

# Would you have dropped the nuclear bomb?

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## These activities enable students to strengthen their competencies of

- Working and communicating in groups
- Understanding and communicating about
  - o the structure of atoms and isotopes
  - o the fission process in a nuclear bomb
  - o the damages of radioactive radiation
  - o the historical situation between USA and Japan in the 1940s
- Navigating aspects of the history of science
- Being reflective and critical about past, present and future science and technology progressions.
- Taking ethical stance towards aspects of science and technology

## Materials:

- Student guide to the role-play
  - o Background material – a general introduction to the development and usage of the nuclear bomb. **[[NOT YET TRANSLATED]]**
  - o Nine descriptions of roles. **[[ONLY SOME TRANSLATED]]**
  - o Letter which summons the participants to the meeting
  - o Student handouts
- Discussion cards which puts a flow to the group discussions (found in the end of this document)

## Proposed plan:

Before the first phase, and after the second phase, of the role-play the teacher can individually plan and structure the course so the overall module fits into the curriculum. In that way the teacher is able to tone down or up the focus on societal studies, history or physics. **In any case, we suggest that the activity ends and concludes a course on atomic particles, fission and radioactive radiation.**

The activity can be divided into **6 phases**:

- 1) Introduction
- 2) Distributing the roles
- 3) Themes related to the individual roles
- 4) Preparations for the roles
- 5) The role-play

## 6) Summary – written assignment.

1. In the introductory session the students should be offered a summary of their prior knowledge of the physics behind a nuclear bomb, and they should be introduced to the history of the nuclear race and the societal structure during World War 2. The teacher(s) is/are free to structure this introduction. Once again, preferably, the students can draw on prior knowledge about micro physics so this session would be one of recollection.

2. The 6-9 different roles are distributed. The roles can be divided into three types: Politicians and military staffs (Truman, Groves, Stimson, Leahy, Byrnes), physicists (Oppenheimer, Wilson, Fermi), and doctors (Quimby, Nolan). One in each group is designated as the *presidential aide*. He/she must keep track of time, play the discussion cards and moderate the discussion. The discussion cards secure a red thread in the play.

3. In this phase the students work in groups with themes related to their individual role. This means that the students who will play politicians and military personnel research (in the sense of gathering information about) the technique behind the bomb and how the bombs were used strategically, the physicists research (in the sense of gathering information about) the fission process in the bombs, and the doctors research (in the sense of gathering information about) how radioactive radiation affect the body and the environment.

4. in this phase the students prepare themselves on their individual role. They should use the internet and other sources to research (in the sense of gathering information about) aspects like personality and career of their role. This should enable them to answer questions about the person they are to play and enable them to play their role as good as possible.

5. In this phase the actual role-play is played. The play is split into two meetings of approx. 45 min each which both take place around a roundtable in the white house. The first meeting pretends to take place before the bombing of Hiroshima in August 1945. President Truman has summoned the experts so as to inform him about America's new weapon – the nuclear bomb. During the meeting the scientists from the Manhattan Project explain the physics behind the nuclear bomb, the military personnel explain how they intend to use the bomb, and the doctors explain the possible side effects to the environment and the Japanese civilians. Taking outset in the personality and status of their role, the students are to discuss, and take a reflective and critical stance towards, the different aspects being touched upon in the meeting. The meeting ends with Truman deciding to use the bomb over Hiroshima. Between the two meetings each character receives a character card with information related to the second meeting. During the second meeting the group must decide whether or not they will advice the usage of a nuclear bomb over Nagasaki. As in the first meeting, relevant details are discussed and new information comes to light. In this meeting it is possible for the group to decide not to advice the President to use the bomb.

6. In this phase the role play, as well as the entire course, is being summated. The students will have the opportunity to discuss and reflect on what happen during the play, and whether it really happened in this way in reality. It is also possible to discuss the contra factual endings of the role-play and the ethics of the usage and discovery of nuclear bombs. It is also possible to discuss how science and research plays a role in our society and how one can be reflective on this role. *Written assignment:* You can chose to let each student write a short essay or paper. E.g. let each student write a letter from his/her character to the grandchildren of that character explaining the character's thoughts on the decisions that were made.

