

LESSON 9: How can we effectively prepare our communities for a natural hazard?

PREVIOUS LESSON We used what we learned to develop a system model that identifies components and processes involved in detecting, warning people, and reducing damage from tsunamis. We generalized the process engineers use to solve problems and determined we should use what we've learned to address a local natural hazard.

THIS LESSON

PUTTING PIECES TOGETHER

3 days



In this lesson, we gather and communicate information about a local hazard in our community. We obtain information from a variety of sources, including agencies and organizations that focus on hazards and emergencies, and develop a plan and/or product to communicate the information to stakeholders in our community.

NEXT LESSON There is no next lesson.

BUILDING TOWARD NGSS

MS-ESS3-2, MS-ETS1-1, MS-ETS1-2



WHAT STUDENTS WILL DO

- 9.A** Critically read scientific texts adapted for classroom use to obtain scientific and technical information related to the likely locations and severity of a local hazard and response systems designed to protect communities from damage that might result.
- 9.B** Communicate scientific and technical information in writing and/or oral presentations about a system designed to prepare community members before a hazard happens, respond during a hazard, and recover after the hazard.

WHAT STUDENTS WILL FIGURE OUT

- All communities are impacted by natural hazards, and these hazards often require different ways to detect, warn people, and reduce damage.
- Knowledge about hazards (the causes of the hazard, locations at risk, how to design solutions, and how to respond when it happens) can empower us and others to design safer communities and save lives.
- Effective communication and response plans account for the people living in a place and the resources communities have to respond.
- Communication strategies include educating the community before a natural hazard happens and then also alerting people when the hazard is happening.

Lesson 9 • Learning Plan Snapshot

Part	Duration	Summary	Slide	Materials
1	5 min	REVISIT RELATED PHENOMENA POSTER Look back at related phenomena from Lesson 1 and use the list to brainstorm how to communicate a plan to members of the community.	A	Related Phenomena poster
2	10 min	CONSIDER SCIENCE IDEAS AND COMMUNITY NEEDS Consider the local community needs for preparing and responding to a natural hazard.	B-C	Tsunami System Model from Lesson 8
3	10 min	DETERMINE HAZARD INFORMATION AND COMMUNICATION PLAN Use <i>Planning a hazard awareness project</i> to organize relevant information about the selected natural hazard and develop a plan to communicate appropriately and effectively with the selected stakeholder group.	D-G	<i>Planning a hazard awareness project, Natural hazards around the World</i>
4	115 min	BEGIN NATURAL HAZARDS AWARENESS PROJECT Develop a project to effectively communicate natural hazard information to selected community stakeholder groups.	J	<i>Planning a hazard awareness project, Potential Project Options, Natural hazards around the World, Obtaining and Communicating Information about Natural Hazards, Varies based on option chosen by group</i>
5	10 min	EVALUATE OUR DQB QUESTIONS Gather around the Driving Question Board and place sticky dots on the questions we think we have made progress on.	K-L	5 sticky dots

End of day 1

Lesson 9 • Materials List

	per student	per group	per class
Lesson materials	<ul style="list-style-type: none">• <i>Planning a hazard awareness project</i>• <i>Natural hazards around the World</i>• <i>Potential Project Options</i>• <i>Obtaining and Communicating Information about Natural Hazards</i>• science notebook• 5 sticky dots	<ul style="list-style-type: none">• Varies based on option chosen by group	<ul style="list-style-type: none">• Related Phenomena poster• Tsunami System Model from Lesson 8

Materials preparation (30 minutes)

Review teacher guide, slides, and teacher references or keys (if applicable).

Make copies of handouts and ensure sufficient copies of student references, readings, and procedures are available.

Review and edit the options for final products on *Potential Project Options*. Gather any materials that students will need (chart paper, markers, pencils, etc.) and ensure the class has computer access for the duration of this lesson if they pursue a digital choice. Use *Hazard Awareness Project Choice and Platform Information* to learn more about digital tool options and modify the handout according to any acceptable use policy or classroom limitations. Use *Potential Accompanying Standards* to identify possible accompanying project standards.

