

Activity A: **Nuclear explosion timeline**

Teacher's Briefing

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Activity A:

Nuclear explosion timeline: Activity overview

Concepts to examine

The effects of a nuclear explosion, their use in WW2, nuclear weapons today.

Materials and space needed

Sugar paper, thick markers, effects cards. Tables will be needed for small group work and/or space for the active version of this activity.

Learning outcome

By the end of the lesson:

All students should be able to describe some of the effects of a nuclear explosion.

Most students will be able explain the long lasting nature of these effects.

Some students will be able to apply this to the bomb used in Hiroshima and to UK nuclear weapons.

Overview

Through discussion and a timeline activity, students discover the massive and long lasting effects of a nuclear explosion. In considering the effects on Hiroshima and the effects of modern day weapons, students will come to understand the significance of the bombing and nuclear weapons today.

Note

As the effects of a nuclear explosion are so vast and long lasting, there will obviously be overlap between the categories. Therefore, complete accuracy is not essential. The activity is designed to portray the extreme effects of a nuclear explosion.

Instructions

There are two versions of this activity, although they begin and end in the same way.

In small groups the students brainstorm what they think the effects of a nuclear explosion are and then feed back to the class.

Version A – Small group version

- Split students into small groups and provide each group with a set of effects cards. On a large piece of sugar paper split it into eight columns.
- Students then match up the effects on the cards to the time frame columns. There should be two to four cards per column. All students in the groups should agree where the cards go, with the answers reached through discussion.
- Discuss the answers and their consequences as a class.

Version B – Whole class, active version

- Write the eight time frame categories on large pieces of paper and stick them up in order on the classroom wall.
- Provide each student with an effect and ask them to go and stand next to the time frame they think is relevant. This must be done through discussion with other members of the class as they work out their position in relation to each other. Each time frame group should agree that the right people are in the group. This will involve conferring with each other and the groups on either side. When groups are sure they have the correct effects they stick them up with a temporary adhesive for easy movement.
- Discuss the answers and their consequences as a class.

Plenary

Discuss some or all of the following questions as a class.

- How similar were the effects to what you thought? Why were they similar/different?
- How do you feel about Britain having such weapons?
- When (if ever) should a weapon like this be used?
- What do you think a nuclear winter could mean? Do you think this could happen in your lifetime?

Activity A:

The effects of a nuclear explosion: Further information

The effects on human beings can most easily be understood as a sequence of overlapping categories: instantaneous, near-immediate, short term and long term.

Instantaneous

When a nuclear weapon explodes, the heat of a nuclear explosion reaches a temperature of several million degrees centigrade. Over a wide area the resulting heat flash literally vaporises all human tissue. When the Hiroshima bomb exploded, within a radius of half a mile, all that remained of most of the people caught in the open were their shadows burnt into stone.

Near-immediate

Beyond this area all people caught in the open would be killed by the heat and blast waves. People inside buildings or otherwise shielded would be indirectly killed by the blast and heat effects as buildings collapse and all inflammable materials burst into flames. The fires created would combine to make super-infernos, large enough to have their own wind systems, depleting oxygen from the area. This would cause people to suffocate. People would also die from their burns, be blinded or killed from flying glass splinters from destroyed buildings. Medical services would also be destroyed.

Short Term

Many survivors – either uninjured or with survivable injuries – will be affected within a matter of days by radioactive fall-out. The amount of fallout that there is depends on whether the bomb exploded in the air or on the ground (the latter would spread more radiation). The area covered depends on the wind speed and direction. The symptoms of radiation sickness include hair loss, bleeding from the mouth and gums, internal bleeding and haemorrhagic diarrhoea, gangrenous ulcers, vomiting, fever, delirium and terminal coma. There is no effective treatment and death follows in a matter of days.

Pregnant women are highly likely to

miscarry or have a child with a range of disabilities. Healing from injuries is often slow, leaving distinctive scar tissue. Damage to the immune system is probable.

