Louisiana Believes

Distance Learning Support for OpenSciEd Grade 8
Unit 6.5 Natural Hazards Field Test Unit

This resource is designed to support teachers in implementing distance learning for OpenSciEd Unit 6.5 Natural Hazards Field Test Unit, Unit 3 on the Louisiana Guide to Piloting OpenSciEd Grade 8. It is intended as a supporting document and should be used in conjunction with the OpenSciEd Unit 6.5 Natural Hazards Instructional Resources. The resources contained in this document have been adapted from OpenSciEd with permission under Creative Commons 4.0 licensing.

The OpenSciEd Remote Learning Resources linked below contain detailed information about adapting specific routines to a remote learning environment and a wide variety of options including those for students who do not have internet access:

- Fostering Productive Norms
- Anchor Phenomenon Routine
- Navigation Routine
- Supporting Discourse
- Problematizing Routine

This guidance document is considered a "living" document as we believe that teachers and other educators will find ways to improve the document as they use it. Please send feedback to STEM@la.gov so that we may use your input when updating this guide.

Updated August 31, 2020

DEPARTMENT of EDUCATION
Louisiana Believes

Norming Language	
Term	**Description**
Virtual Class Pre-Work	Assignments that students should do prior to virtual class meetings in order to be prepared to engage in discussions, there may be multiple assignments throughout a given lesson
Virtual Class Post-Work	Assignments designed for students to apply learning from virtual class meetings, there may be multiple assignments throughout a given lesson
Virtual Class	Live sessions with students through any digital conferencing platform, teachers may choose to allow students without internet to call in during these sessions and record virtual class sessions to share with those who cannot join
Thinking Deeper Documents	Progress trackers for students to use throughout each lesson to record and revise their thinking about science concepts related to the phenomenon; contain assignments for students to complete before, during, and after virtual classes, discussion boards, and home investigations
Lesson Slideshows	Lesson progression specific to each lesson used to guide student work; used during pre-work, post-work, virtual classes, home investigations, and discussion boards; can be shared with students in their entirety at the beginning of the lesson or broken into small portions and shared as needed
Discussion Boards	Assignments designed for students to share ideas and engage in discussion with one another over time rather than a live environment; students will use their Thinking Deeper Documents to brainstorm prior to submitting; teachers may choose to allow students without internet to text in responses and may screenshot/download and share portions of or full discussions via text (ex. through apps like Remind)
Home Investigations	Investigations with readily available materials designed for students to perform at home; teachers may choose to substitute videos or photos of data collection for students who cannot complete investigations at home

Lesson Set Overview: Lessons 1, 2, 3, 4, 5, 6, 7, 8, 9

Lesson Set 1: Lessons 1-9		
Provided Resources Students Will Need	**Additional Resources Students Will Need**	**Additional Materials for Students Without Internet Access**
Lesson Slideshows for each lesson: L1, L2, L3, L4, L5, L6, L7, L8, L9 **Thinking Deeper Documents for each lesson:** Lesson 1 TDD, Lesson 2 TDD, Lesson 3 TDD, Lesson 5 TDD, Lesson 6 TDD, Lesson 7 TDD, Lesson 8 TDD, Lesson 9 TDD **Additional Documents:** Lesson 4 End of lesson assessment (Lesson 4) Engineering Self-Assessment (Lesson 8) Planning A Hazard Awareness Project (Lesson 9) Natural Hazards Around The World (Lesson 9) Optional: Parent Letter	Lesson 1: • Related Phenomena Discussion Board - *teacher made* • Driving Question Board - *after completion* Lesson 2: • Comparing Data Discussion Board - *teacher made* Lesson 6: • Navigation Discussion Board - *teacher made* Lesson 8: • Tsunami System Consensus Model - *teacher created* • Exit Ticket - *teacher created* • System Components Discussion Board - *teacher created*	**Prior to Lesson**: Lesson 2 • Tsunamis Last 100 years (take screenshot images to send to students), Earthquakes vs tsunamis (take screenshot images to send to students), Connecting Earthquakes and tsunamis (take screenshot images to send to students) Lesson 3: • Foil pan demonstration, NOAA Tsunami Data, Mini Wave, Tsunami Wave Visualization Lesson 5: • Fisherman video, Engineer video Lesson 7: • Warning signals Lesson 9: • Relevant screenshots from the following websites: www.cdc.gov/disasters/index.html, www.epa.gov/natural-disasters, www.ready.gov/, www.ready.gov/kids, www.weather.gov **After Lesson Completion:** Virtual Class recordings (Lessons 1, 2, 3, 5, 7, 8, 9) Discussion Boards (Lessons 1, 2, 6, 8)