Display the Related Phenomena poster from Lesson 1.

Display the Tsunami Systems Model from Lesson 8.

Lesson 9 • Where We Are Going and NOT Going

Where We Are Going

The focus of this lesson is for students to use and apply ideas figured out while investigating the tsunami hazard to a local hazard in their community. The lesson is intended to help them understand what the hazard is and how they (and others) will need to respond if it happens.

Where We Are NOT Going

Students will not have time to investigate and evaluate the different design solutions that exist to detect, warn people, and reduce damage from a local hazard.

LEARNING PLAN for LESSON 9

1 · REVISIT RELATED PHENOMENA POSTER

5 min

MATERIALS: Related Phenomena poster

Transition to local hazards. Say, *Last class we ended by thinking about other natural hazards that worry us. We knew that tsunamis may not happen to any of our communities, but there were other hazards we are concerned about.*

Direct students to look back at the Related Phenomena poster from Lesson 1. Ask students if they would like to add any additional natural hazards they are concerned or curious about. Add in any new suggestions from students.

Turn and Talk about local natural hazards.* Project slide A. Have students Turn and Talk to a partner about these questions:

- What natural hazards is our community at risk for?
- How might we protect our community?

Ask students to share their ideas.

Suggested prompt	Sample student response
<i>What natural hazards is our community at risk for?</i>	<i>Accept all relevant responses.</i>
<i>How might we protect our community?</i>	<i>We could design things to protect people.</i> <i>We could get better warning systems in place so that people can be safe during the event.</i> <i>We could educate people, like the school in Kamaishi, so that people know what to do.</i>

* ATTENDING TO EQUITY

Supporting empathy and emotions: At this point in the unit, students will transition to focusing on local hazards. If your community has experienced any recent hazards (and in particular, ones that caused damage and deaths), be mindful that some students might have traumatic experiences that may surface. One option would be to have them research the hazard because creating a communication plan might help them feel empowered and less anxious by knowing how to respond in the future. For some students, it might be better to choose another hazard that has less of an emotional connection for them.

2 · CONSIDER SCIENCE IDEAS AND COMMUNITY NEEDS

10 min

MATERIALS: Tsunami System Model from Lesson 8

Determine relevant science and engineering ideas. Display slide B. Say, *We know we want to raise awareness about our local hazards, but we need a starting place. What ideas from the Tsunami System Model could we use to help us figure out our starting point?*

Guide students to review the Tsunami System Model (from Lesson 8). The key ideas that should resurface should focus on the interconnected system with many parts designed to detect, warn people, and reduce damage from a tsunami hazard.

Suggested prompt	Sample student response
<i>What important ideas did we identify in our Tsunami System Model?</i>	<p><i>We identified how a tsunami starts.</i></p> <p><i>We identified what is in place to reduce damage.</i></p> <p><i>We identified detection and warning systems.</i></p> <p><i>We identified communication, preparation, and response.</i></p>

Ask students, *Do you think other hazards have similar kinds of systems in place?*

Suggested prompts	Sample student responses	Follow-up questions
<i>Do you think other hazards have similar kinds of systems?</i>	<p><i>Yes, when bad weather is happening or imminent, we receive or hear alerts on the TV, radio, and/or our phones.</i></p> <p><i>No, other hazards do not need buoys in the ocean.</i></p>	<i>Do you think other hazard systems might have sensors to detect when they happen?</i>

Consider local community needs. Say, *OK, so we know there are probably some systems in place to protect our communities, but we also know that we need to figure out what is important for people in the community to know about the hazard as well.* Project **slide C**. Give students a moment to Turn and Talk to a partner about the questions on the slide.

