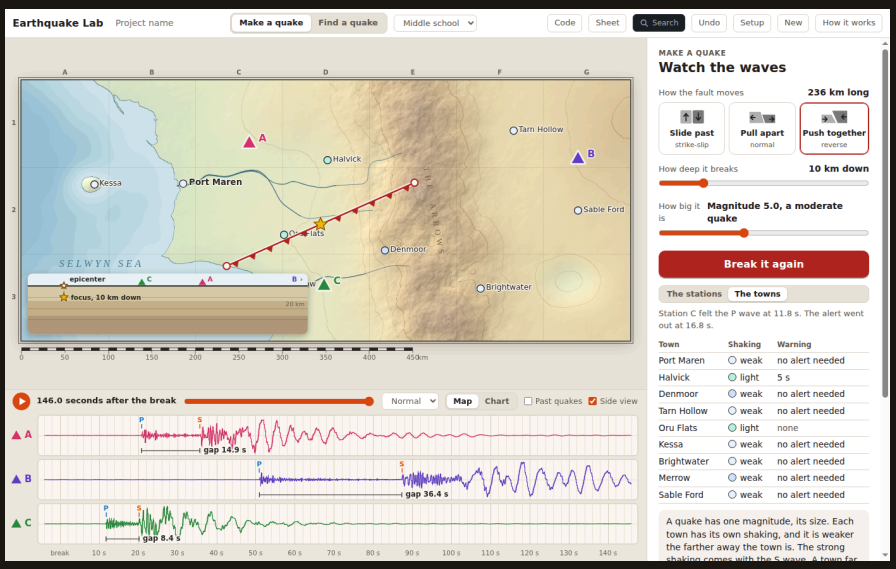
mytekDev

Earthquake Lab: Seconds of Warning

Grades 6-8 · 45 minutes

Earth science



Slides, rubric and answer key **Print and go** **No student accounts**

Chromebook friendly

What's included

- A one-page overview: objectives, essential question, vocabulary, standards and assessment
- A 45-minute lesson sequence: warm-up, direct instruction, guided practice, independent practice, closure
- Slides for the board: a PowerPoint file that also opens in Google Slides
- A student worksheet with a QR code and a towns table
- A 3-question exit ticket, two to a page, with an answer key
- A rubric: 3 criteria, 4 levels, scored out of 12
- Differentiation for English learners, students with IEPs or 504 plans, and students who need more support or more challenge
- Cross-curricular extensions, and notes for teaching it in grade 4 and in high school earth science
- Standards: NGSS

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Students break a magnitude 6.5 quake and open The towns: one magnitude for the quake, but a different shaking for each town, and seconds of warning for the towns far enough away. The alert goes out once the nearest station feels the fast P wave, ahead of the strong S wave. Students move a station to give more towns warning, then break a fault under the sea and watch a tsunami cross it in minutes.

At a glance

ESSENTIAL QUESTION

Nobody can predict an earthquake. How can people still get a warning?

OBJECTIVES

Students will be able to:

- tell magnitude, the size of a quake, apart from the shaking at each place
- explain how an early warning works using the P wave and the S wave
- explain why towns near a quake get little or no warning
- describe what to do in an earthquake, and at a coast afterward

VOCABULARY

Magnitude, Intensity, Early warning, Prediction, Tsunami

STANDARDS

MS-ESS3-2

TIME AND MATERIALS

45 minutes, grades 6-8.

- One computer or Chromebook per student
- A projector
- The worksheet and exit ticket, one copy each per student
- The rubric, one copy per student if you grade the work

PREP

Make copies of the worksheet and exit ticket. Before class, open mytekdev.com/try/earthquakelab?lesson=seconds-of-warning&ref=tpt-earthquakelab-3 once on a student computer to check that your school's filter allows the app. Run it yourself, about ten minutes: press Break the fault, open The towns, read the warnings, drag station C next to the fault and break again, then draw a new fault in the sea near Kessa, set Push together and magnitude 7.5, break it, open The towns and press Watch the sea.

ASSESSMENT

- Formative: the questions under What to look for, asked while students work, and the exit ticket (answer key included).
- Summative: the worksheet, scored with the rubric.

TECHNOLOGY AND PRIVACY

Runs in any browser, Chromebooks included, with nothing to install. Students need no account and no email: the link works signed out, and nothing they do is stored on our server unless they choose to save.