Students should ideally join VIRTUAL CLASS on the following days:

Day 1 & 3 - Lesson 1	Day 5 - Lesson 2	Day 7 - Lesson 3	Day 8 – Lesson 4
Day 10 - Lesson 5	Day 13 - Lesson 7	Day 15 - Lesson 8	Day 17 - Lesson 9

Formative and Summative Assessment Opportunities:

Lesson 2: Comparing Data Discussion Board *(teacher made)*
Lesson 4: End of lesson 4 assessment
Lesson 5: Progress Tracker on TDD
Lesson 7: Progress Tracker on TDD
Lesson 8: Exit Ticket *(teacher made)* & Engineering Self-Assessment
Lesson 9: Planning A Hazard Awareness Project

Lesson 1 (3 days) - Anchoring Phenomenon

In this **Lesson**, students will need the following materials to appropriately engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Related Phenomena Discussion Board - *teacher made*
- Driving Question Board - *after completion*

In this **Lesson**, students who don't have home internet need the following print-outs or files to best engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Tsunami Videos - These are linked on the teacher site; so, students can be provided access within the Virtual Class recording
- Driving Question Board - *after completion*
- Related Phenomena Discussion Board - *teacher made*
- Discussion Board - *after completion*
- Virtual Class Recordings - *after completion*

In this **Lesson**, students should join virtual classes on the following days to engage in learning:

- Days 1 & 3

Lesson 1 (3 days) - Anchoring Phenomenon

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Parts 1-4 (45 min) INTRODUCE THE TSUNAMI PHENOMENON TSUNAMI VIDEOS INITIAL ENGINEERING IDEAS SHARE INITIAL IDEAS AND NAVIGATION Slides A-I	Prior to Virtual Class, the teacher should: 1. Share Lesson Slideshow with students 2. Share Thinking Deeper Document with students VIRTUAL CLASS: 1. Introduce the tsunami phenomenon with a brief reading and a few photographs. Annotate article and record notices and wonders on TDD. 2. Record locations of Japan and Indonesia on the World Map. 3. View Tsunami Videos (Screen share for the Lesson 1 videos at the bottom of the page) and record notices and wonders in TDD. 4. Share and discuss notices and wonders for the reading and the videos 5. Brainstorm ideas around detecting, warning, and reducing damage due to tsunami. 6. Identify 1 or 2 of ideas and describe them in detail on the TDD. 7. Draw or write about how this technology or design would work to detect, warn people, and/or reduce damage. 8. Through a series of discussions, students share one developed engineering idea to detect, warn, or reduce the damage caused by a tsunami. Record other student ideas on the middle column of the Share Designs table on the TDD.	

Day 2		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 5 (20 min) EVALUATING INITIAL ENGINEERING IDEAS Slides J		VIRTUAL CLASS POST-WORK: 1. Identify ideas that show promise or may be challenging to implement and fill in part 4 of TDD.
Part 6 (8 min) NAVIGATE TO RELATED PHENOMENA Slides K		VIRTUAL CLASS POST-WORK: 1. Students create a list of related phenomena on part 5 of TDD connecting the anchoring phenomenon to local natural hazards and begin thinking about how we might design and evaluate engineering solutions for natural hazards in general.
Part 7 (10 min) DISCUSS RELATED PHENOMENA Slides L	1. Create and assign a discussion board for students to share ideas about related phenomena. 2. Read student responses and comment where needed.	DISCUSSION BOARD: 1. Share ideas about related phenomena on the discussion board. 2. Read other responses and comment on two classmates' examples.
Part 8 (5 min) ASSIGN HOME LEARNING Slides M		VIRTUAL CLASS POST-WORK: 1. Students to talk with family and friends to learn more about their family's experience and knowledge around natural hazards 2. Students record discussions on TDD.

