Shake, Rattle, and Break! Understanding Earthquakes and Faults

Materials Needed:

- Large rectangular sponge (or several layers of thick craft foam, or a few graham crackers)
- Knife (adult supervision for sponge/foam) / Hands (for graham crackers)
- Markers (different colors)
- Paper
- Notebook or journal for observations
- Optional: Ruler, small toy houses/cars, play-doh to represent rock layers or structures

Lesson Activities:

Part 1: What is an Earthquake? (15 minutes)

Introduction & Brainstorm:

- Start with a question: "What do you already know or think about earthquakes? Have you ever experienced one or seen one in movies/news?" Discuss any prior knowledge or thoughts.
- Define earthquake: An earthquake is the shaking of the surface of the Earth resulting from a sudden release of energy in the Earth's lithosphere that creates seismic waves.
- Briefly explain that this energy usually comes from movement along **faults**.

Part 2: Meet the Faults! (45-60 minutes)

Activity: Edible/Spongy Fault Models

Today, we're going to make models to see how different types of faults work. We'll use our sponge/foam/graham crackers to represent blocks of Earth's crust.

Preparation:

1. If using a sponge or foam, an adult might need to help cut it partway through the middle, almost to the bottom, to represent a pre-existing fault line. Don't cut it all the way through! If using graham crackers, they will naturally break along lines.
2. Use markers to draw lines on the top surface of your block, across the "fault line." These can represent roads, rivers, or rock layers. You can also draw lines on the side if you've made a cut.
3. Optional: Place small toy houses or cars on top, or add layers of different colored play-doh to the sides of the cut to represent different rock strata.

Modeling the Faults:

For each fault type, discuss the forces involved (tension, compression, shear) before modeling.

1. Normal Fault:

- **Force:** Tension (pulling apart)
- Ask: "What do you think happens when the Earth's crust is stretched or pulled apart?"
- **Action:** Gently pull the two sides of your sponge/foam/cracker block apart slightly, allowing one side to slip downwards along the cut/break. Observe what happens to the lines you drew and any structures on top.
- **Discuss:** Notice how one block (the hanging wall) moves down relative to the other block (the

footwall). This creates a scarp (steep slope). Where might you see these? (e.g., Great Rift Valley in Africa).

2. Reverse Fault (or Thrust Fault if the angle is shallow):

- **Force:** Compression (pushing together)
- Ask: "What happens when the Earth's crust is squeezed or compressed?"
- **Action:** Gently push the two sides of your block together, causing one side to ride up over the other along the cut/break. Observe the changes.
- **Discuss:** Notice how one block moves up relative to the other. This shortens the crust and can form mountains (e.g., the Himalayas, Rocky Mountains).

3. Strike-Slip Fault:

- **Force:** Shear (sliding past each other horizontally)
- Ask: "What if the blocks slide past each other sideways?"
- **Action:** Slide one side of your block horizontally past the other, along the fault line. Observe the offset in your drawn lines or features.
- **Discuss:** Notice how features are displaced laterally. The San Andreas Fault in California is a famous example.

Reflection & Recording:

- For each fault type, have the student draw a simple diagram in their notebook, labeling the fault type, the direction of forces, and the movement of the blocks.
- They can also jot down observations about what happened to their "roads" or "toy houses."

Part 3: From Faults to Quakes (15 minutes)

Discussion:

- "So, how does this movement along faults cause an earthquake?"
- Explain: Rocks on either side of a fault are pushed or pulled, but they get stuck due to friction. Stress builds up. When the stress is too much, the rocks suddenly slip, releasing energy in the form of seismic waves. This is the earthquake!
- Think about snapping your fingers: you press them together (stress), they stick (friction), then suddenly slip, making a sound (energy release).
- Talk about the epicenter (point on the surface above where the quake starts) and focus (point underground where it starts).

Part 4: Staying Safe! (15-20 minutes)

Discussion & Application:

- "If you were in an earthquake, what are some important things to do to stay safe?"
- Discuss "Drop, Cover, and Hold On."
- Brainstorm other safety measures:
    - Indoors: Stay away from windows, falling objects. Get under a sturdy table or desk.
    - Outdoors: Move to an open area away from buildings, trees, power lines.
    - In a car: Pull over, stop, set parking brake. Avoid bridges or overpasses.
    - Aftershocks: Be prepared for them.
- **Creative Application:** Ask the student to design a simple earthquake safety poster or a short comic strip showing someone following safety rules. Or, challenge them: "Imagine you're an architect. Based on what you learned about faults, what's ONE thing you might consider when designing a building in an earthquake-prone area?" (e.g., flexible materials, strong foundations, avoiding building directly on a fault line if possible). This promotes creative

application.

Part 5: Wrap-up & Further Exploration (10 minutes)

- Review the learning objectives. Ask the student to explain one type of fault using their model, or list safety tips.
- **Optional Extension Activities:**
  - Research a famous earthquake and present findings.
  - Explore online earthquake maps (like from the USGS) to see where earthquakes happen most frequently. Why there? (Connect to plate tectonics if covered previously or as a next step).
  - Build a simple seismograph model (many DIY instructions online).

This hands-on lesson allows for exploration and understanding through making and doing, moving beyond simple memorization to application and creative thought about earthquake processes and safety.