

Communications Technology, Earthquakes and Tsunamis

Grades

9-12



Overview:

In this lesson, students examine communications during past earthquakes and tsunamis, and how technology is used in communicating information for mitigating tsunamis today. Finally, students develop a public service announcement as a way to use communication technology for hazard mitigation. NOTE: This lesson requires knowledge of digital recording and sound editing. This lesson may also be team taught among teachers of science, English and Technology.

Targeted Alaska Grade Level Expectations:

Science

- [9] SA1.1 The student demonstrates an understanding of the processes of science by asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring, and communicating.
- [10-11] SA1.1 The student demonstrates an understanding of the processes of science by asking questions, predicting, observing, describing, measuring, classifying, making generalizations, analyzing data, developing models, inferring, and communicating.
- [11] SE1.1 The student demonstrates an understanding of how to integrate scientific knowledge and technology to address problems by researching how social, economic, and political forces strongly influence which technology will be developed and used.

Writing

- [9-10] 4.2.2 The student writes for a variety of purposes and audiences by writing in a variety of nonfiction forms (e.g., letter, report, biography, autobiography, and/or essay) to inform, describe or persuade.

Objectives:

The student will:

- examine past use of information and communications technology in earthquakes and tsunamis; and
- develop a public service announcement for hazard mitigation purposes using information and communications technology.

Materials:

- Computers with Internet access
- Digital recorder
- Sound-editing program (e.g., Garageband, Audacity <http://audacity.sourceforge.net/>)
- ELECTRONIC FILE: Atwater, B. F. (1999). *Surviving a tsunami—lessons from Chile, Hawaii, and Japan*. Reston, Va: U.S. Dept. of the Interior, U.S. Geological Survey (<http://pubs.usgs.gov/circ/c1187>).
- ELECTRONIC FILE: Haeussler, P. J. (1994). *Are you prepared for the next big earthquake in Alaska?: By taking action now we can significantly reduce future losses from earthquakes*. Fairbanks, AK: Alaska Earthquake Information Center (http://www.aeic.alaska.edu/html_docs/nextbigeq.html).
- ELECTRONIC FILE: Intergovernmental Oceanographic Commission, & International Tsunami Information Center. (2005). *Tsunami: The great waves*. Honolulu, HI, USA: International Tsunami Information Center (<http://www.nws.noaa.gov/om/brochures/tsunami.htm>).
- Video-recording equipment (optional)

- Video editing programs (e.g., iMovie, Moviemaker) (optional)
- MULTIMEDIA FILE: “Alaska Amateur Radio March 27, 1964” at ATEP website (www.aktsunami.org/multimedia)
- STUDENT WORKSHEET: “Communications Technology, Earthquakes and Tsunamis”
- STUDENT WORKSHEET: “PSA Planning”

Whole Picture:

This lesson examines past use of information and communications technology (ICT) in earthquakes and tsunamis and builds towards use of ICT for hazard mitigation purposes. As students examine the informational tsunami and earthquake circulars for safety information, the possible topics may emerge as the focus of the student-developed public service announcements: Natural Warning Signs, Earthquake Safety – During the Earthquake, Earthquake Safety – After the Earthquake, Disaster Supply Kit, Tsunami Safety, Tsunami Safety for Boaters.

The circular, *Surviving a Tsunami— Lessons From Chile, Hawaii, and Japan*, is an excellent publication that describes what to expect and what to do in a tsunami. In *Tsunami: The great waves*, pages 10-12 describe tsunami safety. The Alaskan focused publication, *Are You Prepared for the Next Big Earthquake in Alaska?* contains earthquake safety information on pages 1-7 and tsunami safety information on pages 16-18.

Activity Preparation:

1. Preview and select appropriate Internet sources described on the worksheet to display and discuss with the class. Examples may include the SE Asia Earthquake and Tsunami Blog (<http://tsunamihelp.blogspot.com/>), and video clips posted by first-hand observers of the 2004 Indian Ocean Tsunami.
2. Search and access examples of public service announcements to display to the class. Possible sources include the Ad Council (www.adcouncil.org), and the iDidaPodcast and iDidaMovie winners at the Alaska Society for Technology in Education Website (www.aste.org).

Activity Procedure:

1. Explain the objectives for this lesson and distribute STUDENT WORKSHEET: “Communications Technology, Earthquakes and Tsunamis.” Review the information on the sheet and access the MULTIMEDIA FILE: “Alaska Amateur Radio March 27, 1964” to listen to as a class or on an individual student basis.
2. Discuss information communications technology during the 2004 Indian Ocean Tsunami and display the Internet examples described in Activity Preparation.
3. Distribute the booklets on earthquake and tsunami safety and preparedness. Explain that students will select a specific topic to develop a PSA related to earthquake and tsunami safety. Allow time for students to look through information. Development of the public service announcement may be assigned to individuals, small groups or as a class activity. For student guidance, distribute STUDENT WORKSHEET: “PSA Planning” and post the following list of some possible topics on the board: Natural Warning Signs, Earthquake Safety – During the Earthquake, Earthquake Safety – After the Earthquake, Disaster Supply Kit, Tsunami Safety, Tsunami Safety for Boaters.
4. Organize a system to accommodate student use of recording equipment and editing software.
5. Schedule times for presentations of student work.