Day 3		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Parts 9-13 (50 min) NAVIGATION TO STUDYING NATURAL HAZARDS STUDYING NATURAL HAZARDS AND DESIGNING SOLUTIONS DEVELOP QUESTIONS FOR THE DRIVING QUESTION BOARD DEVELOP THE DRIVING QUESTION BOARD BRAINSTORM IDEAS FOR DATA AND INFORMATION NEEDED Slides N-S	VIRTUAL CLASS: 1. Students take time to share their home learning with a partner or group (in break-out rooms) or as a whole class. 2. Revisit related phenomena to generate ideas for how we might study natural hazards and design solutions. Students make notes on the TDD during discussion. 3. Develop questions for the Driving Question Board about the Japanese 2011 tsunami, related phenomena, and ways to reduce the impacts of these hazards 4. Share their questions and organize the questions into categories to build our DQB. (This can be done electronically with a platform like Google Jamboard.) 5. As a class, create an “Ideas for Data and Information We Need” poster and record the class’ thoughts on how to figure out the answers to our initial questions as we move forward.	

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Lesson 2 (2 days) - Investigation

In this **Lesson**, students will need the following materials to appropriately engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Comparing Data Discussion Board - *teacher made*

In this **Lesson**, students who don't have home internet need the following print-outs or files to best engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Tsunamis Last 100 years (take screenshot images to send to students)
- Earthquakes vs tsunamis (take screenshot images to send to students
- Connecting Earthquakes and tsunamis (take screenshot images to send to students)
- Comparing Data Discussion Board - *teacher made*
- Discussion Board - *after completion*
- Virtual Class Recording - *after completion*

In this **Lesson**, students should join virtual classes on the following days to engage in learning:

- Day 2

Lesson 2 (2 days) - Investigation

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 1 (10 min) NAVIGATION AND PREDICTION Slides A	1. Share Lesson Slideshow with students 2. Share Thinking Deeper Document with students	VIRTUAL CLASS PRE-WORK: 1. Think about where tsunamis happen 2. Make predictions and record them on the map.
Part 2 (15min) INVESTIGATING TSUNAMIS PATTERNS Slides B-D		VIRTUAL CLASS PRE-WORK: 1. Analyze the occurrences and causes of global tsunamis for the last one hundred years. 2. Fill in chart, answer questions, and revise predictions on TDD
Part 3 (10 min) COMPARE EARTHQUAKE DATA TO TSUNAMI DATA Slides E-F	1. Create and assign a discussion board for students to share patterns in the data for earthquakes and tsunami-generating earthquakes. 2. Monitor student responses and facilitate discussion as needed.	DISCUSSION BOARD: 1. Using a swipe map, compare all recent earthquake data to tsunami-generating earthquakes. 2. Fill in part 2 of the table and post on the discussion board. 3. Read patterns shared by other students and record 2 patterns noticed that were different.
Part 4 (5 min) EXIT TICKET Slides G		VIRTUAL CLASS PRE-WORK: 1. Explain why certain earthquakes cause tsunamis, but others do not.

Day 2		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Parts 5-10 (45 min) NAVIGATION EXPLORING TSUNAMIS MORE CLOSELY SHARE CONNECTIONS BETWEEN EARTHQUAKES AND TSUNAMIS UPDATE PREDICTIONS WITH NEW INFORMATION PROGRESS TRACKER PROBLEMATIZE THE CONNECTION TO EARTHQUAKES Slides H-K	VIRTUAL CLASS: 1. Share initial ideas about how some earthquakes are related to tsunamis, but not all earthquakes. 2. Class discussion of predictions, revised predictions, and new questions. 3. View https://arcg.is/OfnLC as a class. Discuss what the size and color of the circles mean on the maps. 4. Students independently explore the maps and fill in the data table in their TDD. 5. Come to agreement about what types of earthquakes are associated with tsunami risk and then refine predictions of where tsunamis happen 6. Come to agreement about what types of earthquakes are associated with tsunami risk and then refine predictions of where tsunamis happen 7. Refer back to the map and label what we know now with a different color. 8. Track the ideas figured out and how they can be applied to protect communities. 9. Use the cause and effect relationship to problematize how it is that an earthquake can cause a tsunami to form. Students make notes on TDD during discussion. 10. Assign Home Learning.	

