2023

ShakeAlert® Engagement Guide:

A Playbook for Museums and Free-Choice Learning Environments

OMSI™
Oregon Museum of Science and Industry

ShakeAlert™

Thank you!

We are appreciative of all our partners, including the many museums, science centers, and other organizations who shared their knowledge and experiences to inform this guide. We are inspired by your stories! Thank you also to the US Geological Survey for funding the development of this guide, as well as the ongoing work of public education and engagement related to ShakeAlert.

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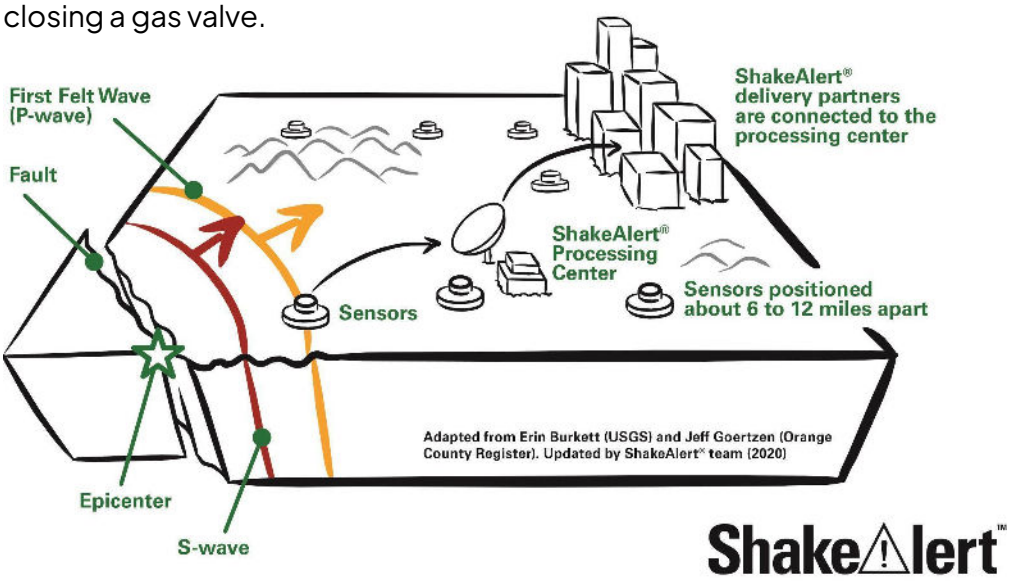
Introduction

Welcome to the ShakeAlert® Engagement Guide for Free-Choice Learning Environments. This guide is designed for educators and other professionals working in museums, science centers, libraries, parks, and other Free-Choice Learning Environments (FCLEs). Here you will find information and resources to help you imagine, plan, and implement educational experiences related specifically to ShakeAlert® Earthquake Early Warning, as well as earthquake science and preparedness more broadly.

We recognize that every Free-Choice Learning Environment is different. There are big urban science museums, small suburban libraries, and coastal state parks. We all have different priorities, audiences, challenges, resources, and program formats. Although we are very different, each of our organizations can support earthquake resilience in our own communities. We can achieve this by leveraging existing relationships and programs to create educational experiences that are locally relevant. We encourage you to use these materials as a starting point, adapting them to suit the needs of your institution and your audiences.

What is ShakeAlert?

ShakeAlert is the Earthquake Early Warning System operated by the US Geological Survey (USGS). ShakeAlert detects significant earthquakes quickly, so alerts can be delivered to people and systems where shaking is expected to occur. Because electronic data travel faster than seismic waves, alerts can reach users seconds or even tens of seconds before strong shaking is felt. Alerts prompt people to take a protective action (such as Drop, Cover, and Hold On) and can also trigger automated actions such as slowing down a train or closing a gas valve.



ShakeAlert is currently operational in California, Oregon, and Washington. Members of the public can automatically receive ShakeAlert-powered alerts on their mobile devices via Wireless Emergency Alerts (WEA, also the source of AMBER alerts) as well as Google alerts (for Android devices). Additionally, select apps are available for download, which can provide ShakeAlert-powered alerts to all phone types.

ShakeAlert FAQ

What apps can I download to get ShakeAlert on my phone?

There are three apps currently licensed to deliver ShakeAlert-powered alerts to mobile devices. These include:

MyShake (CA, OR, WA) QuakeAlert USA (CA, OR) SD Emergency (CA)

Do I *have* to download anything?