Long Term

Radiation-induced cancers will affect many survivors, often twenty or more years later. Certain cancers such as thyroid cancer in children are particularly associated with exposure to radiation. There are statistically higher rates than normal of birth abnormalities and leukaemia rates in children of exposed survivors. There will also be significant environmental damage.

Hiroshima and Nagasaki

The bombs that were dropped on Hiroshima on 6 August 1945 and Nagasaki on the 9 August 1945 completely devastated the two cities. Thousands died instantly and by the end of the year the death toll had reached 240,000.

People continued to die for a long time afterwards and are still dying today from cancers attributed to the radiation. The main reason usually given for the attacks was to quickly end the war and limit American casualties. However, there is substantial evidence to suggest that the Japanese were trying to negotiate surrender before the bombings. It is important to consider other reasons for the attack, such as to establish US dominance after the war or to enable the US to observe the effects of a nuclear explosion on a town. Despite their catastrophic effects, the bombs used against Japan are now considered rather small. Most nuclear weapons in the world today are many times larger.

The UK's nuclear weapons

The UK's nuclear weapon system is called 'Trident' and is submarine based. The system comprises four submarines, each with the capacity to carry 48 warheads, loaded on missiles. Each of these warheads has 8 times the power of the Hiroshima bomb and could kill up to a million people. The UK has

about 215 warheads. The submarines are stationed at the Faslane Naval base, on the west coast of Scotland, and the warheads are produced at AWE Aldermaston and AWE Burghfield, near Reading. One Trident submarine is continually on patrol. In July 2016 Parliament voted to replace the submarine system. Despite opposition from the SNP, the leader of the Labour Party and others, Parliament committed the UK to a new nuclear weapons system. This enables Britain to be nuclear-armed until well beyond 2050.

Nuclear weapons around the world

There are currently nearly 16,000 nuclear weapons in the world today – enough to wipe-out the entire human race, several times over. If there was a nuclear war, with a number of nuclear exchanges, this could prompt a nuclear winter. The huge amount of dust, soot and smoke that would result from a nuclear explosion could enter the atmosphere and block out the sun, resulting in massive climate change.

There has already been environmental damage from the large numbers of nuclear tests, more than 2000 to date. Many of these have been conducted in the South Pacific and affected indigenous populations, leading to cancers and birth defects. Tests performed in the Nevada Desert have also affected American citizens.

Of the 15,000+ nuclear weapons that are currently in the world, the vast majority of these are held by the USA and Russia. The USA has 7,260 nuclear weapons, Russia has 7,500, some are being decommissioned. China, France and Britain have lower numbers with around 260, 300 and 215 respectively. India has 100 and Pakistan has 110. Israel, although it does not officially state it has nuclear weapons, is thought to have 80. North Korea claims to have up to 10 nuclear weapons and has conducted five tests in 2006, 2009, 2013 and two in 2016. USA, Russia, China, France and the UK are all signatories to the Nuclear Non-Proliferation Treaty (NPT).

Temperatures reach millions of degrees celsius in the centre of the explosion and 6000°C on the ground and even 600m beneath the earth's surface.

The heat flash vaporises all human beings around so all that is left is their shadows burnt into the stone.

The heat and light is so intense it is like the centre of the sun.

There is no effective treatment for severe radiation sickness and you would die within days.

Winds rage at thousands of kilometres per hour.

The heat is so intense that bones, flesh, skin, facial features and eyeballs melt.

<p>The bomb releases radiation over a large area as it explodes.</p>	<p>People further away from the blast receive burns and are blinded by the flash.</p>
<p>High temperature fires rage on for days. They are so big they have their own wind systems.</p>	<p>Radiation sickness will set in for months after the bombing.</p>
<p>Buildings burn and collapse. In Hiroshima, most buildings within 2km were burnt to ash and glass windows melted.</p>	<p>People are burnt alive and also suffocate from lack of oxygen. The oxygen is all used up by the fires burning.</p>

