

Lesson Title:

The Science of Destruction

Subjects:

U. S. History, World History

Suggested time:

Three 50-minute class periods (this may need to be longer, depending on how in-depth students will examine this topic)

Grade Levels:

7-12

Essential Questions:

- When is it ever justified to use a weapon of mass destruction?
- Who decides on how to use scientific discoveries?

Learning Target:

After learning more about the atomic bomb and its devastation, students will be able to explain the difficult decision process when considering the use of a weapon of mass destruction (in this case, nuclear weapons).

Overview:

The development of nuclear weapons occurred during World War II, and was the result of scientific breakthroughs in nuclear fission (splitting an atom). The heat/energy from fission could be used to generate steam-powered energy plants, as well as to create bombs that would cause unprecedented destruction. It is not the purpose of this lesson to provide extensive details about splitting the atom, however, some students may find that process interesting and conduct their own research. It is the purpose of this lesson to understand that nuclear reactions might be harnessed for constructive and destructive purposes, and to think about the implications of the destructive forces that result from nuclear weaponry. The Flying Heritage & Combat Armor Museum's (FHCAM) exhibit "Why War: The Causes of Conflict" provides several artifacts that support this lesson, including information about the only two nuclear bombs ever used in war, an original letter from Albert Einstein to President Franklin D. Roosevelt, and an eyewitness account of the devastation to Hiroshima, Japan after the first atomic bomb was detonated.

During World War II, bombing from airplanes caused extensive damage. It was nearly impossible to limit the destruction of the bombing raids, and extensive damage occurred to civilian property and lives. With the two nuclear bombs (also known as atomic bombs, because their destructive energy comes from the process of splitting the nuclei of atoms) dropped over Japan in 1945, the destructive force of bombing grew exponentially. A nuclear explosion breaks the very bonds that hold an atom together, releasing millions of times more energy than conventional explosives. On the American side, the bombing of Hiroshima and Nagasaki produced a combination of awe, fear, elation, and moral confusion. This lesson explores the science, emotions, and ethics around nuclear armament.

Materials:

Two documents will provide background information for the steps of this lesson module:

- *Two bombs:* The Why War: Causes of Conflict exhibit has replicas of the bombs dropped over Hiroshima and Nagasaki. Details about these bombs will provide background for Step 1 below, and add additional context prior to a student's visit to the museum.
- *Consequences of the Atomic Bomb:* This handout provides descriptions from the Causes of Conflict exhibit as well. The first half of the document provides background information describing, briefly, how a nuclear weapon works, and why it is so destructive. This will help your students during the Steps 2 and 3 portions of the lesson. The second half of the same handout provides a concise description of reasons supporting and reasons criticizing the USA's use of atomic weapons over Japan, and provides background information for Step 4

Other materials and references are included within each step below.

Procedures:*Warm up: Accessing Prior Knowledge*

Have the students brainstorm with a partner all that they think of when hearing the term "atomic bomb." After they have all created a list, tell them:

- Atomic weapons were first used for war in August, 1945 over the Japanese cities of Hiroshima and Nagasaki.
- These weapons have grown in power and destructive force, but have not been detonated since 1945.
- The debate continues today about the use of nuclear weapons.

Have each pair of students that met for the initial brainstorm join another pair (this will create groups of 4), and talk about these two questions (have one group member record a few notes about the key points of their discussion):

- 1) What do you think are some reasons that nuclear weapons have been developed and tested but never used since 1945?
- 2) Should countries limit the use of nuclear weapons? If yes, then how? If no, then why?

Have the class share ideas from their discussions to see how similarly and differently they are thinking from each other.

Step 1: Einstein's Letter and Dropping the Atomic Bomb

The Flying Heritage & Combat Armor Museum's (FHCAM) "Why War: The Causes of Conflict" exhibit has an original letter that was written to President Franklin Delano Roosevelt and signed by Albert Einstein. This letter is described as follows:

"After the discovery of uranium chain reactions, a group of Hungarian physicists predicted that the technology could be used to create incredibly powerful weapons. They feared Nazi Germany's possible use of such a weapon and approached Albert Einstein to warn the American government. This letter to President Roosevelt was written by

Hungarian physicist Leo Szilárd and signed by Albert Einstein. It was sent just before the outbreak of World War II and prompted President Roosevelt to launch the American atomic bomb program.”