No. ShakeAlert-powered apps come automatically to all phones through Wireless Emergency Alerts, (similar to AMBER alerts) and to Android phones through Google Earthquake Alerts. These functions are built in to the phone's settings and automatically enabled unless you manually turn them off. Downloading an app is optional, but gives you another way of getting alerts. Having multiple alerting mechanisms increases the likelihood that you will receive and notice an alert when needed. Additionally, the downloadable apps have features and settings that users can customize.

How much advance warning can ShakeAlert provide?

It depends. People very close to the earthquake's epicenter will likely receive no advance warning. That's because it takes a few seconds for the ShakeAlert system to detect and analyze an earthquake and for alert delivery partners to send out warnings. By this time, people near the epicenter will already be feeling shaking. However, people just beyond this "late alert zone" may get 5–30 seconds of advance warning. This estimate is based on computer simulations, as well as the performance of the ShakeAlert system during actual, recent earthquakes.

The need for public engagement

California, Oregon, and Washington are all vulnerable to earthquakes. These can happen at any time. While science and history can help us estimate the *likelihood* of damaging earthquakes in a given region, the reality is that seismic events are by their nature unpredictable. We do not know where or when the next major quake will occur.

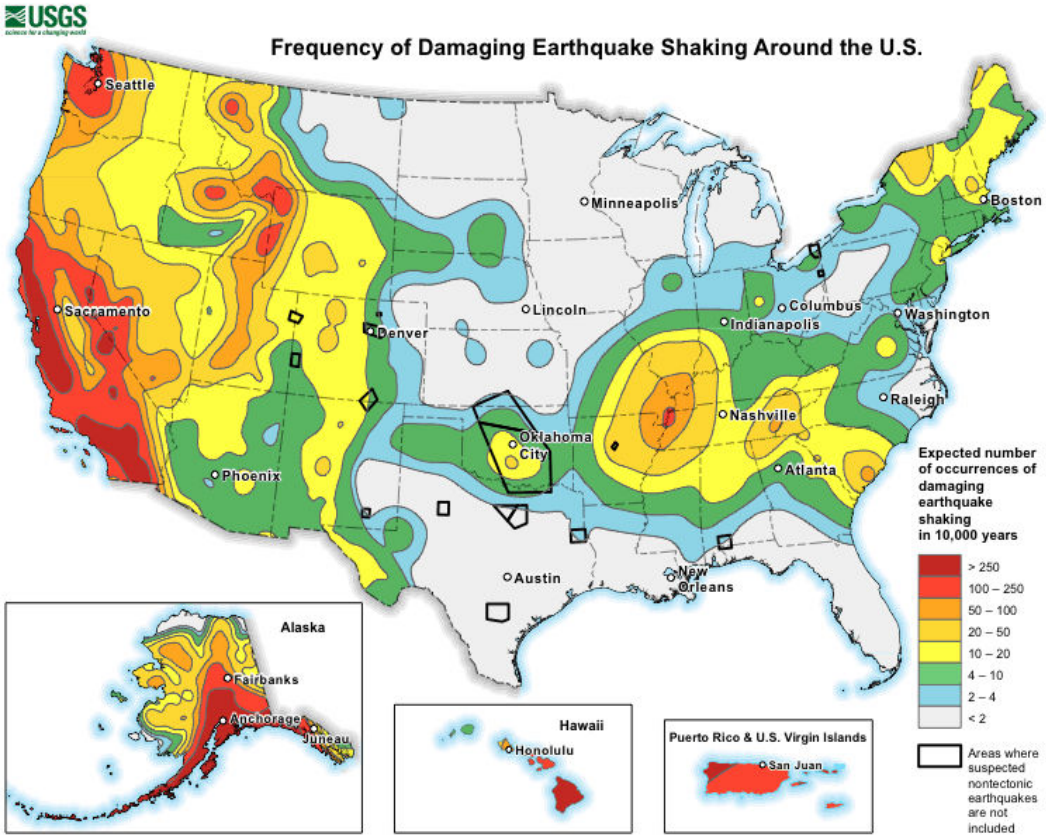


Image source: USGS

As we work together to make our communities more earthquake resilient, we must rely on multiple tools in the preparedness "toolbox." ShakeAlert Earthquake Early Warning is a powerful and relatively new addition to this toolbox; it supports, but does not replace, other critical tools including seismic retrofitting, earthquake drills, and the development of emergency kits and plans.

As a publicly available technology, ShakeAlert has the potential to protect the lives and property of millions of people living in California, Oregon, and Washington. Out-of-state visitors, too—many of whom visit museums, parks, and cultural institutions while traveling—can receive ShakeAlert-powered alerts on their devices when physically present in those states. However, just because ShakeAlert technology is available does not mean

that all potential users are aware of it, understand how it works, and are prepared to respond to an alert safely and effectively.