Lesson sequence

MINUTES	STAGE	WHAT YOU DO	WHAT STUDENTS DO
0 to 5	**Warm-up** Hook	Show the title, essential question and Today I can slides (about 1 minute). Then the warm-up: how could a phone know about shaking before it arrives? Write every answer on the board.	Answer the warm-up on the worksheet.
5 to 12	**Direct instruction (I do)** Model it	Project the app with the starter open. Press Break the fault, then The towns. Read the alert line aloud, then two towns: one near with no warning, one far with seconds. Show One magnitude, many shakings and A magnitude 6.5 quake. > **It's working when:** Point out that the town list says strong, light and weak for the same quake. Magnitude is the quake; shaking is the place.	Watch, and fill in the vocabulary on the worksheet.
12 to 22	**Guided practice (We do)** Break it together	Students open the link or scan the QR code. A short guide walks them through breaking the fault and opening The towns. > **Watch for:** Students who think the warning is a prediction. Ask when the alert went out: after the quake had started, every time.	Fill in the towns table for four towns: distance from the star, shaking, warning.
22 to 38	**Independent practice (You do)** More warning, then the sea	Students drag station C beside the fault and break again: every town gains a little warning. Then they draw a fault under the sea near Kessa, Push together, magnitude 7.5 or more, break it, open The towns and press Watch the sea. Walk the room with the What to look for questions. > **If they ask:** "Try Slide past under the sea. Why does the app show no wave?" Sideways	Record the warnings before and after moving the station, then the shaking time and the wave time for each coast town.
38 to 45	**Closure** Showcase and exit ticket	Show the Showcase slide. Take the order: drop, cover and hold on until the shaking stops, then go to high ground or inland right away, without waiting to be told. Hand out the exit ticket.	Answer the exit ticket.

Before you teach: a ten-minute walkthrough

Open mytekdev.com/try/earthquakelab?lesson=seconds-of-warning&ref=tpt-earthquakelab-3. A short guide opens over the app, with a fault already drawn across the middle of the map and set to magnitude 6.5.

1. **The break.** Press `Break the fault` and let the clock run to the end.

2. **The towns.** Press `The towns`. The line on top says when station C felt the P wave (11.8 seconds) and when the alert went out (16.8). Oru Flats shakes strong with no warning; Port Maren gets 30 seconds, Kessa 59. Towns that shake too little are marked no alert needed.
3. **A better station.** Drag station C close to the fault and break again: the alert goes out sooner.
4. **The sea.** Drag across the sea near Kessa to draw a new fault, choose `Push together`, set the magnitude to 7.5, and break it. In The towns a card says the sea floor moved and lifted the water into a wave; press `Watch the sea`. The wave crosses in minutes, slows where the sea is shallow, and bends round the island; the strips become gauges at three coast towns.

> The moment that lands is the town next to the quake getting none, while a town far away gets most of a minute.

Background for the teacher

Magnitude is one number for the size of a quake. Intensity is how hard the ground shook at one place, and it falls with distance; the app uses the words USGS uses, from not felt to extreme, from a relation fit to California quakes (Bakun and Wentworth, 1997).

Early warning is not prediction: nobody can say ahead of time when a quake will come. Once one starts, the station nearest it feels the fast, weak P wave; a center works out what is coming and sends an alert, which outruns the slower, stronger S wave to places farther away. Places close to the quake shake before the alert can reach them. In the app the alert goes out five seconds after the nearest station feels the P wave; real systems use several stations.

A tsunami comes when a big quake under the sea lifts or drops the sea floor and the water above it; most big ones come from faults that push together. It travels at a speed set by the depth of the water, far slower than the shaking. At a coast, a strong or long earthquake is the warning: drop, cover and hold on until the shaking stops, then go to high ground or inland right away, without waiting to be told. The app shows no wave heights, flooding or damage. The map is made up, and so is every quake on it. The waves travel at 6 and 3.5 kilometers a second in straight lines; in the real Earth they speed up with depth and bend, so the 8 km rule works best within about 200 kilometers.

What to look for

Ask these while students work. A student who has understood the lesson can answer them without help:

- The quake has one magnitude. Why do the towns have different shaking?
- When did the alert go out: before or after the quake started?
- Why did Oru Flats get no warning?
- Why did moving station C help every town?
- How long did the shaking take to reach a coast town, and how long the wave?

> The second question is the real test: a student who says after, once a station had felt the P wave, knows warning is not prediction.

Cross-curricular extensions

- Health and safety: practice drop, cover and hold on, and find your school's plan.
- Math: the S wave travels 3.5 km a second. How far does it get in 30 seconds of warning?
- Geography: find a real coast with tsunami evacuation route signs, and where they point.
- English: write a short alert message for a phone that tells people exactly what to do, in under 90 characters.

Vocabulary

Magnitude	One number for the size of an earthquake.
Intensity	How hard the ground shakes at one place. Each town has its own.
Early warning	An alert sent after a quake starts, before the strong shaking arrives somewhere else.
Prediction	Saying when a quake will happen before it starts. Nobody can do this.
Tsunami	A series of sea waves made when the sea floor moves suddenly, as in a big quake under the sea.

