UTAH OFFICE OF
ENERGY DEVELOPMENT

Energy and Earthquakes

Grade/Subject: 5th Grade

Strand/Standard 5.1.5 Design solutions to reduce the effects of naturally occurring events that impact humans. Define the problem, identify criteria and constraints, develop possible solutions using models, analyze data from testing solutions, and propose modifications for optimizing a solution. Emphasize that humans cannot eliminate natural hazards, but they can take steps to reduce their impacts. Examples of events could include landslides, earthquakes, tsunamis, blizzards, or volcanic eruptions. (ESS3.B, ETS1.A, ETS1.B, ETS1.C)

Lesson Performance Expectations:

- Students will discover the effect of earthquake waves on homes and buried tanks (water, gasoline, oil).
- Students will design a plan for cooking, transportation and heating if typical energy sources are unavailable after an earthquake.

Materials:

- Sand
- Soft plastic container (yogurt, cottage cheese)
- Water
- Small plastic objects (Lego, toy parts)

Time: 50 minutes

Teacher Background Information: Earthquake waves are destructive to communities in a variety of ways. Damage to buildings is the most obvious but movement underground, especially in water-saturated soils or clays, increases the damage and may cause buried objects to rise to the surface. This can disrupt energy delivery/transportation sources: pipes, tanks, wires and roads. People can be prepared for the loss of electricity or natural gas by planning ahead. Impacts can be reduced by avoiding building on water-logged soils and having alternative energy sources.

Student Background Knowledge: Students may have been in an earthquake and should be encouraged to talk about their experience with the class. A similar experience may be a time when the electricity went out (windstorm, snow), and students had to turn to alternative energy sources.

Teacher Directions: A standards-based lesson engages students' curiosity, interest and motivation to learn more. Time and space for the students to experience the phenomenon and ask questions is essential. The student sheet provided below provides guidance but is only one example of how students might respond.

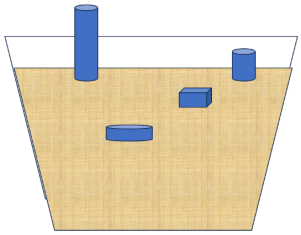
1. Phenomenon: Ask students if they have ever experienced an earthquake. Allow them to share their experience with the class. Show this short video or one like it showing how a room behaves during an earthquake:

https://www.youtube.com/watch?v=fMWAtB5JVAw

2. Use the student sheet for directions to help the students model an earthquake. Each student group will need a coarse grain sand saturated with water. They need to bury some objects and have some stand up above the surface.
3. Ask them to gently shake their model side to side or tap the sides and watch the objects and report what they do on their student sheet.
4. The short reading will introduce the second part. Students can use background knowledge and ideas from the list to fill out the table. This activity should be done as a group and a display can be created by each group with their ideas.
5. Each group lists two alternative sources of energy that could be installed in their home and describes what one of them might look like (solar, wind, geothermal).

Assessment of Student Learning.

Use the drawing of buildings and tanks buried in wet soil to answer these two questions.



1. What will happen to the buildings on the surface of this model when it is shaken? Choose all that apply.

A. They will rise.
B. They will tilt.*
C. They will sink.*
D. They will be unchanged.

2. What effect will the earthquake have on buried tanks? Choose all that apply.

A. They may rupture.*
B. They will sink deeper.
C. They may empty their contents.*
D. They may rise to the surface.*

3. What equipment should a household have in storage in case the lights go out after an earthquake? Choose all that apply.

A. Candle
B. Flashlight*
C. Space heater
D. Safety blanket

4. Which calls should be made after an earthquake on a cell phone?

A. To friends to compare experiences.
B. To family members to help them get home.*
C. To the police to report the earthquake.
D. To medical personnel to get medical help.*

5. If the gas to the furnace is turned off, how can you safely stay warm?

A. Wear more clothing and coats*.
B. Fix the furnace using the instruction manual.
C. Check the internet to see which things might burn.
D. Light a fire in an outdoor fireplace.*

Extension of lesson and Career Connections: Additional information can be found at: https://extension.okstate.edu/programs/emergency-and-disaster-preparedness/earthquakes/checking-utilities-in-the-aftermath-of-an-earthquake.html

Title: Energy and Earthquakes

Name_____

Phenomenon:
Listen as your classmates describe their experience in an earthquake. Watch the video to see live pictures of the effect of earthquake waves moving through the ground and buildings.