For this reason, *public education and outreach is an essential part of the ShakeAlert system*. Education and outreach efforts must be broad, and yet responsive to the many and diverse communities that the ShakeAlert system serves. ShakeAlert education should help learners develop awareness, knowledge and skills that support their personal and collective earthquake resilience.

ShakeAlert EPICenter Partnership

There's great potential for FCLEs to impact public awareness and engagement around earthquakes, particularly if we work together. The ShakeAlert EPIcenter Partnership is a professional network for educators, scientists, emergency managers, and others working to promote earthquake learning and preparedness in free-choice learning environments. An EPIcenter—*Earthquake Public Information center*—is any FCLE engaged in this work, whether through annual emergency drills, public programming, educational exhibits, or other efforts.

For more information about how to get involved with the ShakeAlert EPIcenter Partnership, visit shakeout.org/epicenter

About OMSI

This guide has been developed by the Oregon Museum of Science and Industry (OMSI), with the support of other EPIcenters. OMSI is a mid-sized science museum located in Portland, Oregon, serving over a million learners annually across its programs within the museum and across the region. ShakeAlert education aligns with OMSI's mission to "inspire curiosity through engaging science learning experiences, foster experimentation and the exchange of ideas, and stimulate informed action."

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Why Engage? The Role of Free-Choice Learning Environments

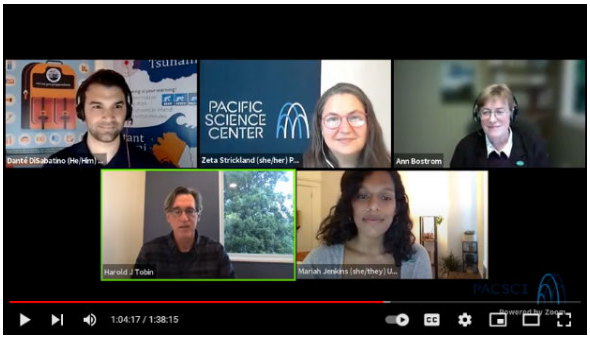
Many institutions have a role to play in public education about ShakeAlert, including state and local emergency managers, formal educators, news media providers and others. Why should museums, parks, libraries, and other FCLEs participate in ShakeAlert education?

We are trusted by our communities

In our increasingly divided age, libraries, museums and similar institutions have earned and retained public trust[1, 2, 3, 4]. People continue to turn to FCLEs for information and experiences that are both scientifically accurate and relevant for their lives.

- ***Case Study: Science in the City at Pacific Science Center***

  In May 2021, ShakeAlert became publicly available in Washington state for the first time; many organizations and agencies joined together in promoting this milestone, using it as an opportunity to raise public awareness about earthquake early warning. The Pacific Science Center in Seattle hosted a virtual panel on ShakeAlert as part of its "Science in the City" series, which focused on a range of timely and socially relevant scientific issues. The panel featured local experts—including a seismologist, an emergency manager, a social scientist, and a communication specialist—who answered questions from the public and provided information about ShakeAlert from both a scientific and social perspective.



We are locally relevant

Earthquakes are locally specific. While the entire West Coast is vulnerable to earthquakes, different communities experience distinct geologic hazards, as well as barriers and assets related to preparedness. FCLEs, whether large or small, are familiar with these regionally specific factors and are often already connected with local preparedness efforts. For this

reason, FCLEs are well positioned to present ShakeAlert in a way that is relevant for local learners.

- ***Case Study: Forces that Shape the Bay at Lawrence Hall of Science***

  At the Lawrence Hall of Science in Berkeley, California, an outdoor exhibit invites visitors to explore earthquakes and other geologic processes while appreciating a panoramic view of the landscape those processes wrought. Hands-on elements and informational panels reference local sites and examples (such as the nearby Hayward Fault and the 1989 Loma Prieta earthquake), encouraging both locals and out-of-town visitors to appreciate the connections between earthquake science and the landscape of the Bay Area.

Images of *Forces that Shaped the Bay* exhibit at the Lawrence Hall of Science. Image credits: Top left, Wikimedia Commons. Top right and bottom, Jenny Crayne.

We engage multi-generational learners

FCLEs provide valuable opportunities for adults and children to learn *together.* Multi-generational learning can support families and other groups in engaging with topics like earthquakes, which affect them collectively.