### Useful sources for student research:

<http://www.hiroshima-remembered.com>  
<http://news.bbc.co.uk/onthisday/hi/dates/stories/august/6/>  
[http://pbskids.org/wayback/prez/secrets/president\\_33.html](http://pbskids.org/wayback/prez/secrets/president_33.html)  
<http://www.pbs.org/wgbh/amex/truman/psources/>  
<http://www.dannen.com/>  
<http://www.doug-long.com/>  
<http://www.exploratorium.edu/doctoratomic/>  
[http://www.unm.edu/~abqteach/atomicamerica/atomic\\_america\\_cover.htm](http://www.unm.edu/~abqteach/atomicamerica/atomic_america_cover.htm)  
<http://www.atomicmuseum.com/>  
[http://en.wikipedia.org/wiki/Main\\_Page](http://en.wikipedia.org/wiki/Main_Page)

**Discussion cards and Character cards are on the following pages...**

## Round 1

### Card 1

Played immediately at the beginning of the first meeting

### Truman needs advice

Dear councilors

You are summoned to this meeting to provide me with information about how the development of the nuclear bomb is progressing and about the situation in Japan. The agenda today is as follows:

1. I suggest that each of you introduce yourselves to the other members of this board.
2. Afterwards it will be best if defense chief Leahy, secretary of war Stimson and secretary of foreign affairs Byrnes present the current political and military situation in Europe and, particularly, Japan. Explain whether we can expect Japan to surrender, and whether you think it will be possible to invade Japan at this time.
3. Then I would like to have General Groves, Researchers Oppenheimer, Wilson and Fermi to present the Manhattan project. Explain how the bomb works and why the explosion is so powerful. And I am eager to hear your idea of the successfulness of the test blast. And I would finally like to know more about the difference between the two types of nuclear bombs.
4. The doctors Nolan and Quimby will then explain the radiation damages which we witnessed at the test blast, and give an assessment of the possible side effects after a nuclear blast.
5. At this time I should have enough information to make my decision. Do you think that the strength of the nuclear bomb will force Japan to capitulate?



*Yours truly*  
President Truman

## Round 1

### Card 2

Played after 25-30 minutes

### Truman has decided: The US will use the nuclear bomb.

Dear councilors.

Thank you for your advice to use the nuclear bomb against Japan. This decision is one of the toughest decisions I have ever had to make. But I have reached a decision. The bomb will be used in the period stretching from now to August 10.

But it has not been decided *how* the bomb should be used. Please advice me on the following issues:

1. Should we warn the Japanese prior to our nuclear strike by letting it explode in very high altitude so that it works as a technical demonstration rather than hurting anyone?
2. Should we pick a designated location of where we will strike and warn the citizens of that area?
3. Should we strike a city with military facilities?

I will await the board's advice.  
And remember: time is of the essence.



*Yours truly,*  
President Truman

## Round 1

### Card 3

Played after 30-35 minutes

### Which city should be bombed?

Dear councilors.

Thank you for your advice. The decision which faces us is not easy. Nevertheless I have no doubt. The bomb must be used against military targets in Japan and without warning. The question remains, however. Which city should we strike? Most major cities in Japan have already been bombed with traditional bombs. There are at least two factors which determine the choice of city. It must be a clear military target, and it cannot be destroyed already, because we have to assess the magnitude and destructive effect of the bomb. Two cities seem to meet these criteria: The city of the emperor, Kyoto, and Hiroshima. I urge the board to discuss which city should be our target.



Yours truly,  
President Truman

Before the war, both President Roosevelt and secretary of war Stimson expressed their concerns about bombing civilian targets. On September 1<sup>st</sup> 1939, Roosevelt said *"The ruthless bombing from the air of civilians in unfortified centers of population during the course of the hostilities which have raged in various quarters of the earth during the past few years, which has resulted in the maiming and in the death of thousands of defenseless men, women and children, has sickened the hearts of every civilized man and woman, and has profoundly shocked the conscience of humanity"*

In 1945, Hiroshima is of great military importance: The city is headquartering Japan's fifth division, and harbors field marshal Hata Shunrokus who leads the defense of the entire southern Japan. The city is centre of communication and troops as well as equipment are stored here. Hiroshima has not yet been bombed so bombing the city may reveal the destructive force of the nuclear bomb.

Kyoto is the emperor city of Japan. In Japan, the emperor enjoys a godlike status. Bombing Kyoto will most certainly affect the spirit of the Japanese. On the other hand, it may not be wise to target the emperor directly.