Students can view the letter Einstein wrote here:

<http://www.atomicarchive.com/Docs/Begin/Einstein.shtml> (a link at the bottom right of this website allows access to an image of the actual letter).

Send students to this site, or print copies for them, and in pairs have students consider the points that the letter is trying to convey to the president of the United States. Remind students that at the time of this letter, the Japanese had not attacked the United States at Pearl Harbor, and the USA was not formally fighting in World War II. Have students identify the following:

- 1) What was the purpose of the letter?
- 2) What persuasive techniques are used to express the main points (in other words, how does it refer to expert opinion? How does it create a sense of urgency, etc.)?

After hearing of the devastation from the atomic bomb over Hiroshima, Japan, Einstein suggested that had he known Germany would not have created an atomic bomb, he would probably have not written the letter to the president in 1939. Einstein was not part of the project that developed the atomic bomb, and distanced himself from any association with its development. After informing the students of this, ask them why they think he took this position.

Step 2: Eyewitness account over Hiroshima

The Flying Heritage & Combat Armor Museum’s (FHCAM) “Why War: The Causes of Conflict” exhibit provides an eyewitness account of the first atomic bomb ever dropped over a city. The bomb, called “Little Boy,” was dropped from the US bomber the *Enola Gay*. The co-pilot of that plane gave a handwritten account, and is transcribed below:

Robert A. Lewis, the *Enola Gay* co-pilot, wrote his account of the Hiroshima mission on the back of his navigation log. The Science Editor of the *New York Times*, having arrived too late to be on board himself, requested the account. Lewis set down his thoughts as Little Boy exploded below, capturing the ambivalence and awe that nuclear power provoked.

Bombing of Hiroshima By Robert A. Lewis Capt—USAAF

August 6 – 1945

Ship #44-27292 “Enola Gay”

Radio Code Dimples ‘12’

...We turned off our IP and had about a 4 minute run on a perfectly open target. Tom Ferebee synchronized on his briefed A.P. and let go, for the next minute no one knew what to expect, the bombardier and the right seat jockey or Pilot both forgot to put on their dark glasses and therefore witnessed the flash which was terrific. Then in about 15 seconds after the flash, there were two very distinct slaps on the ship then that was all the physical effects we felt. We then turned the ship so we could observe results, and there in front of our eyes was without a doubt!!! the greatest explosion man has ever witnessed.

The city was 9/10 covered with smoke of a billowy nature which seemed to indicate buildings blowing up and a large column of white cloud which in less than 3 mins. reached 30,000 ft. and then went to at least 50,000 ft.

I am certain the entire crew felt this experience was more than anyone human had ever thought possible. It just seems impossible to comprehend.

Just how many Japs did we kill? I honestly have the feeling of groping for words to explain this or I might say My God what have we done.

If I live a hundred years I'll never quite get these few minutes out of my mind.

Looking at Capt Parsons, why he is as confounded as the rest and he was supposed to have known everything and expected this much to happen.

After a few last looks I honestly feel the Japs may give up before we land at Tinian. They certainly don't care to have us drop any more bombs of atomic energy like this.

Ask students to write down two new things they learned from this account, and one question they have after reading Captain Lewis' description. As they share their questions, ask students how they can find answers to these questions, and encourage them to report back to the class if they discover the answer to their questions. It is not part of this module to find answers to these questions, but if enough questions emerge, then this could be a great opportunity to set time aside for students to follow a question they have developed.