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Lesson 3 (2 days) - Investigation

In this **Lesson**, students will need the following materials to appropriately engage in learning:

- Lesson Slideshow
- Thinking Deeper Document

In this **Lesson**, students who don't have home internet need the following print-outs or files to best engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Foil pan demonstration
- NOAA Tsunami Data
- Mini Wave
- Tsunami Wave Visualization

In this **Lesson**, students should join virtual classes on the following days to engage in learning:

- Day 2

Lesson 3 (2 days) - Investigation

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 1 (3 min) NAVIGATION Slide A	1. Share Lesson Slideshow with students 2. Share Thinking Deeper Document with students	VIRTUAL CLASS PRE-WORK: 1. Answer navigation questions about how an underwater earthquake could result in a tsunami.
Part 2 (12 min) FOIL PAN DEMONSTRATION Slide B		VIRTUAL CLASS PRE-WORK: 1. Watch how water behaves in a pan when the bottom of the pan is moved abruptly (Foil pan demonstration) 2. Record notices and wonders on the chart and answer reflection questions.
Part 3 (10 min) MAP THE MODEL IN DEMO TO THE REAL WORLD Slide C		VIRTUAL CLASS PRE-WORK: 1. Use a mapping tool to analyze how parts of the demonstration could represent similar parts in the real world.
Part 4 (15 min) ANALYZE NOAA TSUNAMI DATA Slides D		VIRTUAL CLASS PRE-WORK: 1. Watch a computer-generated model based on data collected about the Japan tsunami to see how the water in the Pacific Ocean behaves (NOAA Tsunami Data 2. Record notice and wonders.

Part 5 (5 min) NAVIGATION Slides E		VIRTUAL CLASS PRE-WORK: 1. Reflect on what has been figured out so far about how water behaves when disturbed from below.

Day 2		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Parts 6 (50 min) NAVIGATION MINI WAVE TANK MAPPING PARTS OF THE MODEL TO THE REAL WORLD PHENOMENON COMPUTER VISUALIZATION OF A TSUNAMI WAVE NAVIGATION Slides F-K	VIRTUAL CLASS: 1. Reflect on and discuss what we know so far about how an earthquake causes a tsunami and what we still want to figure out. 2. Watch how water moves in a mini wave tank where the depth changes (Mini Wave) and record notice/wonders in chart on TDD 3. Share and discuss notices and wonders. 4. Use the mapping tool to evaluate the appropriateness of the mini wave tank model for representing the real world. Take notes on TDD during discussion. 5. Watch a computer-generated model that visualizes data showing how the water behaves after an earthquake occurs underneath the ocean. (Tsunami Wave Visualization) 6. Record notices and wonders on the chart, then share and discuss. 7. Brainstorm how the four wave models can help us explain how a tsunami forms, discuss how each model helped and what limitations they each had. Record ideas on TDD during discussion. 8. Assign vocabulary post-work. VIRTUAL CLASS POST-WORK: 1. Define three vocabulary terms and give examples from the videos for each.	

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Lesson 4 (1 day) - Putting Pieces Together

In this **Lesson**, students will need the following materials to appropriately engage in learning:

- Lesson Slideshow
- Thinking Deeper Documents from Lessons 1-3 – *completed*
- Driving Question Board
- End of Lesson 4 Assessment

In this **Lesson**, students who don't have home internet need the following print-outs or files to best engage in learning:

- Lesson Slideshow
- Thinking Deeper Documents from Lessons 1-3 - *completed*
- Driving Question Board
- End of Lesson 4 Assessment

In this **Lesson**, students should join virtual classes on the following days to engage in learning:

