The Atomic Bomb: How It Was Built, Why It Was Used, and How It Changed The World

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Academic Setting

I teach seventh grade Language Arts and Literature at Ernie Pyle Middle School, located in Albuquerque's South Valley. Our students are overwhelmingly Hispanic (90 percent), lower middle class (most qualify for free lunch), and academically challenged (we finish near the bottom of the list when standardized test results are released for our district, with reading scores typically in the 30-percentile range). Low skill levels and a lack of student motivation are obstacles teachers in the South Valley confront every day. We need to inspire students with interesting topics and exciting activities that are relevant to New Mexicans, and a unit about Atomic America fits the bill.

Our students need to learn and practice academic skills -- reading, writing, note taking, map reading, graphing, computer literacy, public speaking -- if they are to improve their academic standing. The trick is to plan curriculum that will involve all these activities not in isolation, but as part of a comprehensive unit that is meaningful and fun. New Mexico history is a part of the seventh grade Social Studies curriculum, but its scope is so wide and time is so limited (the entire New Mexico history curriculum must be presented in one semester) that Los Alamos, the Manhattan Project, and all the implications of the atomic bomb get precious few pages in the Social Studies textbook, and too few minutes of discussion in the classroom.

Like many teachers, I feel that social studies and literature can be blocked in longer classes with better results. A unit about World War II that includes The Diary of Anne Frank, for example, puts a human face on the numbing statistics of the Holocaust and invites student reflection and impassioned classroom discussion. Although our school currently does not offer a humanities block, our individual classes are blocked in 70-minute periods (students have four of these classes, plus lunch and reading, in an alternating A-Day, B-Day schedule). Therefore, students do have the time to delve into topics in detail and pursue project-length assignments. Since language arts and literature are considered to be separate subjects in our system (although I integrate the two in the way I teach and grade), I see every student every day for 70 minutes (as opposed to teachers of other subjects, who see students every other day). I mention this because my curriculum unit will last four weeks, based on five 70-minute class periods per week. Teachers working with different schedules will need to adjust the daily plans accordingly.

Rationale

Certain landmark events in history -- the invention of the printing press, Darwin's

On The Origin of Species, Einstein's Theory of Relativity -- so forever changed the world that they demand in-depth investigation. I believe that the development of the atomic bomb, President Truman's decision to use it, the ensuing Cold War and buildup of nuclear weapon stockpiles, and the all the literary responses to this new atomic age together represent such a watershed event in history. I also believe that these events are best understood -- even for adolescents -- in their relationship to each other and not as isolated phenomena. I therefore propose a unit that will combine New Mexico history (The Manhattan project and New Mexico's current role in weapons development), United States history (the decision to use the atomic bomb and its role in World War II), and Literature (reactions to the atomic age in fiction, non-fiction, poetry, and drama). Although this unit is extremely broad in scope, I strongly believe that the "pieces to the puzzle" are interdependent and must be presented together if students are to get a complete understanding of what it means to live in the atomic age.

Because my students were born in the 1980's, most have no idea what either world war was about or any sense of historical chronology. Although many know that the activities at Kirtland Air Force Base and Sandia and Los Alamos National Laboratories are important to New Mexico's economy, they really don't know what kind of work goes on there. For many of these students, nuclear weapons exist only as instruments of destruction in the videos they rent ("The Road Warrior") and the video games they play ("Duke Nuke-em"). Perhaps they've seen the high-tech "smart bombs" blowing things up in footage from The Gulf War -- and that's a concern in itself. Do today's young people, because they've grown up in a high-tech world, take these weapons that could obliterate civilization for granted, do they view their destructive potential too casually? I would argue they do, all the more reason to take a long look at these issues. I think my students need to understand this material as New Mexicans, as Americans, but most importantly, as human beings and citizens of the world.

As an educator, the exciting thing about a unit like this is that it allows me to introduce these topics to my students while meeting the essential competencies of the Language Arts curriculum -- researching, reading, writing, listening, and speaking. Students will explore topics both on-line and in the library, present their findings to the class, write in different genres, listen to their classmates, historians (via video), and a guest speaker, and read a variety of fiction and non-fiction related to the atomic bomb and the Atomic Age. This investigation will encompass not only social studies and language arts, but math and science as well, for students will ponder the equation $E=mc^2$ and get a brief introduction to atomic physics when we discuss how the bomb was made and how it works. Indeed, the best way to present a unit as broad as this one would be to involve every teacher on the child's team in a sweeping interdisciplinary project, but the ability to do so varies with individual teachers and schools. Therefore, I will include material from whatever subject areas I deem necessary to facilitate student understanding.

Meeting State Standards

Although this unit includes information from multiple subject areas, it was created by a Language Arts teacher with the state (New Mexico) standards for English in mind. When listing the unit objectives, I will reference each objective with the state benchmark that specific activity addresses. There are three major state content standards for English/Language Arts:

- Reading and Listening for Comprehension -- **Content Standard I**: Students will apply strategies and skills to comprehend information that is read, heard, and viewed.
- Writing and Speaking for Expression -- **Content Standard II**: Students will communicate effectively through speaking and writing.
- Literature and Media -- **Content Standard III**: Students will use literature and media to develop an understanding of people, societies, and the self.