Extension Ideas:

- Submit student-developed public service announcements to local radio stations.
- Access, display and discuss “1964 Alaska Earthquake Radio Traffic,” a transcript contributed by John Smith at (www.jacksjoint.com/tidalwave.htm). This transcript shows some military radio communications that occurred during the 1964 Alaska Earthquake and Tsunami. The earthquake began at 5:36 p.m. Alaska Standard Time. In GMT (Greenwich Mean Time), this is equal to 280336. The day is “28,” the hour is “03” and “36” minutes. Some abbreviations used in the transcript include:
 - USCGC or CGC: US Coast Guard Cutter (these include the Bittersweet, Sedge, Minnetonka, Sorrel, and Storis)
 - CCGDSEVENTEEN: Commander Coast Guard District Seventeen
 - KODIAKSARCOORD: Kodiak Search and Rescue Coordination
 - CGLORSTA: Coast Guard LORAN Station
 - NORPACSARCOORD: North Pacific Search and Rescue Coordination
 - F/V: Fishing Vessel
 - NAVBROCEANO: Naval Oceanographic Offices

Answers:

All answers will vary

Lesson Information Sources:

- Atwater, B. F. (1999). *Surviving a tsunami--lessons from Chile, Hawaii, and Japan*. Reston, Va: U.S. Dept. of the Interior, U.S. Geological Survey.
- Gunawardene, N., & Noronha, F. (2007). *Communicating disasters: An Asia Pacific resource book*. Bangkok, Thailand: UNDP Regional Centre.
- Haeussler, P. J. (1994). *Are you prepared for the next big earthquake in Alaska?: By taking action now we can significantly reduce future losses from earthquakes*. Fairbanks, AK: Alaska Earthquake Information Center.
- Intergovernmental Oceanographic Commission, & International Tsunami Information Center. (2005). *Tsunami: The great waves*. Honolulu, HI, USA: International Tsunami Information Center.
- National Oceanic and Atmospheric Administration. *Tsunami*. Retrieved July 9, 2009 http://www.tsunami.noaa.gov/warning_system_works.html

Name: _____

Communications Technology

Earthquakes and Tsunamis

Student Worksheet (page 1 of 5)



In hazard events, communicating information is vital, and examining past events helps us prepare for the future. The following information on two major tsunami events illustrates what technology was used, how it has changed over time, the influence of political forces on tsunami warning systems, and how technology cannot always provide successful solutions.

1964 Alaska Earthquake and Tsunami

During the 1964 Earthquake and Tsunami, information and communications technology (ICT) was somewhat different from today's available ICT. Severed lines crippled telephone communications and existing lines quickly became clogged, disabling communication for many. Radio communications quickly absorbed a lot of the safety communication needs and helped many understand the scope of the disaster. Amateur radio operators, or ham operators, use radio technology to communicate with others for recreation and public service. During the 1964 Earthquake and tsunami, amateur radio operators facilitated communication across the state and to other parts of the world.

Access the MULTIMEDIA FILE: "Alaska Amateur Radio March 27, 1964" on the ATEP Website (www.AKtsunami.org/multimedia). This file includes audio recordings of the actual radio transmissions from the 1964 Alaska Earthquake, including emergency radio transmissions from isolated villages and towns radioed through the Coast Guard Rescue Coordination Center in Juneau. Ham operators use call signs to identify who they are calling and who they are. The call sign of the Coast Guard Rescue Coordination Center in Juneau is KL7ENV. Call signs are often stated using a phonetic alphabet below. Listen to the recording and follow along with the transcription that follows. Replay sections as needed.

A - Alpha	J - Juliet	S - Sierra
B - Bravo or Baker	K - Kilo	T - Tango or Tare
C - Charlie	L - Lima	U - Uniform
D - Delta	M - Mike	V - Victor
E - Echo or Easy	N - November or Nancy	W - Whiskey
F - Foxtrot	O - Oscar	X - X-Ray
G - Golf or George	P - Papa	Y - Yankee
H - Hotel	Q - Quebec	Z - Zulu or Zebra
I - India	R - Romeo	

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Communications Technology Earthquakes and Tsunamis

Student Worksheet (page 2 of 5)

Valdez

KL7EPL Tom Lawrence in Valdez.

