

## Transportation and the Manhattan Project at Hanford, WA: ACTIVITIES

## Total Lesson Time: 60 minutes Total Lesson Time with Extensions: 75 minutes

Lesson Introduction: 5 minutes Activity 1: Circle - 20 minutes Activity 2: Transportation Methods - 30 minutes Lesson Conclusion: 5 minutes Extension 1: <u>Hanford Made Video</u> - 15 minutes

TIME, ACTIVITY, ACTION	<b>SCRIPT OUTLINE</b> (Italics is just a suggested script)
5 MINUTES	Introduce yourself and Manhattan Project National Historical Park
GENERAL INTRODUCTION AND LESSON INTRODUCTION	Establish expectations of class
	Give the class expectations of the lesson
	Warm-up question or game
	What do you think about when I say Hanford? (Possible answers: high school, plays, Falcons, football, science, etc.)
	Hanford was one of the locations of the top-secret Manhattan Project and it is located north of where the Tri-Cities are today. It is where uranium was taken and used to make a new element plutonium.
20 MINUTES	Today we are going to talk about transportation. Transport comes from two Latin words and literally means 'to carry across.'
ACTIVITY 1 - CIRCLE	What are some ways you might transport yourself? (Possible answers: biking, car, walking, plane, etc.)
Display the world map.	<b>Lay out or point to world map.</b> Look at how big the world is. What are other ways people travel? (Possible answers: train, boat, animals, etc.)

ACTIVITY 1 - CIRCLE (continued)	At Hanford, they did need to transport people because there were many, many engineers, builders, scientists, secretaries, and others that came here to work. But just like humans need to move, sometimes so do materials.
Show uranium ore picture.	They were making plutonium at Hanford, but first they needed a different material called uranium. Uranium is a type of silvery metal. Where do you think they found this metal? (Prompt sample: From the air? From the water? No, from the ground. The metal uranium had to be dug out of the ground. Keep that in mind because it's going to be important later. <b>Share</b> <b>picture of uranium ore</b> .)
	Now I'm going to tell you a story of transportation, and it's going to almost cover our whole map.
30 MINUTES	I'm going to need a little help with my story. Can I have a
ACTIVITY 2 - TRANSPORTATION METHODS	volunteer to hold the sign for the B Reactor? This is a building at Hanford where the uranium was taken and nuclear fission happened.
Have the B Reactor photo ready.	When the work in the B Reactor was done, they still needed to separate the plutonium from the uranium. One place that was
Have the T Plant photo ready.	done was the T Plant. Who would like to hold the sign for that?
<i>Have string #1 ready.</i>	Well, the T Plant and the B Reactor were pretty far apart- around 10 miles. <b>Have two volunteers hold string #1 to show distance.</b>
	How do you think they moved the fuel from the B Reactor to the T Plant? It was radioactive, so do you think they wanted to carry it?
Have the train slider ready.	Because it would be dangerous to carry it or put it in a car, they built railroad tracks and had special railroad cars to move it. Have volunteer take train slider and move it from the B Reactor to the T Plant. Ask the others to help make train noises.
	After the work was done at the T Plant and the plutonium was all by itself, the necessary amount of plutonium was taken to another Manhattan Project site called Los Alamos.
Have the Los Alamos photo ready.	Any ideas about how far away Los Alamos is from Hanford? Over 1,000 miles. It's located in northern New Mexico. Who wants to hold the sign for Los Alamos?
	Since we're now thinking of much farther distances, I'm going to have the B Reactor and T plant move closer together.

ACTIVITY 2 - TRANSPORTATION METHODS (continued)	Using string #2, have B Reactor hold the end, and T plant at the first loop, then have Los Alamos hold next loop at roughly 5 o'clock position to Hanford.
Have string #2 ready.	How do you think the plutonium, which had taken all this work and time to create, was transported?
<i>Have the ambulance slider ready.</i>	Well, the very first shipment was taken by ambulance, but after that shipments were taken by passenger train. Have someone move the ambulance slider to Los Alamos.
	Now, some of that plutonium sent to Los Alamos was used for a test called Trinity, and the rest was put inside a bomb called "Fat Man." The plan was to drop the bomb on a Japanese city, as Imperial Japan was the only one of the Axis powers left at this point in 1945.
	How you might describe the landform of Japan? (An island)
Have the Tinian Island photo and the military ship ready.	To get closer to this island of Japan, the military put the plutonium bomb on a military ship and took it to Tinian Island. Who will hold the Tinian Island sign and who will be the military ship? Use the next loop on string #2 for distance, with Tinian Island being roughly 7 o'clock to Hanford, and have a volunteer move the military ship slider.
Have the Nagasaki photo and the plane slider ready.	From here, the Fat Man plutonium bomb was put on a plane and flown over Japan to be drop on the city of Nagasaki. With the end of string #2, have a volunteer hold the Nagasaki sign at roughly 9 o'clock to Hanford and have someone move plane slider.
	When Fat Man was dropped on Nagasaki on August 9, 1945, between 60,000-80,000 people were killed. Imperial Japan announced its surrender on August 15, 1945 and World War II was officially over on September 2 that year.
	Wow, we've traveled a long way, but I think we're missing something. At the beginning of my story, I told you that the plutonium was made from a special type of metal dug out of the ground. Do you remember what it was? (Uranium)
	Well, most of the uranium used for the Manhattan Project came from a mine all the way in Africa. The mine is called Shinkolobwe and is in a country that was called the Belgian Congo at the time, but it is now called the Democratic Republic of the Congo. Does anyone have any guesses about how far away that is? Let children make guesses. From Shinkolobwe to Hanford is 9,695 miles.

ACTIVITY 2 - TRANSPORTATION METHODS (continued)	Can we have someone hold the sign for the Shinkolobwe mine? Have them stand at roughly 4 o'clock to Hanford, farther away.
Have the Shinkolobwe Mine photo ready.	Before we can connect the mine and Hanford, we need to talk about one more step along the way. When the uranium ore left Africa, how do you think it was transported? (Commercial ship) Would it be easy to take a ship all the way from Africa to Washington? No, you'd have to go through the Panama Canal or around South America.
Have the New York City photo, string #3, and the commercial ship slider ready.	The uranium ore was sent by ship to New York City. This was actually where the original headquarters to the MANHATTAN Project was. Have someone hold the New York City sign at 3 o'clock to Hanford. Using string #3, have New York City hold the middle loop and connect the long end to the Belgian Congo at around 4 o'clock. Someone can move the commercial ship slider from Africa to New York.
Have the train slider ready again.	Now for the final stretch, how does the uranium get from New York to the Hanford Site? (Train) Connect the end of string #3 to the B Reactor volunteer and have another volunteer move the train slider from New York City to the B Reactor.
	Marvel at the distance covered, then collect signs, string, and sliders.
5 MINUTES	So here we have our world map. Where did the uranium metal
CLOSING	come from? And where else did our story travel to? Put a marker at each location: Democratic Republic of the Congo, New York, Hanford, Los Alamos, Tinian Island, and
Display the world map.	Japan
	<i>And what methods of transportation were used?</i> (Ships, trains, planes, and an ambulance)