Within these standards, there are performance benchmarks for specific skills. Rather than assign each activity a specific benchmark (such as II-C), I will note Roman Numeral I, II, or III after each objective to place it within the scope of a state content standard. Of course, many activities address more than one content standard and are noted accordingly.

Objectives

This unit is intended to be a survey of three subtopics related to the atomic bomb: how it was built, why it was used at the end of World War II, and how it changed the world in the subsequent Cold War and nuclear arms race. My goal is to introduce these topics, not to accomplish a deep understanding of them. It is my hope that my seventh-grade students will see the vital connections to New Mexico history, develop a better sense of US history and the chronology of World War II, and recognize important components of the post-war environment that emerged because of the atomic bomb. I realize that each one of these subtopics is worthy of a great deal more study, and it is my hope that my students will explore these as they do independent research papers and proceed with US history courses in eighth grade and in high school. This unit, therefore, can be seen as a bridge from seventh to eighth grade social studies as well as a introduction to the important literature that emerged as a result of use of the atomic bomb, works as diverse as John Hersey's Hiroshima and the teleplays of Rod Serling. Each subtopic has its own objectives, and these will be discussed more fully in the implementation section of the unit and in daily lesson plans. Briefly, these are my goals for each week:

Week One (How the bomb was built) -- Students will:

- Take notes during documentary films ("The Day After Trinity" or the PBS production "The American Experience, The Race for the Superbomb" and "Los Alamos, the Secret City" (part of the Trails of Enchantment video library), will be viewed. (I/III)

- Recognize New Mexico's role in the development nuclear weapons -- then and now. (I)
- Introduce students to the scientific discoveries that made the atomic bomb possible (I/III).
- Use computers to research the key people involved in The Manhattan Project.(I/III)
- Discuss President Truman's options regarding this new weapon (I/II).

Week Two (Why the bomb was used) -- Students will:

- Formulate a timeline of World War II (I).
- Read, summarize, and discuss newspaper accounts of important events during World War II (I/II/III).
- Define propaganda and illustrate its uses in editorial cartoons, newsreels, public service advertising, and war posters (I/II/III).
- Use computer programs to measure and map the destruction wrought by nuclear devices (I/III).
- Read survivor accounts of the Hiroshima and Nagasaki bombs (I/III).
- Write creatively about what nuclear devastation would be like (II).

Weeks Three and Four (How the atomic bomb changed the world) -- Students will:

- Define the term "Cold War" and discuss the bi-polar world order that existed until the fall of the Soviet Union (I).
- Graph the rise of nuclear stockpiles from 1945-1996 (I/II).
- Learn of Cold War hostilities, especially the Cuban Missile Crisis and precautions for civil defense (I/III).
- Listen to protest songs that responded to the nuclear threat (Barry McGuire's "Eve of Destruction") and read poetry that provides reflection on the dangerous possibilities of the atomic age (I/III).
- View an episode of *The Twilight Zone* and discuss ways in which American popular culture reflects the concerns of its citizens (I/II/III).
- Write a research paper about some aspect of the Manhattan Project or World War II (I/II/III).
- Visit the National Atomic Museum(located inside Kirtland Air Force Base in Albuquerque, New Mexico) (I/III).
- Hear from a guest speaker (from Sandia National Laboratories) about New Mexico's continuing role in weapons research and other high-tech endeavors (I).
- Read and respond to a novel that deals with the larger issues of what a post-nuclear environment would be like (*Wolf of Shadows* or *War Day* by Whitley Strieber are two possibilities) (I/II/III).

Historical Background

Any understanding of how the atomic bomb works begins with the structure of the atom and the workings of its components -- protons, neutrons, and electrons. Beginning with Ernest Rutherford's discovery of the proton in 1919, continuing throughout the 1930's, when Enrico Fermi produced nuclear fission, and into the 1940's, when a controlled nuclear chain reaction using an isotope of uranium released incredible amounts of energy, a monumental scientific mystery was unfolding. With many of the best analytical minds of the world, most notably physicist Robert Oppenheimer, joining forces with an awesome American industrial machine commandeered by General Leslie Groves, the ultra-secret Manhattan Project produced the weapon that would force Japan's surrender, end World War II, and forever change the world.

The road to the atomic bomb began in 1919, when Rutherford, working at Cambridge University in England, achieved the first artificial transmutation of an element when he changed several atoms of nitrogen into oxygen (1). In the process, Rutherford detected a high-energy particle with a positive charge that proved to be a hydrogen nucleus (2). The fact that energy exists within the structure of an atom, combined with Albert Einstein's famous 1916 theoretical formula E=mc2 (energy equals mass times the square of the velocity of light) promised breathtaking quantities of energy for anyone unlocking the secrets of how these minute particles are held together -- and how they could be broken apart.

Another major step in this process came in 1932, when J.D. Cockroft and E.T.S. Walton became the first scientists to split the atom by bombarding lithium with protons generated by a particle accelerator and changing the resulting lithium nucleus into two helium nuclei (3). Two years later Fermi bombarded uranium, the heaviest of known elements, with neutrons to produce nuclear fission, although it would take the work of other scientists -- Otto Hahn and Fritz Strassmann -- to recognize the potential this process had for harnessing energy (4).