- Day 1

Lesson 4 (1 day) - Putting Pieces Together

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Parts 1-3 (25 min) NAVIGATION REVISIT THE DRIVING QUESTION BOARD NAVIGATION Slides A-F	Prior to Virtual Class, the teacher should: 1. Share Lesson Slideshow with students 2. Ensure that students have access to the Driving Question Board 3. Remind students that they will need their Thinking Deeper Documents from the previous Lessons VIRTUAL CLASS: 1. Discuss what we have figured out about how tsunamis form, where tsunamis tend to occur, and how tsunamis impact people and structures in a community. 2. Revisit the Driving Question Board and determine which questions students are able to answer. 3. Discuss each question students feel they are able to answer. 4. Revisit initial ideas and designs from Lesson 1 for detecting, warning, and reducing damage caused by a tsunami. Motivate the need to evaluate existing solutions. 5. Assign Assessment for students to complete as post-work.	
Part 4 (20 min) END OF LESSON ASSESSMENT Slides G	1. Assign End of Lesson 4 Assessment	VIRTUAL CLASS POST-WORK: 1. Complete end of lesson assessment and submit

Return to Lesson Set Overview

Lesson 5 (3 days) - Investigation

In this **Lesson**, students will need the following materials to appropriately engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Lesson 1 Thinking Deeper Document - *completed*

In this **Lesson**, students who don't have home internet need the following print-outs or files to best engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Lesson 1 Thinking Deeper Document – *completed*
- Fisherman video
- Engineer video

In this **Lesson**, students should join virtual classes on the following days to engage in learning:

- Day 2

Lesson 5 (3 days) - Investigation

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 1 (4 min) REVISIT STUDENT-CREATED DESIGNS Slide A	1. Share Lesson Slideshow with students 2. Share Thinking Deeper Document with students	VIRTUAL CLASS PRE-WORK: 1. Review initial design ideas from the anchoring phenomenon. 2. Note similarities and consider additional data needed for designs
Part 2 (8 min) LEARN ABOUT THE RYOISHI SEAWALL Slides B, C		VIRTUAL CLASS PRE-WORK: 1. Read a case study about Ryoishi, Japan and listen to a resident's story. 2. Answer questions about why residents rebuilt the city in the same area affected by the 1930s tsunami and what caused the seawall to fail.
Part 3 (10 min) DETERMINE RYOISHI'S PROBLEM AND CRITERIA Slide D		VIRTUAL CLASS PRE-WORK: 1. Use the Ryoishi case study to determine the problem we are trying to solve and the criteria for a design solution.
Part 4 (15 min) INTRODUCE VIDEO AND EVALUATE AGAINST CRITERIA Slides E-G		VIRTUAL CLASS PRE-WORK: 1. Introduce a video of an engineer testing common tsunami designs solutions and answer questions to evaluate where the information is coming from. 2. Brainstorm about criteria for evaluating designs. 3. Watch the video and keep track of data gathered by the engineer by filling in the table.

Part 5 (8 min) DETERMINE A RATING SCALE AND NEED FOR MORE INFORMATION Slides H-I		VIRTUAL CLASS PRE-WORK: 1. Reflect on how we might evaluate design solutions and things we need to consider when making a decision about what solution is beat for Ryoishi.

Day 2		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Parts 6-12 (45 min) SURFACE IDEAS FOR ADDITIONAL CONSIDERATIONS IDENTIFY CONSTRAINTS OF DESIGN SOLUTIONS READ ABOUT DESIGN SOLUTIONS REVISIT LIST OF CRITERIA AND CONSTRAINTS RANK DESIGN SOLUTIONS INTRODUCE DECISION MATRIX MAKE AN INITIAL DECISION Slides J-R	VIRTUAL CLASS: 1. Class discussion of what happened in Ryoishi, what the engineer was trying to do, and additional design considerations. 2. Revisit the criteria students came up with in Part 2 on the TDD. Share and discuss. 3. Identify constraints on which design solutions might work for Ryoishi and students fill in their table on the TDD. 4. Read about design solutions and their criteria and constraint rating. 5. Discuss example criteria 6. Revisit criteria and consider how to assess which design solutions make sense. 7. Make any needed changes to the criteria and constraints tables in parts 2 & 4 on TDD 8. Rank the design solutions using a ranking page based upon how well they meet each criteria and constraint 9. Read card about solution and rank on Tsunami Solutions Ranking page in TDD 10. Introduce the decision matrix to better organize and compare design solutions based upon how well they meet the criteria and constraints. Use the matrix to reorganize useful information. 11. Read the solution cards 12. Rank on the Decision Matrix on TDD 13. Hi-Lite one the way out the door to show which design students think would work best.	