## Round 1

### Card 4

Played after 35-45 minutes

### What should the President tell the public?

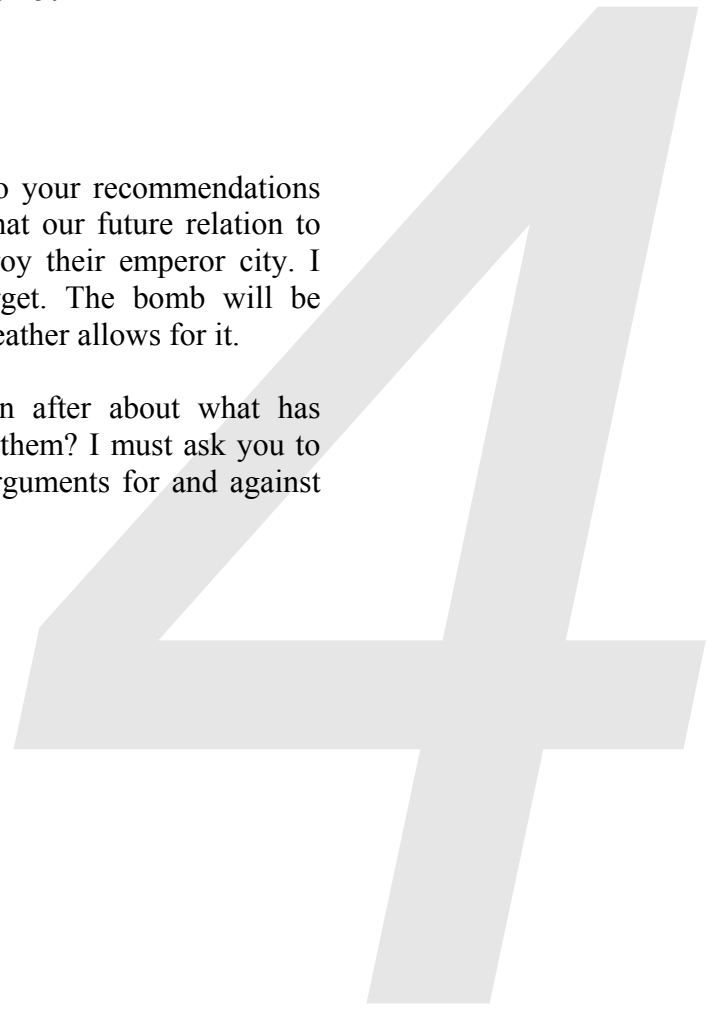
Dear councilors.

Thank you for your advice. I have listened to your recommendations and decided to spare Kyoto, because I fear that our future relation to Japan will be beyond repair should we destroy their emperor city. I have therefore chosen Hiroshima as the target. The bomb will be dropped on August 6<sup>th</sup> in the morning, if the weather allows for it.

As President I must inform the public soon after about what has happened. The question is: what should I tell them? I must ask you to quickly formulate the three most important arguments for and against the decision to use the nuclear bomb.



*Yours truly,  
President Truman*



## Round 1

### Final Card

Played after 45 minutes

### The bomb is used.

Dear councilors.

Once again, thank you for your advice. The first airplanes have departed Tinian airbase in the Pacific Ocean at 0230 local time this morning. There is a clear sky over Hiroshima. The ETA for arrival at Hiroshima is 6 hours. The crew onboard will have time to eat and chat. At 0816 the plane Enola Gay will drop its load over a city which is entirely unprepared that the cargo of a single plane will have such a destructive effect.



*Yours truly,  
President Truman*



### Character card, *Robert Oppenheimer*

The bomb “little boy” was 3 meters long and 71 cm in diameter. It weighed 4000 kg and “only” 64 of these were uranium-235. But only 700 g uranium-235 actually fissioned. “Little boy” was armed on board the air plane while it soared 9600 meters over Hiroshima. But why was the bomb not already armed at that time? Because numerous B-29 bombers crashed after lift off at Tinian air base. Therefore the bomb was disarmed during lift off and the actual flight.

In less than 1 second, the fireball had expanded to 300 meters. The shock wave crushed windows within 15 km and was clearly felt from 50 km away. More than 2/3 of Hiroshima’s buildings vanished. Hundreds of fires began because of the heat from the explosion, and they created a firestorm which incinerated everything within 6-7 km. 30 minutes after the explosion the heavy black rain began. A rain full of dust, soot and radioactive particles polluted areas far away from the explosion.

