ShakeOut Lessons
Grade Level: 9-12

Purpose: To practice earthquake and tsunami drills. The Shake Out activities (www.shakeout.org) correlate with the annual Shake Out drill in which many schools and organizations participate to be prepared to survive and recover from big earthquakes. This activity also includes preparing earthquake kits for personal use and car, and an introduction to the plate tectonic setting of the Japan earthquake.

Time: 50 minutes (steps # 1-4) to three 50 minute class sessions (steps #1-9)

Educational Standards: (High School, HS) SS12.3, MP.4, ESS1-5, ESS2-1, ESS2-7, VPA.2, LS2-6, LS4.C, WHST.9-12.7

Materials:
•Kamome book - The Extraordinary Voyage of Kamome, A Tsunami Boat Comes Home, by Lori Dengler and Amya Miller
•Map or diagram of school evacuation plan (should be posted in classroom)
•Access to a computer with internet access
•world map

Procedure:
1. Prior to an earthquake drill, read The Extraordinary voyage of Kamome.

2. Practice your earthquake drill – Drop, Cover and Hold On – Go to: https://www.shakeout.org/dropcoverholdon/ for specific steps. This link includes a Resources Section https://www.shakeout.org/resources/ with guidelines for people with disabilities as well as guidelines for an earthquake event when you cannot get under a table. If in Humboldt County, tune to KHSU on FM 90.5 on day/time of Shakeout Drill. Go to: https://www.shakeout.org/california/resources/index.html#multimedia for audio and visual downloads. You can play one of these (download ahead of time) during the Shakeout Drill. Another resource with earthquake sounds is https://www.seismosoc.org/inside/earthquake_sounds/

3. Complete the school evacuation plan for an earthquake and for a tsunami event, if you're in a tsunami zone. Go to: Plan Your Drill at www.shakeout.org

4. After your earthquake drill: complete the group activity, Human Waves Demonstrate How Seismic Waves Travel activity [5-10 min], for a total physical response lesson for students to understand seismic wave motion. Have students

physically model and demonstrate a tsunami wave. They will be modeling a P wave to demonstrate the transfer of energy of a tsunami wave across the ocean.
(a) Play IRIS video "Modeling Seismic Waves;
https://www.iris.edu/hq/inclass/video/human_wave_modeling_seismic_waves_in_the_classroom (stop video at 1 min, 25 sec)

5. Go to: https://ceetep.oregonstate.edu/sites/ceetep.oregonstate.edu/files/7-world_map_of_plate_boundaries.pdf for a solid lesson of plate boundaries (review and/or introduction if this topic hasn't been already studied) . Discuss the location of the plate boundaries in which the 2011 Japan earthquake (in the Extraordinary Voyage of Kamome) occurred.

6. Discuss the Extraordinary voyage of Kamome, with the class. (a) How has the sharing of the Kamome boat found in Cresecent City with Rikuzentakata, Japan an act that is valued in a civil society? (b) Ask students for evidence of a tsunami on the other side of the Pacific Ocean (the physical appearance of the Kamome boat, including the barnacles attached to it, the Japanese characters written on it and how this can be part of evidence of a large event (tsunami) in a far away place (Japan) and a long voyage of the boat over a great distance.) (c) Discuss how barnacles attached to Kamome, or other organisms carried by tsunamis, could impact ecosystems where they may not have been before. What do the barnacles indicate about pelagic (open ocean) life forms? (d) Refer to the map on the inside cover of the Kamome book (or classroom world map) to review where the Japan earthquake occurred and where the Kamome boat was ultimately found. (e) Research tsunami boats from multiple sources and summarize in writing.

7. Guide students to put together a personal kit for an earthquake emergency to keep at school as well as in their car. Send home a list for families to guide/ remind them on earthquake emergency supplies. www.ready.gov/build-a-kit#

8. Use the interactive tsunami zone App if you live on the North Coast to locate your address to determine if you live or work in a tsunami zone.

https://arcg.is/198Kaj

If you live in other parts of California, use the CalOES My Hazards web site to determine if you are near a tsunami zone.

http://myhazards.caloes.ca.gov/

Extension activities:
1. Students participate in a ShakeOut flash

mob. Go to: https://m.youtube.com/watch?v=KgxvAQnekwA.

2. Complete the activity: Cascadia GPS (Gumdrop GPS) to develop an understanding of how precise measurements of Earth processes are made. (this lesson takes 2 to 3 50 minute class sessions to complete)
https://ceetep.oregonstate.edu/sites/ceetep.oregonstate.edu/files/resources/15-cascadia-gps-gumdrop-gps.pdf

3. Students participate in Pastels On The Plaza in Arcata, California, create a square demonstrating earthquake safety.
Go to: http://ncsheadstart.org/events/227-2/

4.The Federal Emergency Management Agency (FEMA) has a couple resources useful to schools too:

- FEMA 527 – Earthquake Safety Activities for Children and Teachers
- FEMA P-1000, Safer, Stronger, Smarter: A Guide to Improving School Natural Hazard Safety

5. Go to:
https://www.st.nmfs.noaa.gov/Assets/Nemo/documents/lessons/Lesson_9/Lesson_9-Teacher's_Guide.pdf for a comprehensive lesson on calculating the speed of a tsunami wave.