Ironically, many of the key players in these discoveries were refugees from Fascist regimes -- especially Germany -- that longed for a powerful new weapon that could aid their conquest of neighboring countries. Calculations made by Hahn's former colleague, Lise Meitner, a refugee of Nazism then staying in Sweden, and her nephew, Otto Frisch, concluded that so much energy was released in the Hahn-Strassmann experiments that a previously undiscovered process, dubbed "nuclear fission," was now at work. The riddle was becoming clearer: When uranium-235 is split, some of its mass is lost to energy. In other words, the "glue" that holds atoms together is energy, and when fission begins to break atoms apart, each dividing nucleus becomes the trigger for the next atom, thereby creating a chain reaction that makes the release of enormous amounts of energy possible. Fermi, an Italian married to a Jew, used the occasion of the awarding of his 1938 Nobel Prize to escape his homeland after Mussolini gave signs of favoring racial persecution. By 1939, Einstein was persuaded to sign a letter drafted by Hungarian

physicist Leo Szilard, himself a refugee of Fascist repression, warning President Franklin D. Roosevelt of the danger an atomic bomb could present if German scientists were to build it first (5).

Roosevelt responded with a committee to study uranium, beginning a six-year American quest to research the properties of uranium, produce enough weapons-grade uranium (uranium-235, a scientifically produced isotope of the naturally-occurring uranium-238) to build a bomb, and, most importantly, trigger and manage a nuclear chain reaction that could produce enough energy to decimate an entire city. An intriguing partnership was forged in this effort. Groves, the abrasive, hard-driving engineer who built the Pentagon, and Oppenheimer, the brilliant, chain-smoking professor from Berkeley, would sometimes experience a clash of egos, but ultimately complement each other's talents. While Groves was coordinating the enormous industrial efforts to produce weapons-grade uranium at Oak Ridge, Tennessee (starting in late 1942), and plutonium (another new artificial element created by bombarding uranium-235 with neutrons) at Hanford, Washington (starting in early 1943), Oppenheimer used his charm and personality to lure a extremely young and talented staff of scientists to Los Alamos. Groves, determined to complete and test the new weapon even after the Germans surrendered to the Allies in May of 1945, set a demanding timetable that Oppenheimer's scientists met.

The Manhattan Project yielded two types of atomic bombs, each with its own method of unleashing a nuclear chain reaction using weapons-grade fuel. "Little Boy," the uranium device dropped on Hiroshima on August 6, 1945, used the "gun method," shooting one-half amounts of a critical mass of uranium-235 (together, the two halves were about the size of a softball) at each other down a gun barrel to begin the explosion. "Fat Man," dropped on Nagasaki on August 9, 1945, used the "implosion method, " compressing plutonium-239 to trigger the bomb. The complexity of scientific, social, and political factors related to The Manhattan Project makes this slice of American history rich ground for research, and I hope my students will find some aspect of this period engaging.

Equally fascinating is Truman's fateful decision to use the bomb. Many Americans, myself included, grew up believing that the use of the weapon, although regrettable, was necessary to save a million American lives in the Pacific and force Japanese surrender. Many historians have challenged this view, most notably J. Samuel Walker, author of *Prompt and Utter Destruction*. After examining the historical evidence, Walker concludes that the prevailing belief about the bomb preventing an invasion of Japan and hundreds of thousands of American casualties is a "mythological construct" for the following reasons:

- There were other options available for ending the war in a reasonably short amount of time without an invasion.
- Truman and his key advisers believed that Japan was so weak that the war could end before an invasion began.

- Even if a invasion were necessary, military planners in the summer of 1945 projected the amount of American casualties to be far fewer than the hundreds of thousands Truman and his advisers would claim after the war (6).

Although Walker concedes that the use of the bomb was militarily expedient, ending the war more quickly than other approaches would have, he points to evidence suggesting that other considerations weighed heavily, perhaps decisively, in Truman's decision. Walker cites the work of political economist Gar Alperovitz, whose 1965 book Atomic Diplomacy argues that Truman did not seriously consider alternatives to the bomb because he wanted to impress the Soviets with its power (7).

Other factors may well have played a part in Truman's decision as well, including powerful anti-Japanese sentiments stemming from the sneak attack on Pearl Harbor and intensified by World War II propaganda depicting Japanese as a bloodthirsty, sub-human race. Japanese military traditions equating surrender with dishonor and well-publicized accounts of atrocities committed by Japanese troops -- especially during the "Bataan death march" of 1942 -- also contributed to American notions that the Japanese might "fight to the last man" and "deserve some of their own (cruel) medicine." Groves' determination to see the Manhattan Project through to its ultimate goal, thereby justifying the $2.2 billion cost of the atomic bomb effort, was another contributing factor. Although the reasons behind Truman's decision will likely be debated for years to come, the court of American public opinion (especially a court comprised of those alive during World War II) apparently still approves of Truman's actions. A 1995 Gallup survey showed that Americans between the ages of 50 and 64 approved of the action by a margin of 72 to 24 percent; Americans aged 65 and older approved it by an even wider margin, 80 percent to 13 percent. (8)

The controversy came to head in 1994, when the Smithsonian Institution was forced to abandon plans for an exhibit -- slated as a 50th-year commemoration of World War II -- that would examine the atomic bomb's creation, the decision to use it, the *Enola Gay*'s mission, the ground-level effect of nuclear weaponry, the bomb's role in ending the war, and the new era it created (9). As chronicled in the book *History Wars* by Edward T. Linenthal and Tom Engelhardt, the exhibit became a litmus test for a wide spectrum of American political views. Conservatives, on one end, decried perspectives sensitive to the horrifying Japanese civilian losses as un-American, while liberals, on the other end, found the possibility of celebrating an event so lethal and destructive -- and so ominous for the future of mankind -- to be thoroughly repugnant. My purpose as an educator is not to advocate any position, but to open a discussion of these issues among my students, even if they may not fully comprehend all of the ramifications.