Step 3: Blast zone

This step in the module helps students gain a perspective of the devastation from a nuclear weapon. If you determine that your students have an appropriate maturity level for this, then the following website is a Google mashup that allows you to select a location, a nuclear weapon, including the two bombs dropped in 1945, and then see the resulting blast zone. You can add the number of fatalities as well. Again, this will not be appropriate for all students, but if you decide that it will help students meet the goal of understanding the mass destruction caused by nuclear bombs, then this mashup will be helpful:

<http://nuclearsecrecy.com/nukemap/>

Today, over 65 years after Hiroshima and Nagasaki, nuclear weapons are more powerful than ever before. While it is true that nuclear weapons have not been used, they have been developed and built extensively. In the years following World War II, a nuclear weapons "race" between the United States and the Soviet Union led to the "Cold War." With nuclear weapons, the prevailing thought was that a strong arsenal of weapons would deter others from attacking out of fear of a devastating retaliation.

Ask students to "free write" (or, write whatever comes to mind) for 5 minutes about this prompt:

"When you see the area that is effected by a nuclear blast and ensuing fallout, what comes to mind about the use of nuclear weapons?"

After students write to the prompt above ask for volunteers to share their ideas to the class. As students share, listen to make connections about common themes or ideas (e.g., seeing it on a map of the Puget Sound region made the size of the fallout more realistic; it is scary to think about terrorists accessing nuclear weapons).

Step 4: Science and ethics

Tell the students that we often are faced with ethical challenges as the result of technological innovations. Nuclear fission, the power behind nuclear energy and nuclear weaponry, is an example of science and ethics. Splitting the atom creates tremendous heat energy that can be harnessed to produce steam and generate electricity and also mass destruction. Civil use of nuclear explosions were tried, but deemed to be too risky and inappropriate. One such initiative was called “Operation Plowshare.”¹

It is clear that manufacturing a nuclear weapon involves undisclosed technologies, and most countries do not have access to this information. Five countries, however, do have arsenals of nuclear weapons. International debate about controls on nuclear weapons led to a United Nations Treaty on the Non-Proliferation of Nuclear Weapons. This treaty was made in 1968, and most recently updated in 2010, with 191 countries agreeing to its terms.²

After presenting students with this background information, pose the following question, and sub-questions, to them:

Question:

What is an appropriate international policy for the development, storage, or use of nuclear weapons for the 21st century?

Sub-questions:

- Who should oversee nuclear weapons around the world?
Should some countries not be allowed to develop nuclear weapons?
- Who determines the countries that can and cannot have weapons?
- Should all countries have limits on nuclear weapons?

In the groups of 4 formed in Step 1, ask students to discuss answers to these questions. Have each student write down their answers and key ideas from the discussion. After having a chance to discuss these answers with classmates, have students develop a policy statement (an answer to the question above: What is an appropriate international policy for the development, storage, or use of nuclear weapons for the 21st century?). The statement should be one paragraph long, and have at least one source of evidence as support.

¹ For a concise paper on this, please refer to this site:
<http://large.stanford.edu/courses/2014/ph241/powell11/>

² For more information on this disarmament treaty, visit this United Nations website:
<https://www.un.org/disarmament/wmd/nuclear/npt/>

Extension Activity:

If students visit The Flying Heritage & Combat Armor Museum’s (FHCAM) “Why War: The Causes of Conflict” exhibit, they will be able to read the actual first draft of the 1939 letter Einstein signed and had delivered to FDR. The initial draft at the FHCAM is shorter, and contains less information. Einstein, signed both, and requested that FDR be given the longer version. Students can take a copy of the sent to FDR (this was used in Step 1 above, and is available at this site: <http://www.atomicarchive.com/Docs/Begin/Einstein.shtml> - a link at the bottom right of the page allows access to an image of the actual letter if students want to compare it to the one in the FHCAM exhibit).

Language Support:

To aid those with limited English proficiency or others who need help with academic language, place them in groups with at least one student who speaks English as a first language. The handout on risk factors can also be given to ELLs the day before this activity, and ELLs should be told which risk factor they will examine.