You have received this message from your cousin who serves in Japan: *“Dear Robert, rumor has it that Japan will soon surrender, and that we will not invade Japan. This means that we will not have to rush onto the beaches at Tokyo through a rain of grenades and machine gun bullets... I cried of relief when I heard it. I feel I have been given the right to live and grow old.”*

### Character card, *Leslie Richard Groves*

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In addition you get the following information: Before the war you had a Japanese girlfriend who moved back to Japan – to Hiroshima. It is very likely that she is either dead or seriously injured.

### Character card, *Enrico Fermi*

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In addition you receive this information from your colleague Otto Frisch who also helped develop the nuclear bomb. He got the news of the Hiroshima bomb when he was in Los Alamos with his co-workers: *“Someone opened my door and yelled ‘Hiroshima has been destroyed! It is believed that around hundred thousand people have been killed’ I can still remember the eerie – almost nauseous - feeling I got when I saw how a lot of my friends came running ... to party. Of course, they were excited that the fruits of their work had been so successful, but it was very uncanny to celebrate the sudden death of a hundred thousand human beings, even if they were foes”*

### Character card, *Edith Hinkley Quimby*

Around 80.000 people died in the explosion in Hiroshima, and a similar amount of people were injured. Later many more died of radiation sickness affected by the radioactive fall-out. In total, it is believed, 135.000 people lost their lives as a result of the explosion. A substantial amount of pregnant women miscarried or gave birth to children with severe deformities.

Akihiro Takahashi was 14 when the bomb exploded. He stood together with some of his classmates: *“The heat was enormous. It felt like my body was burning all over. The cold water in the river felt wonderful. When I went out of the river I meet one of my friends ... he was so severely burned on his feet that the red muscles on the soles of his feet were exposed. Even though I suffered burns I couldn’t just leave him... I got him to crawl by using his arms and knees. Afterwards I managed to get him to walk on his heels while I supported him.”*

Mrs. Akiko Takakura was in the bank 300 meters from the ground zero when the bomb exploded: *“Many people were killed instantaneously on the street. The fingertips of the dead struck fire and the fire spread to the entire body. I was so shocked to see that finger tips could ignite and melt in this way. I just couldn’t understand it. It was terrible. And while I watched, it was terrifying to think that these hands had held babies or turned the leaves of a book, but were now just gone.*

Here in the 2<sup>nd</sup> part of the play you as a doctor, know more about the effects of radioactive radiation and how it affects nature, body tissue, pregnancy etc. You now have to present all the information you in reality know about radioactive radiation.

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### Character card, *Robert Wilson*

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### Character card, *James F. Nolan*

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### Character card, *William Daniel Leahy*

Excerpt from the Statement by the President Announcing the Use of the A-Bomb at Hiroshima, August 6<sup>th</sup> 1945:

*"Sixteen hours ago an American airplane dropped one bomb on Hiroshima, an important Japanese Army base. That bomb had more power than 20,000 tons of T.N.T. It had more than two thousand times the blast power of the British "Grand Slam" which is the largest bomb ever yet used in the history of warfare. The Japanese began the war from the air at Pearl Harbor. They have been repaid many fold. And the end is not yet. With this bomb we have now added a new and revolutionary increase in destruction to supplement the growing power of our armed forces. ... It was to spare the Japanese people from utter destruction that the ultimatum of July 26 was issued at Potsdam. Their leaders promptly rejected that ultimatum. If they do not now accept our terms they may expect a rain of ruin from the air, the like of which has never been seen on this earth."*

You have a brother in the army who is stationed in Japan. He might be one of the soldiers to fight the Japanese if USA decides not to use a second nuclear bomb.

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### Character card, *James Byrnes*

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Many Americans partied when they heard that a nuclear bomb had been dropped over Hiroshima. But in your family your wife and your children think that it is scary that you have participated in deciding to use the bomb. They have all had terrible nightmares.

## Round 2

### Card 1

Played immediately at the beginning of the first meeting

### After the Hiroshima bomb

(August 8<sup>th</sup> 1945)

Dear councilors

You are summoned to this meeting so that you can develop an overview of the situation in Japan after the bomb was dropped over Hiroshima. I need your assessment of the need to use yet another bomb over Japan. But first I would like you to inform each other on what has happened since your last meeting.