I also want my students to understand the atomic bomb's legacies in the post-World War II world order, the Cold War, literature, and popular culture. The

building of the Berlin Wall, the Korean War, the Cuban Missile Crisis, and the frightening and devastatingly expensive nuclear arms race are all related in some degree to nuclear weapons and tensions between the United States and the Soviet Union. Like it or not, the Cold War's "draw a line in the dirt" mentality dominated world politics for four decades, and students must grasp its dimensions if they are to fully understand the History of America and the world.

Works of literature related to the bomb revealed a new sense that the world is different place, less secure and infinitely more dangerous. Military operatives of two superpowers sit in front of radar screens on opposite sides of the globe, poised with their proverbial "fingers on the button." Oppenheimer reportedly experienced this sense of dread while watching the successful Trinity test explosion near Alamogordo, New Mexico, on July 16, 1945, recalling later that the spectacle reminded him of the legend of Prometheus, punished by Zeus for giving man fire (10). John Hersey, writing for *The New Yorker Magazine* in 1946, stunned Americans with a sobering, spare account of what several Hiroshima survivors witnessed on that morning when a bright flash in the sky signaled a terrifying fate for their city. Little Boy killed 70,000 people and injured another 70,000 with its hurricane-force explosion and resulting firestorm. By 1950, the death toll would rise to 200,000, the awful result of nuclear radiation (11). With the publication of *Hiroshima*, which immediately sold out on newsstands and was subsequently published in book form (and remains in print today), Hersey put a human face on the tragedy, jolting Americans from a post-war euphoria and signaling a new sensibility about the atomic age. An excerpt remains as powerful today as the day it was written:

"Thousands of people had nobody to help them. Miss Sasaki was one of them. Abandoned and helpless, under the crude lean-to in the courtyard of the tin factory, beside the woman who had lost a breast and the man whose burned face was scarcely a face any more, she suffered awfully that night from the pain in her broken leg. She did not sleep at all; neither did she converse with her sleepless companions" (12).

Of course, Japanese writers and artists also responded to the twin nightmares of Hiroshima and Nagasaki. *Shin's Tricycle*, a children's book by Tatsuharu Kodama, tells of a three-year-old Japanese boy who dies in the Hiroshima attack; his burned tricycle is on display at the Peace Museum in Hiroshima. *Sadako*, by Eleanor Coerr, tells the story of a Japanese girl struggling with leukemia, a disease sometimes caused by the effects of radiation. An examination of newspaper accounts from the war, like those written in *Brave Men* by American correspondent Ernie Pyle (himself killed by a Japanese sniper in the closing days of the war), may put these events into historical perspective and underscore the fact that the war in the Pacific was incredibly brutal, bringing death and misery to Americans and Japanese alike.

In the 1950's "beat generation" writers and poets like Jack Kerouac and Allen

Ginsberg railed against most of the prevailing American icons -- consumerism, industrialism, suburbia, and military preeminence -- but remained on the fringes of the nation's consciousness. As the Cold War intensified and stockpiles of nuclear weapons rose, the possibilities of nuclear annihilation began to creep into the American dialogue. Science fiction television dramas like *The Twilight Zone* and *The Outer Limits* sometimes included alien visitors eerily aware of humanity's capacity for destroying itself. A song on the "B" side of the hit single "Rock Around The Clock" by Bill Haley and the Comets, titled "Thirteen Women and Only One Man," tells of a town hit by a nuclear weapon, leaving the narrator as the only surviving male.

Reality imitated art in 1962, when the hysteria generated by The Cuban Missile Crisis reminded Americans how closely the Soviet Union and the United States could come to a shooting war with nuclear weapons. In an event later dramatized in Stanley Kubrick's classic 1964 movie *Dr. Strangelove*, the White House received a long, incoherent message from Nikita Khrushchev, prompting President John F. Kennedy's top decision makers to wonder whether the Soviet leader was drunk. To a greater extent than many might believe, *Dr. Strangelove* faithfully mirrors this historic epoch, in which the world's fate often seemed hostage to accident, miscalculation, and human fallibility (13). Other films such as *The Day After* and *Day One*, both produced for television, would later sound similar worries.

The themes of the Vietnam War, minority civil rights movements, and nuclear proliferation often overlapped in the protest music and poetry of the 1960's and 1970's. Songs like "Where Have All The Flowers Gone" by Pete Seeger and "Masters of War" and "Blowin' In The Wind" by Bob Dylan voiced the concerns of a generation of Americans wary of international conflict in the ages of nukes. A collection of Poetry titled *Nuclear Age Literature for Youth*, edited by Millicent Baker, presents many selections on this theme. Again, students need to know the history of the Cold War if they are to grasp the meaning of these poems and dramas, and this material should be accompanied by a framework of the period and the facts of the arms race, from statistics and charts reflecting the rise of nuclear stockpiles to first-person accounts of the activities going on at government labs dedicated to the development and manufacture of these weapons.