Day 3		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 13 (18 min) BEGIN CONSENSUS BUILDING Slide S		VIRTUAL CLASS POST-WORK: 1. Answer questions to determine which solution best fits the needs of Ryoishi. Determine that the solution is dependent upon prioritized criteria and trade-offs have to be made for each solution
Part 14 (10 min) DETERMINE CRITERIA AND CONSTRAINTS VALUED BY RYOISHI Slide T		VIRTUAL CLASS POST-WORK: 1. Read about Ryoishi and Kamaishi to determine priority criteria for Ryoishi. 2. Designate primary and secondary criteria and re-evaluate design solutions using these ideas
Part 15 (5 min) REFINE DESIGN CHOICES AS A CLASS Slide U		VIRTUAL CLASS POST-WORK: 1. Determine that the answer is still not clear, but has been narrowed down. 2. Compare the process to the decisions of actual engineers.
Part 16 (5 min) REFLECT ON BENEFITS OF USING A MATRIX Slide V		VIRTUAL CLASS POST-WORK: 1. Consider how the matrix has helped you refine decisions about which solutions might work best. 2. Answer questions on TDD.

Part 17 (5 min) UPDATE PROGRESS TRACKER Slide W	1. Review submitted responses from students and provide feedback as needed. (Option to create a separate assignment rather than having students turn in their TDD.)	VIRTUAL CLASS POST-WORK: 1. Update Progress Tracker with what we learned about design criteria considerations in TDD. 2. Submit to the teacher.
Part 18 (2 min) DETERMINE NEXT STEPS Slide X		1. Brainstorm about what to do when design solutions fail and revisit design ideas from Lesson 1.

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Lesson 6 (1 day) - Investigation

In this **Lesson**, students will need the following materials to appropriately engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Navigation Discussion Board - *teacher made*

In this **Lesson**, students who don't have home internet need the following print-outs or files to best engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Navigation Discussion Board - *teacher made*
- Discussion Board - *after completion*

In this **Lesson**, students should join virtual classes on the following days to engage in learning:

- None

Lesson 6 (1 day) - Investigation

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 1 (5 min) NAVIGATION Slide A	1. Share Lesson Slideshow with students 2. Share Thinking Deeper Document with students	VIRTUAL CLASS PRE-WORK: 1. Students recall why tsunami plans sometimes do not involve building large scale structures such as sea walls or breakwaters.
Part 2 (25 min) CLOSE READING ON HOW TSUNAMIS ARE DETECTED AND WARNING SIGNALS SENT Slide B		VIRTUAL CLASS PRE-WORK: 1. Read about how one system designed to detect tsunamis and send warnings works. 2. Complete Close Reading Activity
Part 3 (8 min) SUMMARIZE IDEAS FROM THE READING Slide C		VIRTUAL CLASS PRE-WORK: 1. Students summarize ideas from the reading in order to identify the criteria for a tsunami detection system by answering questions.
Part 4 (5 min) UPDATE OUR PROGRESS TRACKER Slide D		VIRTUAL CLASS PRE-WORK: 1. Update our Progress Tracker with what we have figured out about how tsunami detection and warning systems work.

Part 5 (2 min) NAVIGATION Slides E	1. Send out discussion board question to students. 2. Monitor responses.	DISCUSSION BOARD: 1. Wonder about what happens once a tsunami is accurately predicted to reach land. How is a tsunami warning communicated? 2. Respond to questions on the discussion board. 3. Write two different responses posted by other classmates on your TDD.