- ***Case Study: The Epicenter at Oregon Museum of Science and Industry (OMSI)***

  OMSI's *Epicenter* exhibit is a favorite among museum visitors of all ages. The exhibit is accessible via steps as well as a lift. Child-height buttons invite visitors to select one of three historical earthquakes to simulate. Then, as the floor begins to rumble and shake, visual and audio cues prompt everyone: "Drop, Cover, and Hold On!" Exhibit evaluators noted that the experience sparked conversation for families and other groups, with 75% of observed participants talking with their group and 31% of those participants sharing stories about real earthquakes they had experienced[5].

Museum visitors enjoy the *Epicenter* exhibit.
Image courtesy of OMSI.

Ways to engage: Opportunities for Free-Choice Learning Environments

In this section we highlight a variety of approaches that Free Choice Learning Environments can take for engaging learners around ShakeAlert. While there is no limit to the types of program formats FCLEs may use, this guide will focus on:

- Preparedness exercises: drills, simulations, and more
- Interactive demonstrations
- Events
- Youth programs.

Within each of these categories, we provide general tips for implementing a successful program and highlight specific activities implemented by OMSI or other FCLEs. Where relevant, we also link to key resources, including activity outlines, planning guides, printable resources, etc.

However you engage, consider your audience first, and incorporate, to all extents possible, opportunities to build relationships, be responsive, and co-develop programs and experiences with community partners.

In developing ideas and resources for this "Ways to Engage" section, we pulled from a wide variety of existing resources, sometimes using them as-is, and sometimes adapting them. Many of these key resources are linked directly below. In addition, we encourage you to peruse the full catalog of information and materials available from these partners:

- USGS ShakeAlert
- Earthscope Consortium
- The Great ShakeOut

Preparedness Exercises: Drills, Simulations, and More

ShakeAlert can give people seconds of warning in advance of earthquake shaking. Those seconds are crucial, allowing people to mentally prepare and physically protect themselves before severe ground shaking begins. Because ShakeAlert generally provides, at most, just a few seconds of early warning, it is essential that people respond immediately when they receive an alert.

Preparedness exercises (including drills, simulations, practice scenarios, tabletop exercises, etc.) can prepare people to respond quickly and effectively in the event of an earthquake or other emergency. These activities serve multiple learning purposes, including:

- ***Educational*** - Preparedness exercises, such as drills, support overall awareness of earthquake hazards and can establish or strengthen peoples' knowledge of protective actions and procedures.
- ***Procedural*** - Practice makes perfect! In a drill, participants simulate an emergency and rehearse the actions and roles they can take to keep themselves and others safe. Drills can help individuals develop "muscle memory," allowing them to respond quickly and effectively during a real earthquake.
- ***Transformational*** - Preparedness exercises may reveal inconsistencies, vulnerabilities, or other needs related to earthquake safety. Organizations can use these exercises to learn *from participants* how to improve their emergency procedures, as well as their communication about those procedures.

Many FCLEs include earthquake drills or other exercises as part of their regular staff emergency training; some FCLEs also include visitors or members of the public in these activities. An increasing number of FCLEs are participating in earthquake preparedness activities as part of the Great ShakeOut, which occurs annually in October. Whether your institution has an existing earthquake response practice or you are developing one for the first time, there is an opportunity to make it "ShakeAlert-powered"—that is, to integrate ShakeAlert into your planned activities, so that participants review the basics of earthquake early warning, then practice responding to an alert in a specific setting.

When planning a ShakeAlert-powered earthquake drill, or any other kind of preparedness exercise, consider the following:

- ***Emphasize Drop, Cover, and Hold On (DCHO)***

  ShakeAlert may not give sufficient warning for building evacuation. If people attempt to run or flee, they risk being thrown to the ground when strong shaking arrives and/or being hit by falling debris. For this reason, the USGS recommends that, in most situations, if you receive a ShakeAlert-powered alert or feel shaking, you should "Drop, Cover, and Hold On." If a table or similar sturdy object is available, take shelter beneath it, holding on to the table's legs so that it doesn't migrate away from you during shaking. If a table is not available, drop to the ground and cover your head and neck with your arms.

- ***Make it inclusive and accessible***

Drop, Cover, and Hold On (DCHO) is a general recommendation; in practice, DCHO will look different for different bodies. Consider the access and functional needs of your participants and include guidance for those who use wheelchairs, walkers or other mobility assistance tools and/or who are unable to drop to the floor for any reason.