The possibilities of nuclear Armageddon also surface in the novel, especially in the genre of science fiction. *A Canticle For Leibowitz*, by Walter M. Miller paints a frightening picture of an America blasted back into an age of feudalism where tribes of warriors roam the plains and the Catholic Church is left to sort through the rubble. *Neuromancer* by William Gibson tells of a world dominated by powerful corporations that use to technology to control every aspect of life, even procreation. I hope to use this unit a springboard to a science fiction novel for young adults with *Wolf of Shadows* and *War Day* by Whitley Strieber being two possibilities.

Implementation

The lesson plans that follow comprise a four-week unit based on five 70-minute class periods per week. Although I teach 7th grade Language Arts, the unit encompasses social studies and would fit nicely in a humanities block combining both classes. Although I teach middle school, the subject material is appropriate for high school as well, and teachers could adapt by changing materials and strategies to fit their audience (for example, including a debate or mock trial regarding the decision to use the atomic bomb instead of a an essay; choosing a more advanced novel -- such as Kurt Vonnegut's *Cat's Cradle* -- to illustrate the perils of the nuclear age). The unit progresses in three stages: how the bomb was built (Week 1), why the bomb was used (Week 2), and how the bomb changed the world (Weeks 3-4). The daily plans use an abbreviated version of Marylin Burns' five-step lesson plan and include these components: objectives (goals), focusing activity, instruction, guided practice, and independent practice. It should be noted that two days will take place in a computer room equipped for Internet access. Materials and preparations needed for each lesson are noted on a day-by-day basis. An assessment rubric follows at the end of the implementation section.

Week One (How the bomb was built)

Day One -- ***Objectives:*** Students will list what they already know about the atomic bomb, write questions they have on the topic, then attempt to answer their own questions using their social studies text and while watching a video about the Manhattan Project. ***Materials/Preparation:*** Social studies textbook (with section about the Manhattan Project); "Trails of Enchantment" video titled *Los Alamos: Secret City* (or other video on Manhattan Project). ***Focusing Activity:*** Students make a two-column list with these headings: "What I already know about the atomic bomb" and "What I'd like to know about the atomic bomb." Partner students for five minutes so they can brainstorm a list for column one. Share some "facts" with the class -- are any of these "facts" misconceptions? ***Instruction:*** In column two, students write at least five questions they have regarding the atomic bomb. Students then read the section of the New Mexico history text (or US history text) dealing with the Manhattan project (typically one or two pages) to see if the answers are there. The "Trails of Enchantment" video titled *Los Alamos: Secret City* (running time about 25 minutes) will then be presented. ***Guided Practice:*** Students use the information provided in the video to answer their own questions. A class discussion about the importance of the Manhattan project -- to New Mexico and to the nation -- provides closure for the day.

Day Two -- ***Objectives:*** Students will learn the basics of atomic theory and research a breakthrough in military history. ***Materials/Preparation***: Pictures or overhead transparencies illustrating a fission chain reaction (see The Manhattan Project: Making the Atomic Bomb, page 3); several library books dealing with the weapons used in warfare throughout history. Be prepared to present a very basic lecture about atomic theory and nuclear fission. ***Focusing Activity:*** Students will attempt

to answer the following two questions: 1. What does the formula $E=mc^2$ mean? 2. What weapon, when it was first invented, changed the course of military history? ***Instruction:*** Discuss student ideas for both questions. Ask students how these two questions could be related. Provide the basics of atomic theory using the chalkboard (or overhead projector) to discuss diagrams of the atom while students take notes. Conclude with the concept of the dividing atom releasing energy and connect the idea with Einstein's formula. How could this energy be used for a weapon? How could this energy be used in other ways? A list of breakthroughs and discoveries -- steps to the development of the bomb -- will be presented. ***Guided Practice:*** Working in partners or small groups, students use library materials to research an important advance in military history (the crossbow, gunpowder). Partners present their findings to the class. During the reports, students must compile a three-column chart: the military advance/ the year it appeared/ why it was important. Teacher adds nuclear weapons to the list before students turn their charts in.

Day Three -- ***Objectives:*** Students will use the Internet to research important people and events in the development of nuclear weapons. ***Materials/Preparation:*** Computers with access to the Internet. Preview the activities at the pbs.org website "The Race for the Superbomb." ***Focusing Activity:*** Review rules and strategies for computer use and navigation of the world-wide web. ***Instruction:*** Students begin their search on the pbs.org website and proceed through a series of links beginning with the link "The American Experience" (the series), then the program "The Race for the Superbomb." Each student (or pair of students -- if there are not enough computers) is assigned a year (1941-1963) and a person (or event) to research. Students go to the "timeline" link to find facts about their year, then to the "people and events" link to find information about their topic. ***Guided Practice:*** Students take notes they will use to write and present two reports -- one on the events from their year, another on a person (such as Robert Oppenheimer) crucial to development of nuclear weapons and the arms race. Students use their notes to write two brief reports that will be presented in class the next day. ***Independent Practice:*** Students are encouraged to find more information on their own to supplement their notes.