- Does our community need to know more about the hazard to properly respond?
- What information will we need to communicate to people?
- What methods will we use to communicate with the community? Why those methods?

Lead a short discussion with students over the questions.

Suggested prompt	Sample student response
<i>Does our community need to know more about the hazard to properly respond?</i>	<p><i>Yeah, the community will need to know what the warning signs are so they can be safe during the hazard.</i></p> <p><i>They need to know if they are at a place where they may be at risk.</i></p> <p><i>They need to know how bad the hazard is going to be to know where to go or what to do.</i></p> <p><i>They have to know it's coming and be alerted to respond.</i></p>

Suggested prompt	Sample student response
<p><i>What information will we need to communicate to the community?</i></p>	<p><i>How to know when a hazard is starting.</i></p> <p><i>What to look or listen for when a hazard starts.</i></p> <p><i>How to be safe during a hazard and what to do after.</i></p> <p><i>What is already there to protect them in case of the hazard and how it starts in the first place.</i></p>
<p><i>What methods will we use to communicate with the community? Why those methods?</i></p>	<p><i>I think we have to reach different people in different ways, just like they did in Ryoishi. We have to use different methods because not everyone will pay attention to the exact same method.</i></p> <p><i>Maybe we need two different methods, like a commercial or a newspaper article or something. My grandma trusts the newspaper, but my sister is super into tv and commercials.</i></p> <p><i>Maybe it could be through a video that can be shared on social media. I know a lot of people my age get their information from social media.</i></p> <p><i>I think we have to use methods that people are comfortable using and that they trust. People have to trust the information they are receiving to use it.</i></p>

ADDITIONAL GUIDANCE

For this discussion, consider using charts from previous lessons to help draw out ideas from students. For example, you might say, *Back in Lesson 3 after we figured out how a tsunami is caused by an earthquake, we figured out there are things we would want to know about an earthquake and the resulting tsunami to know when and how to warn a community. Let's look back at our poster, do you think we would want to consider any of these ideas about these other hazards in order to figure out how to evaluate a protection system?*

3 · DETERMINE HAZARD INFORMATION AND COMMUNICATION PLAN

10 min

MATERIALS: *Planning a hazard awareness project, Natural hazards around the World*

Say, *OK. When evaluating and proposing a protection plan, we have a lot that we need to communicate and a lot to consider according to who we are trying to communicate with. We know that our communication method will depend on the stakeholders, and what we are communicating will depend on our local hazard information. Let's take a few minutes to look at a tool and figure out how it will help us plan for our project.*

Explain part 1 of handout. Display slides D-E. Distribute *Planning a hazard awareness project* to students. Explain to students that this handout will guide them through collecting information about their hazards based upon the areas we identified in our systems model from Lesson 8. Students will have to consider the stakeholders and determine a way to best communicate with their chosen stakeholders.

Explain part 2 of handout. Display slides F-G. Show students part 2 of the handout. Part 2 is where students will think about what they are communicating to their chosen stakeholders and the methods they are using.

*** ATTENDING TO EQUITY**

Universal Design for Learning: Students are asked to consider the authentic needs of the community and *relevant* ways in which to engage their stakeholders. Placing the hazard awareness project in a local context provides relevance for both students and stakeholders. Assessing the needs of the stakeholders identifies additional value to

Go over available reference materials.* Project slide H. Show students the natural hazard resources using *Natural hazards around the World* in the student edition. Explain that most, if not all, of the information they need for the natural hazard will be in the reference deck. Point out that each hazard is organized into different sub-categories to make it easier to find information.

- About the ____ hazard: This section provides students with an overview of the natural hazard, including information about where, when, how strong it can be, and what kind of damage can result.
- Detect, Warn People, Reduce Damage: This section provides students with an overview of the technologies and design solutions in place to protect communities.
- Prepare, Respond, Recover: This section provides students with best practices to prepare for a hazard before it happens, what people should do during a hazard to protect themselves, and then what they can do after the hazard is over.
- Helpful Resources: The resources have additional information for students to explore to gather more information about the hazard.