- ***Consider your own setting***

  It's easy to imagine what DCHO looks like in a standard office or classroom setting, where a desk or table is typically available to provide cover. However, FCLEs include a range of indoor and outdoor settings where tables may not be available and other hazards may be present. What does DCHO look like in a planetarium, an art gallery, a maker space, or an interpretive trail? A practice exercise held in one of these "nontraditional" settings does more than prepare people to protect themselves in that specific setting; it can help them develop situational awareness and adaptability so they can protect themselves *wherever* they are when an earthquake strikes.

  Below, OMSI staff and volunteers demonstrate "Drop, Cover, and Hold On," in one of OMSI's more unique spaces: the dock where visitors access the Willamette River and the USS Blueback submarine.

- ***Make it social***

  FCLEs are social settings. Leverage that fact by creating opportunities for participants (whether staff, volunteers, members of the public, or a combination) to practice and debrief together.

Free-choice learning settings can use a variety of approaches to engage staff, visitors, and communities in earthquake preparedness activities, as highlighted by the following examples.

- ***Case Study: Staff earthquake preparedness training at OMSI***

  As part of OMSI's regular preparedness procedures, all staff participate in an annual emergency training. During this training, all OMSI employees—including administrators, custodians, exhibits staff, and guest services representatives—practice earthquake protective actions in various locations around the museum. Staff practice dropping, covering, and holding on in office spaces, in exhibit halls, in the chemistry lab, and even in the Planetarium. This exercise provides employees with an opportunity to consider how they would protect themselves—and potentially help guests/visitors as well—in some of the more unique spaces found in a science museum.

  In 2022, as an extension to our all-staff earthquake training, OMSI provided staff with information specifically about ShakeAlert, including how to get alerts on phones, tablets, and other devices. OMSI employees were invited to bring their personal devices to a "ShakeAlert Help Desk" where trained staff would help them ensure those devices were set up to receive ShakeAlert-powered alerts (whether through WEA, Google Alerts, or downloadable apps like MyShake).

- ***Case study: Simulation-based activity with museum visitors at OMSI***

  For ShakeOut 2022 OMSI piloted a variation on an earthquake drill which included a simulated ShakeAlert-powered alert, followed by a simulated (audio and visual) earthquake. Each activity was 15–20 minutes long, where participants identified the types of educational activities they prefer, they had an opportunity to share with the larger group, and they experienced an earthquake simulation.

  The simulation had a section prior to it beginning where people were welcomed and asked for feedback on how much experience they had with earthquake education, what methods people would prefer to receive the education, and what content they would like to learn. They were then instructed that they would be participating in a simulation.

  This earthquake simulation had a video component, where a short displayed shaking facing the Portland Willamette River waterfront. Audio played and an alert displayed on screen mimicking the emergency alert that would be delivered through ShakeAlert powered alerts as well as the noise that would happen from buildings and earth shaking. Several tablets with speakers were placed around the room. Visitors were instructed to visit the OMSI physics lab and pretend like they were

visiting on a normal day. They were told to do what came naturally to them. In later simulations, lights flickered, trashcans shook, and empty boxes were thrown around the room to simulate debris falling.

This type of simulation works well with audiences of all ages, but there should be some level of warning to parents that their young children may find it upsetting. We suggest offering the opportunity to leave at any time!

Key resources for Drills and Exercises:

- ShakeAlert® Tests, Drills and Exercises Toolkit
- ShakeOut Drill Manual for Non-Profits and Other Organizations
- Video: ShakeOut! Get earthquake-ready with OMSI staff

Interactive Demonstrations

Interactive demonstrations—or "demos"—are an effective way to engage a large number of people using short, yet memorable experiences. The best demos include hands-on materials, open-ended discovery, and two-way conversations between facilitators and learners. A tabletop demo may be supplemented by more static informational materials, such as flyers and posters. This format is particularly well suited for informal settings such as a museum hall, a farmers market, a science fair, or festival.

- ***Case Study: ShakeAlert demos in the museum***

  Demos are standard fare in the science museum; these short, hands-on activities are flexible to engage visitors of all ages and can be led by both novice and experienced educators. At OMSI, we have developed a collection of demos related to earthquakes and ShakeAlert (see "Key Resources," below) for educators and volunteers to facilitate with museum visitors. Below, youth from OMSI's Teen Science Alliance lead a tectonic mapping activity (see "Mapping Earthquakes", below) and a volunteer helps visitors put together a paper model to illustrate the effects of earthquake waves on different height buildings (see "Swaying Buildings", below).