Day Four -- ***Objectives:*** Students will make a short oral presentation to the class and take notes on the presentations of others. A timeline will be compiled from all the information presented. ***Materials/Preparation:*** Teacher will have a huge timeline ringing the classroom that students will use to reference the reports presented. Teacher will distribute extra-long paper (such as 8.5" x 16.5") for timelines. ***Focusing Activity:*** Teacher will point out the big timeline ringing the classroom and ask students to guess about the first and last years listed. Students will make a line beginning with 1919 (Ernest Rutherford discovers the proton) and continuing through 1963 (the limited test ban treaty is signed). ***Instruction:*** Teacher will review the scientific breakthroughs that led to the atomic bomb (1919-1941) while students note them below the appropriate year on their timeline.

For example, under 1932, students will write "J.D. Cockroft and E.T.S. Walton first split the atom." Students will then stand under the appropriate year to report their findings to the class. ***Guided Practice:*** Students will make notes under each year on their timelines, including important facts from the presentations of their classmates. Entire timeline can be reviewed before it is turned in, time permitting.

Day Five -- ***Objectives:*** Students will discuss President Truman's decision to use the atomic bomb. ***Materials/Preparation:*** Index cards, copies of a key excerpt from Truman's autobiography. ***Focusing Activity:*** Partners each get an index card. On the front, list three possible benefits from a successful nuclear weapon. On the back, list three potential drawbacks. After 10 minutes or so, share these with the class. Did the atomic bomb save lives at the end of World War II? Are we still dealing with the drawbacks of nuclear weapons? What made the decision to use the atomic bomb a difficult one for President Truman to make? ***Instruction:*** Read an excerpt from *The Memoirs of Harry S. Truman* (regarding his monumental decision). ***Guided Practice:*** As a prewriting exercise, help students formulate a two-column list regarding the decision, with "pros" and "cons" in respective columns. ***Independent Practice:*** Students write an essay stating their opinion about Truman's decision, making arguments to support their position and addressing the concerns of opposing viewpoints.

Week Two (Why the bomb was used)

Day One -- ***Objectives:*** Students will learn about important events in World War II and discuss the mood of the American public. ***Materials/Preparation:*** Excerpts (or complete articles) of journalist Ernie Pyle's reports from the battles in the Pacific; World War II posters and editorial cartoons from the time period. ***Focusing Activity:*** Teacher will read excerpts from student essays, underscoring the complexity of the decision to use the atomic bomb. If possible, war posters could be shown to emphasize the emotions of both the Americans and the Japanese about the war in the Pacific. Teacher will stress that this decision must be understood within the context of World War II and not be treated as an isolated event. ***Instruction:*** As a class, students will read about a World War II battle as described by newspaper correspondent Ernie Pyle. Editorial cartoons and posters expressing public sentiment will be shown and discussed. Why is this sometimes referred to as "The Good War"? ***Guided Practice:*** Working with partners, students will read and summarize an article written by Ernie Pyle. The same groups will get an editorial cartoon to analyze. Summaries will be presented orally to the class (time permitting). ***Independent Practice:*** Students will create their own editorial cartoon to illustrate the theme of their article.

Day Two -- ***Objectives:*** Students will discuss propaganda, the media, and ways to influence public opinion. ***Materials/Preparation:*** Full-page ads from magazines and newspapers; World War II posters; art materials such as poster board, construction paper, and markers. ***Focusing Activity:*** Teacher will hold up full-page advertisements for various products. How do these ads get your attention? How do

they try to get you to buy a product? Ask students to share their homework (editorial cartoons). How do these images influence opinion? ***Instruction:*** Define propaganda. What kinds of media present propaganda to us? Show students examples of World War II posters (such as "Rosie the Riveter;" "Buy War Bonds;" "This is the enemy"). What values do they espouse? What stereotypes do they present? How do they influence national morale and public opinion? ***Guided Practice:*** Help students think of ideas for World War II posters***. Independent Practice:*** Students finish full-sized, full-color war poster for homework.

Day three -- ***Objectives:*** Review the Manhattan Project and discuss the role of the atomic bomb in World War II. ***Materials/Preparation:*** Video outlining the development of atomic weapons and the history of the arms race (Two possibilities -- "The Race for The Superbomb", a PBS/American Experience video, and "Trinity and Beyond: The Atomic Bomb Movie"). ***Focusing Activity:*** Have students show off their war posters. What kind of feelings do these posters elicit? How do you think Americans at this time felt about the possibility of a powerful new weapon? ***Instruction:*** Present students with guidelines for note taking, then show the video. ***Guided Practice***: Students take notes during the video. ***Independent Practice:*** Students write a journal response about the dangers of the arms race.

Day four -- ***Objectives:*** Students will use computer programs to plot a world map of nuclear test site locations and investigate the effects a nuclear device would have on a specific city (such as their own). ***Materials/Preparation:*** Computers with Internet access. Blank world map dittos. ***Focusing Activity:*** Students will review the procedures for using computers to navigate through a website. ***Instruction:*** Using the website pbs.org (link to the American Experience series, then to the program "The Race for The Superbomb"), students will find and use programs described above. ***Guided Practice:*** Students will plot 22 locations where nuclear tests have taken place, identifying each and noting the year the explosion(s) occurred. When this is completed, students will choose a city to "blow up" and take notes to identify what effects would occur at different radius points from ground zero. If time permits, students can also watch an Apple Quick-time video of a nuclear weapons test.