*Yours truly*  
President Truman

## Round 2

### Card 2

Played after 15-25 minutes

### Should the second bomb be tested?

Dear councilors.

As you know there are two types of nuclear bombs. The bomb used at Hiroshima was a uranium bomb. The other type of bomb is a plutonium bomb. It was this type which was tested at the test blast on Juli 17<sup>th</sup> 1945. But can we be sure that it will work in full size? How much damage will a real plutonium bomb do? Which bomb is the most effective? Can we know it before we use it? Are there sufficient arguments for using this type of bomb over Japan?



*Yours truly,  
President Truman*

## Round 2

### Card 3

Played after 25-30 minutes

### Will Japan surrender?

Dear councilors.

2 days have passed since we used the bomb on Hiroshima. Japan is in ruins and there cannot be enough foods to feed the population or the army. But we still await an answer of whether Japan capitulates. This is why I ask for you advice on the following issues:

1. Should we offer a peace agreement to Japan, according to which their emperor stays in charge? Or should we give no concessions?
2. How easy will it be for Japan to surrender if they feel they would loose their honor? How easy will it be for Japan to surrender if they feel they would end the war with some dignity?
3. How much pause for thought should we grant Japan?



*Yours truly,  
President Truman*

## Round 2

### Card 4

Played after 30-40 minutes

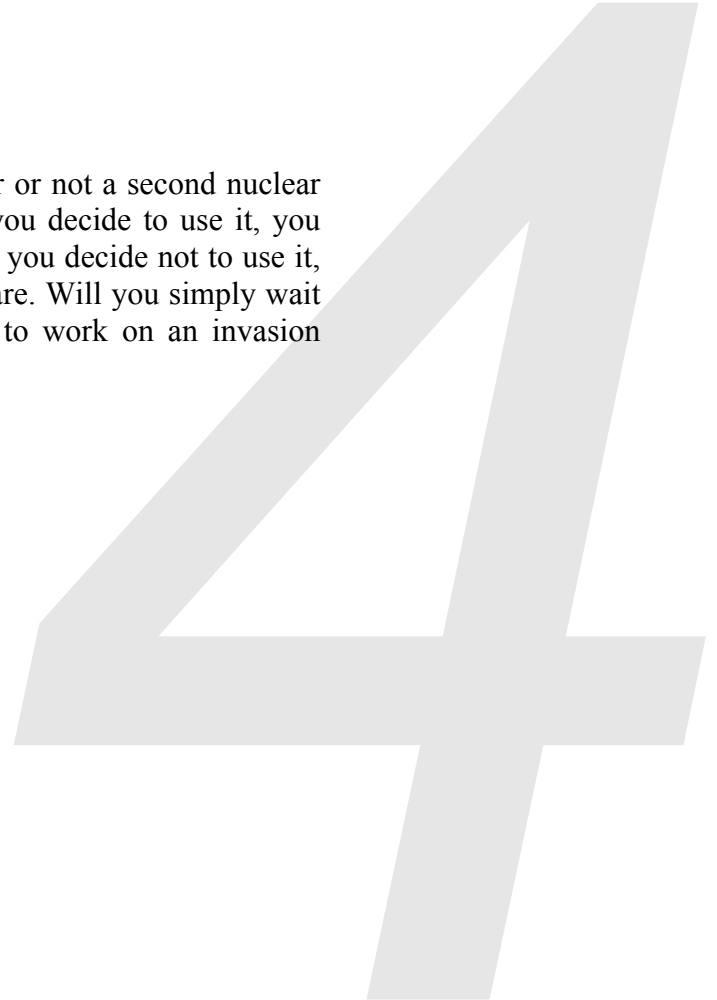
### Should we use “fat man”?

Dear councilors.

You must now reach a decision about whether or not a second nuclear bomb should be used against Japan. Should you decide to use it, you must chose which city it should target. Should you decide not to use it, you must explain what your alternative plans are. Will you simply wait for Japan to surrender, or will you continue to work on an invasion plan?



*Yours truly,  
President Truman*





## Round 2

### Final Card

Played after 40-45 minutes

### Why did you reach this decision?

Dear councilors.

Please summarize the following:

1. Did you decide for or against using a second nuclear bomb?
2. Write down your three main arguments for using the bomb, and the three main arguments against using the bomb.

Finally, I would like to thank you very much for advising me and our country.

A handwritten signature in black ink that reads "Harry S. Truman".

*Yours truly,  
President Truman*