Return to Lesson Set Overview

Lesson 7 (2 days) - Investigation

In this **Lesson**, students will need the following materials to appropriately engage in learning:

- Lesson Slideshow
- Thinking Deeper Document

In this **Lesson**, students who don't have home internet need the following print-outs or files to best engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Virtual Class Recording - *after completion*

In this **Lesson**, students should join virtual classes on the following days to engage in learning:

- Day 1

Lesson 7 (2 days) - Investigation

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Parts 1-5 (40 min) WHEN AN WARNING SIGNAL IS SENT READ STORIES FROM JAPAN IDENTIFY COMMUNITY STAKEHOLDERS IDENTIFY CRITERIA AND CONSTRAINTS FOR COMMUNICATION SYSTEMS HOME LEARNING Slides A-G	Prior to the Virtual Class meeting, the teacher should: 1. Share Lesson Slideshow with students 2. Share Thinking Deeper Document with students VIRTUAL CLASS: 1. Listen to real tsunami warning signals. 2. Record notices and wonders on the chart and share out. 3. Read quotes and stories from survivors of the Japanese tsunami about how they felt when the earthquake struck and tsunami warning signals were sent. 4. Using stories from the community residents of Japan, students identify stakeholders and their needs. 5. Fill in Identify Community Stakeholders Part 1 & Part 2 on TDD and discuss as a class. 6. Identify one criterion and constraint for communication systems designed to warn people of a hazard in Part 3 as a class. 7. Students brainstorm additional criteria and constraints independently using the reflections questions on Slide F. (Fill in the rest of each table.) 8. Discuss additional criteria and constraints. Students revise or add to their lists during the discussion. 9. Assign home learning for students to notice all the ways they receive communication outside of school	

Day 2		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 7 (20 min) CASE STUDIES: COMMUNICATION OPTIONS Slides H-I		VIRTUAL CLASS POST-WORK: 1. Evaluate different communication options by rating criteria and listing constraints. 2. Consider the importance of having multiple modes of communication.
Part 8 (12 min) CASE STUDY: KAMAISHI SCHOOL Slides J		VIRTUAL CLASS POST-WORK: 1. Evaluate the value of having a preparedness plan in place when a natural hazard occurs. 2. Use the Close Reading Activity to analyze the Kamaishi Junior High Case Study.
Part 9 (5 min) UPDATE PROGRESS TRACKER Slides K	Option to create an assignment or have students submit their TDD for teacher feedback.	VIRTUAL CLASS POST-WORK: 1. Update Progress Tracker to include new ideas.
Part 10 (3 min) NAVIGATION Slides L		VIRTUAL CLASS POST-WORK: 1. Motivate the need to take stock in all the different systems to protect communities from tsunamis

Return to Lesson Set Overview

Lesson 8 (2 days) - Putting Pieces Together

In this **Lesson**, students will need the following materials to appropriately engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Tsunami System Consensus Model - *teacher created*
- Exit Ticket - *teacher created*
- System Components Discussion Board - *teacher created*
- Engineering Self-Assessment

In this **Lesson**, students who don't have home internet need the following print-outs or files to best engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Tsunami System Consensus Model - *teacher created*
- Exit Ticket - *teacher created*
- System Components Discussion Board - *teacher created*
- Discussion Board - *after completion*
- Engineering Self-Assessment

In this **Lesson**, students should join virtual classes on the following days to engage in learning:

- Day 1

Lesson 8 (2 days) - Putting Pieces Together

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Parts 1-5 (45 min) LOOK BACK AT SYSTEM COMPONENTS CREATE AN INITIAL TSUNAMI PROTECTION SYSTEM MODEL COMPARE TSUNAMI SYSTEMS MODELS CREATE TSUNAMI SYSTEM CONSENSUS MODEL EXIT TICKET Slides A- F	Prior to the Virtual Class meeting, the teacher should: 1. Share Lesson Slideshow & Thinking Deeper Document with students 3. Determine how students will share their completed models and come up with a plan to be implemented in class. (Will they be allowed to screen share? Should they do them on paper and hold them up? Will they take a screenshot and drop it into a shared document?) 4. Create the Exit Ticket assignment and ensure students will be able to access it at the end of class. VIRTUAL CLASS: 1. Class discussion about parts of the tsunami system that have been identified. 2. Fill in a chart and organize the parts of the system on TDD. 3. Using system components from the chart, construct a tsunami protection system model, including subsystem interactions. 4. Share models with the class and discuss the way systems and subsystems are connected as well as similarities and differences among models. (questions on Slide D will guide analysis of models and discussion) 5. As a class develop a systems model of tsunami detection/warning signals, damage reduction, and communication/preparedness. 6. Transfer the components of each subsystem into a consensus model to show how the subsystems interact across a larger more complex system. (Teacher draw consensus model and post to class for student reference) 7. Assign Exit Ticket. VIRTUAL CLASS POST-WORK: 1. Complete an exit ticket considering the role of each component in the system and submit it to the teacher. (Teacher should review student responses and provide feedback as needed.)	