Day five -- ***Objectives:*** Students will discuss the effects of a nuclear blast. ***Materials/Preparation:*** Excerpts from John Hersey's *Hiroshima*; photos illustrating the destruction caused by the atomic bombs. ***Focusing Activity:*** What were the effects of a nuclear blast on our city? (Use yesterday's data to answer). ***Instruction:*** Teacher will introduce *Hiroshima*, John Hersey's classic account of eyewitnesses to the devastation in the first Japanese city to be decimated by the atomic bomb. Students will read excepts from this book, and pictures of the devastation will be circulated. ***Independent Practice:*** Students will write a journal response to this reading or a short fictional account of what a nuclear attack might be like.

Weeks three and four (How the atomic bomb changed the world)

Day one -- ***Objectives:*** Students will continue to discuss the effects of a nuclear blast and how these weapons changed the world. ***Materials/Preparation:*** DVD player; Obtain and preview the DVD video "Barefoot Gen." Note: Although this is an animated video, scenes of graphic violence are depicted, therefore, consider making a disclaimer before showing the DVD, and use a parent permission form if needed. ***Focusing Activity:*** With partners, students will share their journal entries about a nuclear attack. Teacher will ask students to share one thing they liked about their partner's writing with the class as a whole. ***Instruction:*** Teacher will present the DVD video "Barefoot Gen," the animated account of how a Hiroshima survivor remembers the ordeal***. Independent Practice:*** Students will write a journal response to the video.

Day two -- ***Objectives:*** Students learn what the term Cold War means and make a timeline of important Cold War Events. ***Materials/Preparation:*** Obtain and review a chronology of the Cold War; display a map of Europe and Asia; give students extra long paper for timeline. ***Focusing Activity:*** As a class, brainstorm a list of things we know about the Cold War. What was it? Who was involved? Is it over? Why did it end? ***Instruction:*** Teacher will provide a brief overview of the Cold War. ***Guided Practice:*** Students will plot the years 1945 to 1985 on a timeline. Teacher will identify prominent events such as the Trinity Site test, the first Soviet atomic test, Soviet expansion in Eastern Europe, Sputnik, the development of the hydrogen bomb, and the Cuban Missile Crisis. For discussion: If the Cold War is over now, do we still have to worry about a nuclear attack?

Day three -- ***Objectives:*** Students will examine the effects of the atomic age in poetry and song lyrics. ***Materials/Preparation:*** Recordings of 1960's protest songs and appropriate player; copies of *Nuclear Age* poetry (one for each pair of students); Children's book *Shin's Tricycle*, Table of Global Nuclear Stockpiles (info. from Internet), graph paper. ***Focusing Activity:*** Teacher will play samples of protest songs; students will discuss the tone and the messages they hear. ***Instruction:*** Teacher will read the children's book *Shin's Tricycle* to the class. What statement does this book make about nuclear weapons? Does the book sidestep the realities of World War II? ***Guided Practice:*** Partners will read a poem about nuclear war, then write a short response. Partners will share their poems with the class. ***Independent Practice:*** Give students Table of Global Nuclear Stockpiles, 1945-1996 and graph paper. Using two different colors (or pen and pencil), graph the number of nuclear weapons the US and Soviet Union had for specific years (you may want to plot every fifth year to fit the entire period on one sheet of graph paper. A bar graph would work best). Students begin this in class, then finish for homework.

Day Four -- ***Objectives:*** Students will view a Cold War era television program and discuss the effects of the nuclear age on popular culture: ***Materials/Preparation:*** TV and VCR; Obtain and preview *The Twilight Zone* episode titled "The Shelter." ***Focusing Activity:*** Discuss the homework graphs illustrating the rise in nuclear weapons. Why did this occur? When were the biggest "jumps?" What was

happening in the world to increase tensions between the two superpowers? Teacher will ask the class if anyone knows what a bomb shelter is, then discuss how these underground havens were a important part of America in the 1960's. ***Instruction:*** Students will read a short biography of Rod Serling, creator of the television series *The Twilight Zone*. The video of one episode, titled "The Shelter" will be shown. ***Independent Practice:*** Students will write a journal response to the video.

Day five -- ***Objectives:*** Unit review and test***. Materials/Preparation:*** Unit review questions and answers in at least five or six categories (using index cards works well since you are the "game show host"); comprehensive unit test. ***Focusing Activity:*** Go over the rules for a Jeopardy-style review game. ***Instruction:*** Review important people, events, and dates presented so far by playing the game. ***Assessment:*** Test will cover material from all three weeks.

Day six -- ***Objectives:*** Review graded test and begin a novel with implications from the atomic age. ***Materials/Preparation:*** Graded tests and class novel set. ***Focusing Activity:*** Announce the grading scale and class results before handing back the test. ***Instruction:*** Go over all parts of the test before beginning the novel. Try to link test material to the content of the novel to preview its themes.

Day seven -- ***Objectives:*** Assign research paper and go to the school library to begin work on this project. ***Materials/Preparation***: List of research paper topics (there are hundreds); rubric for a research paper; reserved time in the school library. ***Focusing Activity:*** Distribute and read rubric for the research paper (any person or event related to the Manhattan Project, World War II, or the Cold War is a suitable topic). ***Instruction:*** Review library procedures and strategies for finding information. Make sure every student has at least one topic idea before leaving for the library. ***Independent Practice:*** Students use the rest of the period to get information at the school library, then finish the project for homework.