Standards:**Washington Standards (EALRs/GLEs)****8th Grade Social Studies****EALR GLE GLE Description**

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|---------|-------|--|
| History | 4.3.1 | Analyzes and interprets historical materials from a variety of perspectives in U.S. history (1776—1900). |
| | 4.3.2 | Analyzes multiple causal factors to create positions on major events in U.S. history (1776 – 1900). |

9th and 10th Grade Social Studies**EALR GLE GLE Description**

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|---------|-------|--|
| Civics | 1.3.1 | Analyzes the relationships and tensions between national interests and international issues in the world in the past or present. |
| History | 4.2.1 | Analyzes how individuals and movements have shaped world history (1450—present). |
| | 4.2.3 | Analyzes and evaluates how technology and ideas have shaped world history (1450—present). |
| | 4.3.2 | Analyzes the multiple causal factors of conflicts in world history (1450 – present). |
| | 4.4.1 | Analyzes how an understanding of world history can help us prevent problems today. |

11th Grade Social Studies**EALR GLE GLE Description**

- History 4.2.3 Analyzes and evaluates how technology and ideas have shaped U.S. history (1890— present).
- 4.3.1 Analyzes differing interpretations of events in U.S. history (1890—present).
- 4.3.2 Analyzes multiple causes of events in U.S. history, distinguishing between proximate and long-term causal factors (1890—present).
- 4.4.1 Analyzes how an understanding of United States history can help us prevent problems today.
- Skills 5.1.1 Analyzes the underlying assumptions of positions on an issue or event.

12 Grade Social Studies

EALR GLE GLE Description

- History 4.2.1 Evaluates how individuals and movements have shaped contemporary world issues.
- 4.2.2 Analyzes how cultural identity can promote unity and division.

Common Core State Standards:

Build Social Studies Literacy through Reading and Writing Common Core State Standard for ELA & Literacy in Social Studies Grades 9-10

<http://www.corestandards.org/ELA-Literacy/RH/9-10/>

Key Ideas and Details:

CCSS.ELA-LITERACY.RH.9-10.1

Cite specific textual evidence to support analysis of primary and secondary sources, attending to such features as the date and origin of the information.

CCSS.ELA-LITERACY.RH.9-10.2

Determine the central ideas or information of a primary or secondary source; provide an accurate summary of how key events or ideas develop over the course of the text.

Build Social Studies Literacy through Reading and Writing Common Core State Standard for ELA & Literacy in Social Studies Grades 11-12

<http://www.corestandards.org/ELA-Literacy/RH/11-12/>

Key Ideas and Details:

CCSS.ELA-LITERACY.RH.11-12.1

Cite specific textual evidence to support analysis of primary and secondary sources, connecting insights gained from specific details to an understanding of the text as a whole.

CCSS.ELA-LITERACY.RH.11-12.2

Determine the central ideas or information of a primary or secondary source; provide an accurate summary that makes clear the relationships among the key details and ideas.

CCSS.ELA-LITERACY.RH.11-12.3

Evaluate various explanations for actions or events and determine which explanation best accords with textual evidence, acknowledging where the text leaves matters uncertain.

Craft and Structure:

CCSS.ELA-LITERACY.RH.11-12.4

Determine the meaning of words and phrases as they are used in a text, including analyzing how an author uses and refines the meaning of a key term over the course of a text (e.g., how Madison defines *faction* in *Federalist* No. 10).

CCSS.ELA-LITERACY.RH.11-12.5

Analyze in detail how a complex primary source is structured, including how key sentences, paragraphs, and larger portions of the text contribute to the whole.

Integration of Knowledge and Ideas:

CCSS.ELA-LITERACY.RH.11-12.9

Integrate information from diverse sources, both primary and secondary, into a coherent understanding of an idea or event, noting discrepancies among sources.

NCSS C3 Framework (College, Career, and Civic Life)

Dimension 1: Developing Questions and Planning Inquiries

Dimension 2: Applying Disciplinary Concepts and Tools

Dimension 3: Argument Writing

Dimension 4: Communicating Conclusions and Taking Informed Action