Consider ways this information could be communicated to others. Say, *Wow, there is a lot of information about the different natural hazards. When a natural hazard event occurs, this information needs to be shared with different communities. The way this information is shared needs to be easy to understand, but also communicate all the important information. What are some ideas you have for how this information could be communicated to people in a way that is easy to understand but also includes the important points?*

Suggested prompt	Sample student response
<p><i>What are some ideas you have for how this information could be communicated to people in a way that is easy to understand but also includes the important points?</i></p>	<p><i>We could make a commercial for people to watch!</i></p> <p><i>We could create flyers for people to read!</i></p> <p><i>We could make something kid-friendly!</i></p> <p><i>We could make a lot of things that work for different members of our communities.</i></p>

Display slide I. Give students a list of all the resources available to them as they work in small groups on a local hazard.

the community and creates an authentic project that can be utilized both inside and outside of the classroom.

*** SUPPORTING STUDENTS IN ENGAGING IN OBTAINING, EVALUATING, AND COMMUNICATING INFORMATION**

At this point in this final lesson, students will focus on critically obtaining important information from a text adapted for classroom use, alongside some additional resources. They will need to integrate that information and decide how to communicate it with others in a relevant, effective, and/or engaging way. To support this practice, use questions like: *What is the main idea about how this hazard impacts people? Or, What are the three most critical pieces of information to communicate about _____.*

4 · BEGIN NATURAL HAZARDS AWARENESS PROJECT

115 min

MATERIALS: *Planning a hazard awareness project, Potential Project Options, Natural hazards around the World, Obtaining and Communicating Information about Natural Hazards, Varies based on option chosen by group*

Begin small group investigation. Project slide J. After orienting students to the handout and resources available, give students time to work in partners or small groups through Parts 1 and 2 of the handout.* Some students may request extra resources to complete their handouts. Many states have state-specific disaster information readily available online. Here are some easy to access national sites for student-driven research:

- www.cdc.gov/disasters/index.html
- www.epa.gov/natural-disasters
- www.ready.gov/
- www.ready.gov/kids
- www.weather.gov

Provide multiple project options. As students are working on part 2 of the handout, distribute *Potential Project Options*. Explain that the handout will give additional ideas students can use over how to communicate with the stakeholder(s) and what those projects would require. Once students are finished with both parts of *Planning a hazard awareness project*, have students bring the handout to you. Review the handout with students and ask clarifying questions about any areas that seem to be lacking information or are incomplete.

*** SUPPORTING STUDENTS IN DEVELOPING AND USING STABILITY AND CHANGE**

While students work on obtaining information about a hazard, take this opportunity to support students in understanding what parts of the system are in place to protect communities while it is stable and what parts of the system are in place to detect and respond to sudden changes, such as the rapid onset of a natural hazard. In some hazards, communities have more time to prepare and respond. In other natural hazards, such as earthquakes, the

Approve an appropriate project format. Look specifically at the last 2 boxes on part 2 of *Planning a hazard awareness project* with students. Ask students what method they are going to use to present the information and why they are choosing that method. Help students determine if this method would be a reasonable method for communicating with their stakeholder group(s). The teacher reference, *Hazard Awareness Project Choice and Platform Information*, can be used to help students identify which communication platform or method would help them to best communicate their hazard information based upon their group strengths and classroom limitations. This reference can also be used to gain general information about different popular project platforms that may be used during this project by any student.

 **Provide students with information about how their project will be assessed.** Give students a copy of *Obtaining and Communicating Information about Natural Hazards*, which provides guidance on the important considerations for assessing their final product.

ASSESSMENT OPPORTUNITY

Building towards:

9.A Critically read scientific texts adapted for classroom use to obtain scientific and technical information related to likely locations and severity of a local hazard and response systems designed to protect communities from potential damage.