Day eight -- ***Objectives:*** Students will learn about the work that is done at Sandia National Labs in Albuquerque, New Mexico. ***Materials/preparation:*** Arrange for a guest speaker to visit (ideally, this would be someone from the National Labs with expertise in the technology of modern weaponry). ***Focusing Activity:*** Teacher will introduce a guest speaker from Sandia Labs. This speaker will provide a brief history of the lab, discuss its role in national defense, and identify the kinds of work going on there now with an emphasis on career opportunities. ***Instruction:*** Students are expected to take notes during the presentation and ask questions afterwards.

Day nine -- ***Objectives:*** Field trip to the Atomic Museum, located at Kirtland Air Force Base in Albuquerque, New Mexico. ***Materials and Preparation:*** Arrange for a field trip to the National Atomic Museum (contact Virginia Salazar at (505) 284-3229 to discuss scheduling); educator's packets provided by the museum include dittos students can complete during their visit. ***Instruction:*** Students will see three hour-long presentations related to nuclear weapons development

throughout the Cold War, nuclear medicine, and the Manhattan Project.

Day ten -- ***Materials and Preparation:*** Test covering material presented by guest speaker and at the field trip. ***Assessment:*** Following the test, students will turn in their research papers and complete the novel in subsequent class meetings.

Assessment Rubric

- Two-column chart -- What I Know/Don't Know About Atomic Bomb: 10 points
- Three-column chart -- Research /Advances in military technology: 10 points
- "Race for Superbomb" Internet report #1/Important people 10 points
- "Race for Superbomb" Internet report #2/Important events10 points
- Oral presentation of Internet reports10 points
- "Race for Superbomb" timeline, with notes for each event presented10 points
- Opinion essay on Truman's decision to use the atomic bomb30 points
- Ernie Pyle news dispatch summary10 points
- Editorial cartoon analysis10 points
- Editorial cartoon expressing theme of Ernie Pyle article20 points
- War poster20 points
- Journal response -- "The Dangers of the Arms Race"10 points
- World map of nuclear test sites (using "Superbomb" Internet site) 10 points
- Notes on atomic blast at selected city (using Internet site)10 points
- Journal response -- "My thoughts on *Hiroshima*"10 points
- Journal response -- "Barefoot Gen" video10 points
- Cold War timeline with notes for events from 1945-198510 points
- Nuclear-age poetry reading and response10 points
- Bar graph illustrating growth of nuclear stockpiles20 points
- Journal response -- *Twilight Zone* video "The Shelter"10 points
- Comprehensive test100 points
- Research paper 100 points
- Guest speaker notes/questions10 points
- Field trip notes/worksheets20 points
- Open-notes test on guest speaker and field trip information20 points

Grading scale (for total of 500 points): 450-500 points = A; 400-449 points = B; 350-399 points = C; 300-349 points = D; 299 points and below = F.

Documentation

Notes

1. Gosling, F.G. *The Manhattan Project: Making The Atomic Bomb*. Oak Ridge, TN: United States Department of Energy, 1999, p. 1.
2. Gosling, F.G., p. 1.
3. Gosling, p. 1.
4. Gosling, p. 2.
5. Gosling, p. vii.
6. Walker, Samuel. *Prompt And Utter Destruction*. Chapel Hill, NC: University of North Carolina Press, 1977, p. 5-6.
7. Walker, Samuel, p. 105.
8. Walker, p. 5.
9. Linenthal, Edward T., and Engelhardt, Tom. *History Wars*. New York: Owl Books, 1996, p. 2.
10. Gosling, p. 49.
11. Gosling, p. 51.
12. Hersey, John, *Hiroshima*. New York: Alfred a Knopf, 1946, p. 64.
13. Boyer, Paul. *Fallout*. Columbus, OH: Ohio State University Press, 1998, p. 96.

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Toland, John. *The Rising Sun*. New York: Bantam Books, 1971.

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Walker, Samuel. *Prompt And Utter Destruction*. Chapel Hill, NC: University of North Carolina Press, 1977.

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Wyden, Peter. Day One: *Before Hiroshima and After*. New York: Simon & Schuster, 1984.

Zicree, Marc Scott. *The Twilight Zone Companion*. Los Angeles: Silman James Press, 1982 and 1989.

Internet resources

The History Channel. <www.historychannel.com> (link to World War II topics).

Grolier Encyclopedia. <http://gi.grolier.com/wwii/wwii_atom.html>.

Atomic Bomb World Wide Web Museum. <www.csi.ad.ip/ABOMB/index.html>.

National Archives. <http://www.nara.gov/exhall/powers/powers.html> (for WWII posters).

"The American Experience." *The Race For The Superbomb*. Public Broadcasting Corporation. <www.pbs.org/wgbh/amex/bomb> (link to classroom activities).

"Nuclear Weapons & Waste." *Table of Global Nuclear Stockpiles*. The Natural Resources Defense Council. <www.nrdc.org> (link to Nuclear Weapons & Waste).

World War II Links. <http://metalab.unc.edu/pha>.

"History Matters." George Mason University. <http://chnm.gmu.edu/us/index.html> (link to Instructional Materials for History

topics).

"The National Museum of American History." The Smithsonian. <www.si.edu>