- ***Case Study: ShakeAlert demos in the community***

Demos travel well! Fairs, festivals, and similar events are valuable opportunities to engage community members outside the boundaries of your park, museum, or facility. And, a hands-on activity is a great way to initiate a conversation about earthquakes. Below, OMSI staff bring ShakeAlert demos and information to the Oregon State Fair (left) and Día de los Niños, a family festival organized by a local Latino-serving organization, Centro Cultural.

Key resources for Interactive Demonstrations:

- General: Tips for leading hands-on activities from NISENet
- Activity Guide: Interactive Demonstrations

Public Events

At Free-Choice Learning Environments, public events can take a variety forms, from small-scale offerings to full-scale, multi-day extravaganzas. Regardless of the scale or format, FCLEs can use public events to focus attention on ShakeAlert and earthquake science, bringing people together in a way that is both informative and fun.

- ***Case Study: ShakeOut Event at OMSI***

  Every year in October, individuals and organizations all over the world participate in the Great ShakeOut, an international earthquake drill and preparedness event. In 2022, OMSI celebrated ShakeOut by organizing a public event on a Saturday at the museum. OMSI's ShakeOut event featured a wide range of activities related to earthquake science and safety, including: hands-on demos led by OMSI volunteers (see "Interactive Demonstrations", above); and a preparedness fair featuring local emergency managers, earthquake engineers, and vendors; an earthquake-themed escape room. OMSI's OMSI's IMAX theater and Science on a Sphere display both featured earthquake themed content for the day. Additionally, museum visitors were invited to practice their earthquake protective actions in a simulation activity (see above, under "Drills and Exercises").

  Below, attendees at OMSI ShakeOut learn about local earthquake preparedness resources from a volunteer with Portland's Neighborhood Emergency Teams, a seismic engineer with Earthquake Tech, and the owner of Parkman Emergency Preparedness—a local purveyor of emergency training and supplies.

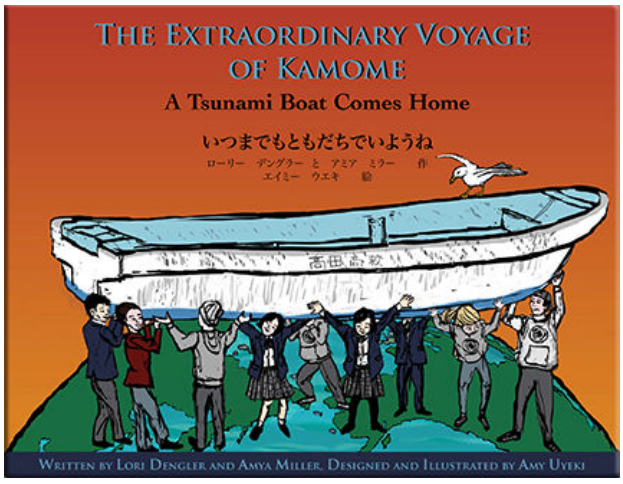
- ***Case Study: Shift Happens—The Science of Seattle's Earthquakes at the Museum of History and Industry (MOHAI)***

  Seattle's Museum of History and Industry (MOHAI) holds a regular First Free Thursday event, which often features programming around a specific, locally relevant theme.

In August of 2019, MOHAI invited the public to *Free First Thursday: Shift Happens—The Science of Seattle's Earthquakes*. For this event, MOHAI leveraged local partnerships to highlight local seismic history and preparedness, putting together a menu of activities that featured diverse experts and appealed to various learning styles. Event activities included discussions with regional emergency managers; science demonstrations led by local seismologists; a screening of the film *Understanding Unreinforced Masonry Buildings;* and an earthquake story-time for young learners. Additionally, the Emergency Management Coordinator from the local Chehalis Tribe gave a public lecture, *Early Warnings from Ancient Stories: The Legacy of Native Myths and Stories in Earthquake Preparedness*, outlining what indigenous oral history can teach Pacific North-westerners about past and future earthquakes.

- ***Case Study: Tsunami-themed Storytime at Multnomah Public Library***

  Public events occurring on the anniversary of notable earthquakes can commemorate past seismic events while reminding the public of the continued need for preparedness. In March, 2021, OMSI partnered with the Multnomah County Library to organize a special story time to coincide with the 10-year anniversary of the 2011 Japanese earthquake and tsunami. The storytime featured a read-aloud of the book *The Extraordinary Voyage of Kamome: A Tsunami Boat Comes Home* (below) along with thematic, hands-on activities to pair with the story. Adults and children also learned about earthquake and tsunami safety, including how to receive and respond to ShakeAlert-powered alerts.