9.B Communicate scientific and technical information in writing and/or oral presentations about a system in place designed to prepare community members before a hazard happens, respond during a hazard, and recovery after the hazard.

Students are working on these two lesson-level performance expectations over the course of days 1-3.

What to look for/listen for:

- Ideas about obtaining information and communicating about hazards (the causes of the hazard, locations at risk, how to design solutions, and how to respond when it happens).
- Ideas about how effective communication and response plans account for the people living in their community and the resources the community has to respond.
- Ideas about how different communication strategies include educating the community before a natural hazard happens and then also alerting people when the hazard is happening with a variety of different modes of communication.

What to do: Use the Progress Tracker to help students recall ideas figured out from previous lessons and then apply those ideas to a new hazard and a new community. Use *Obtaining and Communicating Information about Natural Hazards* to help students understand the expectations for their final project.

Communicate Design Solutions (optional, but recommended). If time allows, it is recommended that students present their designs to one another. In this case, we recommend using guidance in *Peer Feedback Guidelines* in the student editions for students to provide feedback on one another's designs. There is teacher guidance for doing so in *Unknown material with identifier: nh.l9.tref* and also a handout, *Self-assessment: Giving and Receiving Feedback* that allows students to self-assess how well they give and receive feedback.

5 · EVALUATE OUR DQB QUESTIONS

10 min

MATERIALS: science notebook, 5 sticky dots

Gather at the DQB and mark questions that students think we have answered. Present slide K and have students place sticky dots on the class DQB next to the questions that they think we have made progress on.*

Look for patterns using the sticky dots. In the Scientists Circle, focus on the questions that have the most sticky dots.

Discuss as a class the questions the class can now answer. Present slide L if needed. Have the class discuss the answers to these questions as a group. If you have space, you might make a Take Aways board to record the answers the class comes up with.*

onset of the hazard is sudden with no warning. Depending on the hazard under investigation, students should consider how much time people have to prepare and respond with warning.

* ATTENDING TO EQUITY

Universal Design for Learning: Allowing students to choose the method (media) and platform (tools) in which they present allows for multiple means of *expression* and *communication*. Additionally, by analyzing the trusted methods of communication for other stakeholders, students are engaging in assessing the potential engagement, perceptions, and interests of others.

Platforms such as Clips allow for multiple languages and broader *expression* opportunities for ELLs. Different methods can allow for broader communication of the hazard plan in multiple formats.

* ATTENDING TO EQUITY

It is important to revisit the DQB to ensure students feel as though their questions are valued and recognized. While not all questions will have been addressed (it's more

ALTERNATE ACTIVITY

Another option is to have students work either individually or in pairs to answer the questions they posed. This can be done by asking them to write their questions on a sheet of paper and answer the questions in words and/or pictures. To help students feel like they made progress answering their own questions, create a focus on the questions that we have not answered, but now feel we could (or partially could) using the ideas we have developed.

As another option, some teachers may start a Wonder board, on which questions that have not yet been answered, but students are still interested in pursuing, are housed. These questions are available for students to pursue independently or as time allows.

Additional Lesson 9 Teacher Guidance

See *Potential Accompanying Standards* for a complete list of connections to ELA, Mathematics, and Technology standards.

likely that most will be at least partially answered), this helps students see that they have done hard work to help answer many of their own questions.

* SUPPORTING STUDENTS IN ENGAGING IN ASKING QUESTIONS AND DEFINING PROBLEMS

Revisiting the DQB at the end of the unit helps students see the progress they have made toward answering the questions that were important to them at the onset of the unit. At that time, students asked questions “that required sufficient and appropriate evidence to answer”. Through investigations and individual and whole-group sensemaking, they can now answer many of their initial questions. This final visit to the DQB also allows students to see how their work toward a shared learning goal can help them figure out the phenomenon and also explain other phenomena in the world.