.mphpa.org/
Atomic Heritage Foundation, Washington D.C.

https://www.archives.gov/atlanta/exhibits/rg326.html
National Archives at Atlanta
Atomic Energy Commission [AEC], Record Group 326

https://www.nps.gov/mapr/index.htm
National Park Service, Manhattan Project National Historical Park
http://www.oakridgetn.gov/
City of Oak Ridge

http://exploreoakridge.com/
Oak Ridge Convention and Visitors Bureau

http://www.losalamoshistory.org/atomic_links.htm
Los Alamos Historical Society's Atomic Links
http://www.visitlosalamos.org/
Los Alamos Chamber of Commerce

https://www.ci.richland.wa.us/i-want-to-/tourism/richland-road-trip
City of Richland, WA (Richland was the company residential town for Hanford)

http://www.hanford.gov/c.cfm/photogallery/index.cfm/1 US Department of Energy, Office of River Protection, Richland Operations Office Hanford Photo Gallery

Ham, Paul. Hiroshima, Nagasaki: The Real Story of the Atomic Bombings and Their Aftermath. New York: St. Martin's Press, 2014. Chapter 6 "The Manhattan Project."

Kelly, Cynthia C. Editor. The Manhattan Project: The Birth of the Atomic Bomb in the Words of Its Creators, Eyewitnesses, and Historians. New York: Tess Press, 2010.

Brode, Bernice. Tales of Los Alamos: Life on the Mesa 1943-1945. Los Alamos, NM: Los Alamos Historical Society, 1997.

Serber, Charlotte and Wilson, Jane S. Editors. Standing By and Making Do: Women of Wartime Los Alamos. Los Alamos, NM: Los Alamos Historical Society, 1998.

Bird, Kai and Sherwin, Martin J. American Prometheus: The Triumph and Tragedy of J. Robert Oppenheimer. New York: Vintage Books, 2005