Key resources for Public Events:

- OMSI ShakeOut 2022 Event guide

- Description of MOHAI Shift Happens event
- Kamome Storytime - recorded video

Youth Programming

Youth programming, whether delivered via camps, classes, field trips, or afterschool programs, can allow for deeper, more extended exploration of earthquake topics. Research indicates that children are key messengers of preparedness information to their families, meaning that earthquake education for youth can have a "trickle-up" effect in the community[6].

Museums, libraries, and other FCLEs offer a variety of program formats for youth, ranging from a one-time class to a multi-week program. As you consider how to engage youth in learning about earthquakes at summer camp, storytime, after-school club or other settings, keep in mind both the goals of the program and the characteristics of the youth and families involved.

Questions you might ask include: Where do the participating youth live, and are there specific geologic or social hazards relevant to this area? Do the participants have a specific interest, such as photography or engineering, that could be applied to the topic of earthquakes?

And finally, consider the program goals. Is the intent to develop students' content knowledge and scientific reasoning skills? Are you hoping to support youth in developing scientific identity and agency? Or, do you just want students to have fun exploring science? All of these learning outcomes can be part of an earthquake-focused program for youth.

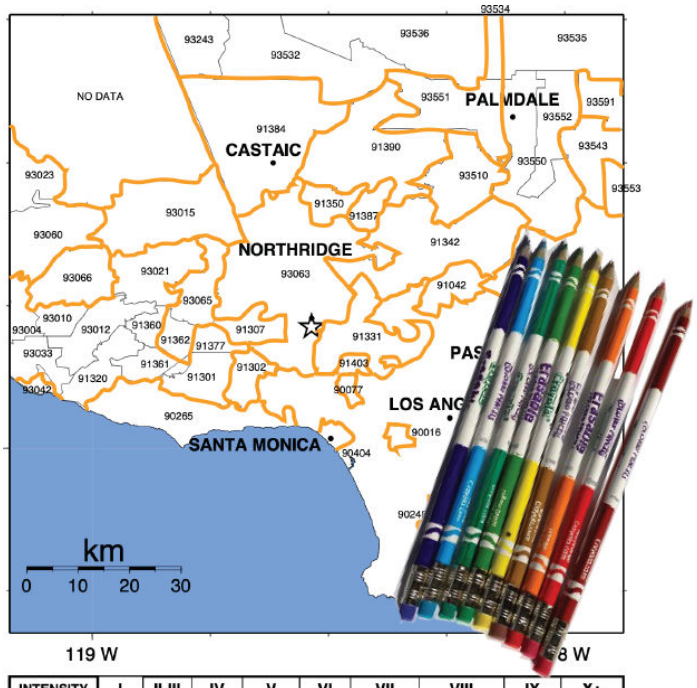
Below we will describe our own experience designing and delivering ShakeAlert-related youth programming across three formats: a one-hour lab for homeschool students; a two-day summer camp for Latina girls; and a five-week after-school program for middle school youth. In each of these cases, we drew on existing earthquake education resources adapting and supplementing them to suit the needs of the specific program and learners. We encourage you to do the same!

- ***Case Study: OMSI lab program exploring magnitude and intensity***

  For this class, OMSI partnered with Oregon Homeschool Science Club to offer a one-hour lab for homeschool students focused on earthquakes. This particular

group of 3rd- and 4th-graders had some prior exposure to earthquake content and were interested in exploring the more advanced concepts of magnitude and intensity.

For this program, students learned about earthquake magnitude using spaghetti and experimented with earthquake intensity using a lightbox (see Key Resources, below). Finally, they learned how citizen science data contributes to scientists' understanding of earthquakes by examining "Did You Feel It?" reports from a past seismic event. Students read real-life reports from people who experienced the 1994 Northridge earthquake—for example, "I was driving home from work and it felt like I had a flat tire. I pulled off the road to check and as I stopped the car I saw the chimney on a nearby house collapse!" Students then used these reports to color-code a "Shake Map" showing how shaking intensity varied around the epicenter (image below).



INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+
SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
DAMAGE	none	none	none	Very light	Light	Moderate	Moderate/Heavy	Heavy	Very Heavy

Key resources for magnitude and intensity lab:

- Activity Guide: Spaghetti Quake

- Activity Guide: Earthquake Lightbox
- Activity Guide: Magnitude and Intensity

- ***Case Study: One-day STEM summer camp, "Earthquakes 101"***

For this "Earthquake 101" program, OMSI partnered with a local Latina-serving organization, Adelante Mujeres, to lead a full day of earthquake-themed activities at a STEM summer camp for girls ages 7–12. Given the summer camp setting, we chose to prioritize games, crafts, and similar hands-on activities as tools for exploring earthquake science.