We're in bad shape here. I don't know what the deal is here. How bad it is, the streets are all broken up. The bridges are broken up going out of town and it was a terrific one. All of the water mains and sewer mains are all broken all over town. We're completely without water and I don't know what our medical situation will be. We'll have to find out pretty soon.

Anchorage

- KL7ENE Mayday! Mayday! Mayday! KL7ENE Mayday! Mayday! Mayday!
- KL7ENE, give me your Mayday. This is KL7ENV, running traffic with the coordination center in Juneau.
- KL7ENV, KL7ENE. Need phone patch traffic to Anchorage. Need phone patch traffic to Anchorage by any available means.
- All our lines to Anchorage are out. You can give your traffic to us.
- KL7ENE, this is W5GEG here in Anchorage. [Ham is Mike?] Go ahead.
- W5GEG, KL7ENE. Do you have any phone communications?
- Negative, Negative. No power. No phones. It's pretty rough. Over.
- Okay, well, thank you.

Cape Yakataga and Cordova

- KL7ENV, this is KL7ENW I just had a phone call from Cordova. The station here at Cape Yakataga had a phone call from Cordova and there are cracks in the street. There are cracks in the street but I have no other information.
- Roger, can you reach Cordova?
- Just a moment. I'll check.

Delta

- KL7EVF, would you give me your QTH (location) please?
- KL7ENV, KL7EVF. QTH Delta, and no damage here. KL7ENV, KL7EVF.
- KL7EBF, this is KL7ENV. Roger your report of "no damage" in Delta. Is that affirmative? Go.
- Roger that, you're go.

Kodiak

- KL7EKU [unintelligible] Kodiak clear. Heading for high ground.
- KL7EKU, this is KL7ENV.
- KL7ENV, KL7EKU. Communications are cut between the Sedge and here, apparently. [The Sedge refers to the US Coast Guard Cutter "Sedge".] We cannot [unintelligible] them. I have sent an ACS messenger down to...

Name: _____

Communications Technology Earthquakes and Tsunamis Student Worksheet (page 3 of 5)

Kodiak

- Kodiak, this is Juneau. Go ahead.
- This is Kodiak KL7APH and I am on top of a mountain. [unintelligible] lost communication I am heading for higher ground. A tidal wave was spotted heading towards Kodiak, just about 20 miles away. Roger.
- I didn't catch your call but I understand that a tidal wave is headed towards Kodiak and it's about 20 miles away. Would you give me your call again, please?
- KL7APH, APH mobile.
- KL7APH, this is KL7ENV. Roger. Do you have any other traffic?
- Negative, no other traffic. I am mobile. I am mobile. I am on top of Pillar Mountain. I am on top of Pillar Mountain. I will be on frequency. KL7APH mobile, out.

Valdez

- Valdez standing by for you.
- Valdez, would you give me a report on the condition there?
- This is KL7ECA. Valdez was hit pretty hard. The dock is out and electricity is still coming in though. There are no fires. I haven't been around too much to see if there's any other damage done. I understand there was somebody down on the dock when it did go under. There was a big steamer in here and that's all right too. KL7ECA.
- Is that ECH? Is your call KL7ECH?
- It is KL7ECA. KL7 Eskimo Charlie Alaska. KL7ECA.
- Okay, KL7ECA Valdez, this is KL7ENV. Thank you for your report. Over.
- Yes, most of the buildings were caved in and the boat centers were pretty much damaged. Split in half and stuff like that. They were. All the water mains were busted and [unintelligible] where those houses were. Waves coming in after it quick. Over. The rumor is that [unintelligible] bridge is out. One of the bridges is out. I'm not sure. I got to go locate my sister. Over.

Kodiak

- KL7ELG in Kodiak
- KL7ELG, this is KL7ENV. Go ahead.
- No emergency traffic but we're standing by. Everyone is taking for high ground here on Kodiak and expecting a tidal wave. The old water is coming up here. So we may have to ... we may have to [unintelligible] suddenly take out again. We are back at the [unintelligible] stand by. KL7ENV, KL7ELG.

Glennallen

- Roger, roger. KL7ETZ This is KL7 England, London. Mary, go ahead with your traffic.
- KL7EPG Glennallen, KL7ELM.
- Roger, we will notify the Department of Public Works that all power, water, lighting is out at Glennallen. Is that correct? Over.

Name: _____

Communications Technology Earthquakes and Tsunamis

Student Worksheet (page 4 of 5)

Fire Island

KL7ENV, Fire Island KL7BFB. Everything seems to be under control at Fire Island. We're right in front of Anchorage. The runway at Fire Island is unusable. There is water on the runway and it is broken [unintelligible]. So for the time being, the runway is unusable, but other than that we did get through here with minor damage and we're standing by on the frequency to assist as we can. I have no information from Anchorage.