<p>Symptoms of radiation sickness include: bleeding from the mouth and gums, hair loss, bloody diarrhoea, vomiting and fever and terminal coma.</p>	<p>The surrounding environment is also totally destroyed. Water is polluted with radiation and humans and animals will die from drinking it.</p>
<p>In Hiroshima, thousands of people died from radiation sickness.</p>	<p>Babies are born with illness and deformities.</p>
<p>Many children were affected by leukaemia in the years after Hiroshima.</p>	<p>In Hiroshima many children were born with smaller skulls than usual which has lead to severe disabilities.</p>

<p>Even more survivors develop cancers of the breast, lung and salivary gland.</p>	<p>Survivors develop leukaemia which is cancer of the blood or bone marrow.</p>
<p>In Hiroshima, more and more people developed cancers in the 1960s. The closer you were to the blast, the more danger of cancer there was.</p>	<p>The numbers who would develop cancer after a UK Trident bomb exploded would be even greater.</p>
<p>If a UK Trident bomb exploded on the ground, it would be uninhabitable forever.</p>	<p>A major material used to make nuclear bombs is plutonium and this takes hundreds of years to stop being radioactive.</p>

Experiences of Hiroshima – a personal testimony

Tokuo Nakajima (interviewed aged 12), six years old at time of the bombing

Adapted from *Children of the A-Bomb* by Arata Osada

“I wasn’t up yet on the 6th of August at the time the atom bomb fell. When the explosion came I couldn’t imagine what had happened and got up to see. I found that everything was in darkness. I couldn’t work out what had happened and sat down. Just then over my head the roof tiles came down so I quickly stood up. By that time both the roof and the ceiling were gone.



One of the neighbour ladies came by and said, “You’ll be burned to death if you don’t hurry up and get away.” So I ran off.

I was running when I suddenly realized that my mother wasn’t there. I wanted to find her so I went back along the way I’d come. When I looked at our house I saw that it was smashed flat. Mother must be outside, I thought, and I called but there was no answer. I tried to think where she could be. Just then another lady came so I asked her, “You haven’t seen our mother, have you?” When she answered, “No I haven’t”, I was miserable.

A man who was passing said, “If you don’t get out of here quickly you’ll be burned to death. Come on let’s go right away.” He told me to come with him and that he’d find my mother tomorrow. We went to a hill outside the city. When I looked back I could see that the sky was all dark and the houses were smashed and tiles had been blasted off. Everyone was eating the tomatoes growing nearby as they couldn’t find any water.

All round people were screaming, “Help, save me!” Wounded people were so badly injured that you couldn’t recognize their faces. They were begging, “Water, water!” That evening I finally fell asleep at the hill. The town was burning steadily and in the sky the moon was like a red lantern.

The next morning I went back to the place where our house had been. I stood there for a long time thinking that maybe Mother would be worrying about what had happened to me. She might come here to try and find me. But I did not see Mother.

I went to where all the dead and dying people were. I went around looking carefully at their faces one by one, but Mother wasn’t there. After I wandered around for a long time I came to Meiji Bridge. It was full of dead people lying everywhere. There was no sign of Mother there. I came to the edge of the river. I waited there crying, but no matter how long I waited she didn’t come back. In the river dead people were floating and bobbing around.

Six years have passed since then. I’ve had my fill of war. What I want to do is make peace last forever in the world. ””

Question sheet

The bombing of Hiroshima, Japan 1945

Visit: bit.ly/OUQVDt

Click on 'The dropping of the bomb'

1. Name 3 reasons why the USA wanted to use a nuclear bomb against Japan
2. What was the date of the bombing?
3. What was the name of the bomb dropped on Hiroshima?

Visit: bit.ly/16uY7fN

These pages contain images that some people might find disturbing.

Click on 'The damage done'

4. Name one thing that happened to people and one thing that happened to buildings due to the 'Heat ray' and 'Blast'.

Click on 'Radiation'

5. Why was the rain that fell in Hiroshima black and what was so dangerous about it?

Click on 'Super-hot fires'

6. Look at the bottom picture. What was the target of the bombing?

Try making your own peace cranes

Watch youtube video to help: <https://www.youtube.com/watch?v=ppe2TyoWDzo>