In the morning, students learned about the driving forces of earthquakes by collaboratively solving the Plate Tectonics Puzzle and modeling crustal processes with Edible Plate Tectonics. Working in pairs, they used Slinkies to model different types of earthquake waves, and then created paper city models to show how those waves could affect buildings of differing heights. The afternoon session focused on earthquake engineering, starting with Pasta Quake as an introduction to magnitude and transitioning into two hands-on building challenges; first, students used popsicle sticks to explore the function of bracing in seismic engineering, then they applied those concepts to an open-ended building challenge using toothpicks and marshmallows. The day ended with an onsite earthquake drill, where students practiced Drop, Cover, and Hold On in response to a simulated ShakeAlert-powered alert.

A note about using food in activities

Several of the activities described in this guide make use of food items such as spaghetti and marshmallows. When using food for hands-on activities, keep in mind the lived experience of your audience. It is common for children to experience food insecurity, so it might be wise to let your students eat their edible creations at the end of the activity. We also encourage having vegan products available (e.g., vegan marshmallows and vegan frosting) to respect the religious, cultural, and dietary needs of the students in attendance. It is never a bad idea to ask your participants if they have dietary restrictions ahead of your activities!

Chicas Summer Camp participants work together to assemble the Tectonic Puzzle Map (left) and model seismic waves using a Slinky (right)

Key resources for Earthquakes 101 Summer Camp:

- Activity Guide: ShakeAlert Interactive Demos (see Mapping Earthquakes, Tectonic Puzzle Map, and Graham Cracker Plate Tectonics, and Swaying Buildings)
- Activity Guide: Seismic Slinky
- Activity Guide: Spaghetti Quake
- Activity Guide: Designing Earthquake-resistant Structures

- ***Case Study: Five-week Afterschool program: Designing for Disasters***

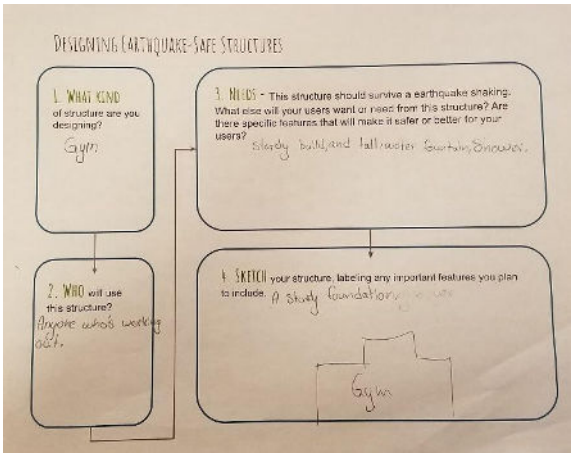
  An extended program format, such as an afterschool club, allows for deeper engagement and provides opportunities to align earthquake learning with topics and activities students may already be interested in.

  OMSI has an ongoing partnership with Self Enhancement Inc. (SEI), a community-based organization in Portland, Oregon that primarily serves Black and African American youth. OMSI was invited to bring ShakeAlert programming to their multi-week afterschool program for middle school students. We recognized that for this program to engage middle-schoolers and align with SEI's goals, it should present earthquake science in a way that prioritized fun, creativity, and

empowerment. For this reason, we chose to use *Design Thinking* as a frame for exploring earthquakes generally and ShakeAlert specifically.

Design Thinking (DT) is an approach to problem solving focused on people; it begins with empathy, which then informs the process of imagining, creating, testing, and improving design-based solutions to actual problems. Within this frame, the challenges and problems associated with earthquakes are reframed, not as science problems specifically, but as *human* problems to be addressed through DT.

During this five-week afterschool program, students first practiced the Design Thinking process through a time-tested activity, "The Perfect Present." In subsequent weeks, they applied a similar process to explore challenges related to earthquakes and consider design-based solutions for earthquake detection, earthquake alert alerting, earthquake-resilient building, and emergency preparedness kits. See "Key Resources" below for full curricula and resources.



In Designing for Disasters, SEI students design earthquake-proof structures to suit the needs of specific users

Key resources for Designing for Disasters program:

- Activity Guide: Designing for Disasters
- Recorded presentation: Designing for Disasters: Learning About Earthquakes Through the Lens of Design Thinking, presented at American Geophsyical Union Fall Meeting, 2022

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