Valdez

- ELS.
- [Unintelligible]
- The [unintelligible] of Valdez urgently request any tidal wave information for Valdez. Do you have any information on a tidal wave heading closer to Valdez ... [unintelligible] requests this information. Go ahead.
- ELS, this is Juneau Rescue Coordination Center. Negative, we have no further information. We will attempt to get the Coast Guard Cutter "Sedge" as soon as we establish communications with you people. If you have 2182 Kilocycles capabilities [unintelligible] on that frequency and attempt to establish communications with the "Sedge." Over.
- Negative. Negative on that frequency. Just the ham frequency here. I'll pass this information along to my [unintelligible] at Valdez and standby on the frequency. KL7ELS.

2004 Indian Ocean Tsunami

Technology was quite different during the 2004 Indian Ocean Tsunami. In addition to professional journalists, common citizens were able to share their personal experience and perspectives with the world through the Internet. Many vacationers had video cameras and were able to post their images of the tsunami on the Internet for others to see. The SE Asia Earthquake and Tsunami Blog was one of many blogs where people went to post, or search for, information. People posted pictures and information of people missing in the tsunami on a Missing Persons Flickr Page. High tech solutions didn't work in all circumstances. In some of the areas most devastated by the tsunami, electricity and telephones were not available. In these areas amateur radio was the connection to the world. In some instances, communication was further limited to using Morse code to save power from car batteries used to operate the radios.

Although many technologies were available, a tsunami warning system did not exist in the Indian Ocean prior to the Indian Ocean Tsunami of 2004. After the main shock of the December 26, 2004 earthquake was recorded, the Pacific Tsunami Warning Center in Hawaii, and the Pacific Marine Environmental Laboratory in Washington, were able to determine that a potentially disastrous tsunami will develop from this large earthquake, but the warning could not be delivered to the coastal areas in the Indian Ocean. Recognizing the need for communicating tsunami warnings to populations around the Indian Ocean, the U.S. Agency for International Development funded the creation of the U.S. Indian Ocean Tsunami Warning System (IOTWS) in cooperation with other countries and U.S. agencies.

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Communications Technology Earthquakes and Tsunamis

Student Worksheet (page 5 of 5)

ICT and Tsunami Mitigation

The National Weather Service communicates tsunami warnings and watches using a wide range of technologies to ensure that information reaches people using different types of technology. Also, if one form of technology fails, there are other ways to communicate. Notifications of tsunami warnings and watches are sent from the National Weather Service through NOAA Weather Radio to television, AM/FM radio and cable television broadcasts. Tsunami information is also communicated through the Internet, text messaging, and email. NOAA Weather Radio also activates the All-Hazard Alert Broadcast (AHAB) units located in remote coastal areas, alerting people in those isolated locations.

Tsunami Statement	Description	Suggested Action
Warning	Significant inundation possible	Full evacuation suggested
Watch	Danger level not yet known	Stay alert for more information
Advisory	Strong currents likely, potential beach and harbor danger	Stay away from the shore
Information	Minor waves at most	No action suggested

Information Communication Technology can also be used to educate the public about tsunamis before one strikes. One method is to develop a public service announcement (PSA). PSAs are non-commercial advertisements to raise awareness of different issues. These may be in the form of an audio or video broadcast and typically last from 30 to 60 seconds.

Name: _____

PSA Planning Student Worksheet



Complete the planning for your Public Service Announcement and submit to your teacher for approval.

Title of production: _____

Goal or Main Idea: _____

On another sheet of paper, draft a script, and make a storyboard (video only). Attach it to this sheet.

Describe any additional audio and/or video elements.

Sources of information:

Teacher approval: _____ (signature)

Rubric:

Category	<i>Advanced</i> 8	<i>Proficient</i> 6	<i>Below/Not Proficient</i> 0-4
Content	<ul style="list-style-type: none">All information is accurateSuccinctly informs audience towards the main ideaInteresting information	<ul style="list-style-type: none">Some minor inaccuracies in information that do not detract from communicating the main ideaInformation is long-winded	<ul style="list-style-type: none">Needs more information to inform audience towards the main idea.Information is inaccurate.
Delivery	<ul style="list-style-type: none">Engages audience with clear, intelligible, powerful expression and rhythm.Well-rehearsed.	Clear, rehearsed message.	Needs more work for clarity and rhythm.
Technical Components		<ul style="list-style-type: none">30 to 60 seconds in lengthClear, audible recordingsAudio and video enhancements are relevant help communicate the main ideaTitles and credits enhance and clarify the main idea	<ul style="list-style-type: none">Production is not 30-60 seconds in lengthUnclear, inaudible recordingsAudio and video are not related to communicating the main ideaTitles and credits needed