What questions do you have?
1.

2.

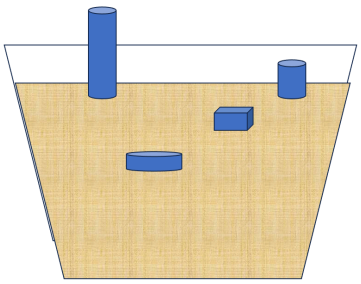
Part 1: Make a model of the effect of an earthquake on buildings and buried tanks (water, oil, gasoline).

Materials:

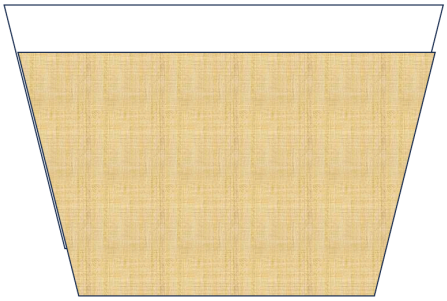
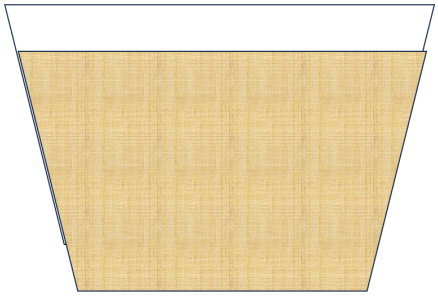
- Sand
- Soft plastic container (yogurt, cottage cheese)
- Water
- Small plastic objects (Lego, toy parts)

Directions: **I don't think I have any suggestions for this lesson. It was very straightforward and simple to follow. My students were very engaged and had good discussions based on what they saw from their models.**

1. Fill the plastic container about ¾ full of sand. Add water until the sand is wet but not over the top of the sand.
2. Place plastic items on the surface (make some tall and some short) and bury a couple of them.

i. 

3. Gently shake the container from side to side to model an earthquake. Shake slowly at first then faster.
4. Write down and draw what happens:

Start:  Finish: 

Part 2: Planning the next steps after an earthquake.

The list below will provide you with some good suggestions for protecting yourself and those around you.

1. Think before moving! Remain in a safe position until the shaking stops. Move slowly and carefully.
2. Move slowly. Evacuate your building with caution. Use alternate routes if necessary.
3. Meet your family outside in a pre-designated spot away from buildings that may be dangerous.
4. Wear shoes to protect your feet from broken glass and objects that have fallen.
5. Use a flashlight, not a candle. Sparks, open flames, gas lanterns, or cigarettes may cause a fire or explosion if there is a gas leak. Turn off gas to the home heating.
6. Check water supply, food storage, and first aid supplies.
7. Do not attempt to drive. Leave roads clear for emergency vehicles. Roadways may also be blocked with obstacles that make driving unsafe.
8. Turn on your battery operated radio to listen for advisories.
9. If your cell phone is working, use it sparingly. People with emergencies need phone service first.

From: https://iemaohs.illinois.gov/preparedness/earthquakeafter.html

Work with your group to plan alternate strategies for energy use after an earthquake. Fill out the table as you work:

Energy Type	Strategy 1	Strategy 2
Light		
Internet, TV, Radio		
Heat		
Transportation		

Part 3:

1. Write down 2 sources of energy that potentially could be used at your home if the electricity was cut off after an earthquake.
2. Choose one of these and describe what it might look like at your home.

CER

Claim: How prepared is your family?

Evidence: How do you know?

Reasoning: What could your family do about improving your earthquake readiness?