Differentiation

ENGLISH LEARNERS

- Keep the vocabulary slide up, and point at the screen as you say each word: the rings, the flags and the circles carry the meaning.
- Pair each learner with a partner; the towns table colors each town by its shaking.
- Accept the towns table with words and numbers only.

STUDENTS WITH IEPS OR 504 PLANS

- Pair students for the independent part, one dragging and one filling in the table.
- Zoom the browser to 125%; the towns table stays readable.
- Allow the station move only, without the sea, where the IEP allows a modified assignment.

STUDENTS WHO NEED MORE SUPPORT

- A sentence starter: "Oru Flats got no warning because ___."
- A check-in after the guide: every student has The towns open with warnings showing before anyone moves on.
- Ask only which town got the most warning and which got none.

STUDENTS READY FOR MORE

- Find the place for station C that gives Port Maren the most warning.
- Turn the magnitude down to 5: which towns now need no alert at all, and why?
- Under the sea, compare Pull apart and Push together at the same size. What does the card say about most big tsunamis?

Adapting for other grades

Younger students: In grade 4, pick 4th grade in the header: the towns and the sea work the same. Focus on which towns shook hardest and what people can do to stay safe; skip the third rubric row; total 8, and 6 meets the objectives.

Older students: In high school, compare the towns' shaking with distance on a graph and fit the relation the app uses, a straight line in the logarithm of distance; then discuss why real warning systems use many stations.

Student worksheet

Name: _____ Date: _____

Open the app: scan the QR code, or go to mytekdev.com/try/earthquakelab?lesson=seconds-of-warning

Essential question: Nobody can predict an earthquake. How can people still get a warning?

Warm-up: How could a phone know about shaking before it arrives? _____

1. **Vocabulary.** Magnitude, intensity, early warning, prediction, tsunami: write each in your own words.

2. **The towns table.** For four towns: distance from the star _____ km; shaking _____; warning _____ s. Then with station C moved: warning _____ s. For a coast town: shaking arrived _____ s; wave arrived _____ min.

1. Why do towns close to the quake get little or no warning?

2. You feel a strong, long earthquake at the beach. What do you do first, and what next?

Earthquake Lab: Seconds of Warning

Exit ticket

Name: _____

1. An early warning is sent (A) days before a quake (B) after a quake starts, before the strong shaking arrives (C) only after the shaking stops

2. One quake makes strong shaking in one town and light shaking in another. The quake has (A) one magnitude (B) two magnitudes (C) no magnitude

3. Explain why a town far from the quake can get more warning than a town close to it.

Earthquake Lab: Seconds of Warning

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Answer key: exit ticket

QUESTION	ANSWER	WHY
1	B	Nobody can predict a quake; the alert goes out once a station has felt the P wave.
2	A	Magnitude is the size of the quake; shaking is different at each place.
3	The strong S wave takes longer to reach it	The alert travels almost at once, but the S wave is slow, so the farther away, the more time between the alert and the shaking. Saying only that it is farther is half.

Rubric

Score each row from 1 to 4.

Name: _____

CRITERIA	4 EXCEEDS	3 MEETS	2 APPROACHING	1 BEGINNING
The towns table	Four or more towns with distance, shaking and warning, before and after moving the station, and the coast towns' shaking and wave times.	Four towns with distance, shaking and warning.	Some towns recorded.	No towns recorded.
Explaining the warning	Explains that the alert goes out once the nearest station feels the P wave, ahead of the slower S wave, and why near towns get none.	Explains that far towns get more warning because the strong shaking takes longer to reach them.	Says far towns get more warning, with no reason.	No explanation, or calls it a prediction.
Magnitude and safety	Tells magnitude from each town's shaking, and gives the coast steps in order: drop, cover and hold on, then high ground without waiting.	Tells magnitude from shaking, or gives the coast steps.	Mixes up magnitude and shaking.	No answer.

Total: ____ / 12. A score of 9 or more meets the objectives.

Standards

The lesson is built for MS-ESS3-2: data on a natural hazard, and a technology, early warning, that lessens its effects without predicting it.

FRAMEWORK	CODE	GRADES	STANDARD	HOW THE LESSON MEETS IT
NGSS	**MS-ESS3-2**	6-8	Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.	Students read shaking and warning data and see why earthquakes "occur suddenly and with no notice, and thus are not yet predictable", in the clarification's words.

Checked November 2026 against: NGSS MS-ESS3-2, Earth and Human Activity.

Optional: save student work in a free class

The whole lesson runs at the link on the worksheet, with no accounts and no sign-up.

To keep students' work, and see it all in one place, make a free class. It takes about ten minutes, once, and covers every lesson in this series: mytekdev.com/tools/class-setup

Students in a class open mytekdev.com/tools/earthquake-lab/lessons/seconds-of-warning/start instead of the worksheet link. Each one gets their own copy of the starter, and the same link reopens it next time.

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