Day 2		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 6 (14 min) ANALYZE SYSTEM AND SUBSYSTEM COMPONENTS Slides G, H		VIRTUAL CLASS POST-WORK/DISCUSSION BOARD: 1. Determine how the subsystem components interact to meet the overall criteria of the system.
Part 7 (12 min) CREATE WHAT WE DO AS ENGINEERS CHART Slides I		VIRTUAL CLASS POST-WORK: 1. Create a process diagram on TDD to illustrate how the class used engineering ideas and practices to evaluate parts of the system.
Part 8 (14 min) CONDUCT ENGINEERING SELF ASSESSMENT Slide J	1. Assign Engineering Self-Assessment to students 2. Review assessments.	VIRTUAL CLASS POST-WORK: 1. Complete Engineering Self-Assessment and submit to the teacher.
Part 9 (5 min) LOOK BACK AT LESSON 1 HAZARDS Slides K		VIRTUAL CLASS POST-WORK: 1. Look back at hazards from Lesson 1 and determine what students can do to help with natural disasters.

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Lesson 9 (1 days) - Putting Pieces Together

In this **Lesson**, students will need the following materials to appropriately engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Planning A Hazard Awareness Project
- Natural Hazards Around The World
- Additional websites: www.cdc.gov/disasters/index.html; www.epa.gov/natural-disasters; www.ready.gov/; www.ready.gov/kids; www.weather.gov

In this **Lesson**, students who don't have home internet need the following print-outs or files to best engage in learning:

- Lesson Slideshow
- Thinking Deeper Document
- Planning A Hazard Awareness Project
- Natural Hazards Around The World
- Relevant Screenshots from Additional websites: www.cdc.gov/disasters/index.html; www.epa.gov/natural-disasters; www.ready.gov/; www.ready.gov/kids; www.weather.gov

In this **Lesson**, students should join virtual classes on the following days to engage in learning:

- Day 1

Lesson 9 (1 days) - Putting Pieces Together

Day 1		
Lesson Components	**Distance Learning Plan**	
	Teacher	**Student**
Part 1 (50 min) REVISIT RELATED PHENOMENA POSTER CONSIDER SCIENCE IDEAS AND COMMUNITY NEEDS DETERMINE HAZARD INFORMATION AND COMMUNICATION PLAN BEGIN NATURAL HAZARDS AWARENESS PROJECT EVALUATE OUR DQB QUESTIONS Slides A-K	Prior to the Virtual Class meeting, the teacher should: 1. Share Lesson Slideshow & Thinking Deeper Document with students 3. Determine timeline for project completion, group assignments, and plan for groups to interact during or after virtual class (break-out rooms, shared documents, etc.). VIRTUAL CLASS: 1. Discuss questions from the post-work in Lesson 8 examining related phenomena from Lesson 1. 2. Discuss relevant science ideas for the Tsunami system and their relationship to other hazards. 3. Consider the local community needs for preparing and responding to a natural hazard by answering questions on Slide C in the TDD, then discussing as a whole class. 4. Use Planning A Hazard Awareness Project to organize relevant information about the selected natural hazard and develop a plan to communicate appropriately and effectively with the selected stakeholder group. 5. Develop a project to effectively communicate natural hazard information to selected community stakeholder groups: Natural Hazards Around The World. 6. Review available resources for the project including additional websites linked on Slide I. 7. Students complete Parts 1 & 2 of the project with their group and get teacher approval for their project type. (Option to have students complete this as post-work with a due date for teacher approval if working in groups is not an option during virtual class.) 8. Assign timeline for project completion. 9. Look back at our DQB and place discuss questions we think we have made progress on. VIRTUAL CLASS POST-WORK: 1. Students complete their project with teams and submit. Teacher uses the rubric on the TDD to grade.	

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