A Week-Long Expedition to the Center of the Earth

Materials Needed:

- **General Supplies:** Science notebook ("Explorer's Log"), pencils, colored pencils/markers, computer with internet access, printer (optional).
- **Day 1 (Play-Doh Planet):** 4-5 different colors of play-doh or modeling clay (e.g., yellow, orange, red, brown, blue/green), dental floss or plastic knife for cutting.
- **Day 2 (Edible Earth):** A clear glass or cup, ingredients for a layered parfait or "density cake" (e.g., honey or corn syrup for the core, pudding or yogurt for the mantle, crushed cookies or granola for the crust), a spoon.
- **Day 3 (Core Correspondent):** Access to online encyclopedias (like Britannica School) or kid-friendly science websites (like National Geographic Kids).
- **Day 4 (Mantle Movers):** A clear, heat-safe glass beaker or jar, water, food coloring (red or blue), a heat source (like a candle, hot plate, or even a mug of very hot water placed underneath - with adult supervision), small, lightweight items to float (e.g., thyme flakes, sawdust, or tiny bits of paper).
- **Day 5 (Planetary Travel Agent):** Large sheet of paper or poster board (or use a digital tool like Canva), art supplies (markers, scissors, glue).

Curriculum Alignment:

This lesson plan aligns with middle school Earth Science standards, such as the Next Generation Science Standards (NGSS MS-ESS2-1 & MS-ESS2-2), by focusing on developing models to describe Earth's systems and constructing explanations for geoscience processes.

Daily Expedition Plan

Day 1: Mapping the Interior

- **Learning Objective:** The student will construct a 3D model of the Earth's layers and be able to identify and describe the four main layers: crust, mantle, outer core, and inner core.
- **Activity: The Play-Doh Planet**
    1. Begin by watching a short, engaging video about the Earth's layers (e.g., "Layers of the Earth" by SciShow Kids or National Geographic).
    2. Using the play-doh, create a model of the Earth. Start with a small ball of yellow for the **inner core** (solid iron and nickel).
    3. Wrap a thicker layer of orange play-doh around it for the **outer core** (liquid iron and nickel).
    4. Add a very thick layer of red for the **mantle** (hot, dense rock).
    5. Finish with a very thin layer of brown for the **crust**. Add small patches of blue (oceans) and green (continents) on top.
    6. Once complete, use dental floss or a plastic knife to carefully slice the model in half, revealing the distinct layers inside.
- **Discussion Points:**
    - Which layer is the thinnest? Which is the thickest?
    - Why do you think the inner core is solid even though it's the hottest? (Hint: pressure!)
    - If our model was to scale, how thin would the crust layer actually be? (Answer: As thin as

the skin on an apple).
- **Explorer's Log Entry:** Draw a diagram of the cross-section of the play-doh model. Label each layer (crust, mantle, outer core, inner core) and write one key fact about each.

Day 2: A Tasty Lesson in Density

- **Learning Objective:** The student will create an edible model that demonstrates how density contributes to the layering of the Earth.
- **Activity: The Edible Earth Parfait**
  1. Discuss the concept of density: how much "stuff" (mass) is packed into a certain space (volume). Explain that the densest materials sank to the center when the Earth was forming.
  2. In a clear glass, create a layered parfait. The layers represent the Earth's interior, ordered by density.
     - **Inner/Outer Core:** Pour in a layer of honey or corn syrup (most dense).
     - **Mantle:** Carefully spoon a layer of thick pudding or yogurt on top.
     - **Crust:** Sprinkle crushed cookies, granola, or cereal on the very top (least dense).
  3. Observe how the layers stay separate. Now, enjoy your delicious geological model!
- **Discussion Points:**
  - Why didn't the honey mix with the yogurt?
  - How is this similar to the real Earth's layers? How is it different? (e.g., it's not hot, the layers aren't made of food).
  - What do you think would happen if you tried to put the layers in the opposite order?
- **Explorer's Log Entry:** Write a paragraph explaining density in your own words, using the parfait as an example.

Day 3: Journey to the Center of the Earth

- **Learning Objective:** The student will research one layer of the Earth in detail and creatively synthesize the information in a narrative format.
- **Activity: Core Correspondent**
  1. Choose one layer of the Earth to be an "expert" on: the crust, mantle, outer core, or inner core.
  2. Using the provided online resources, research your chosen layer. Find out its composition (what it's made of), temperature, state of matter (solid/liquid), and one other fascinating fact.
  3. Write a short, creative story (1-2 pages) from the perspective of an explorer traveling through that layer. Describe what you see, feel, and experience. Use the facts you researched to make your story scientifically plausible (within the bounds of creative license!). For example, if you're in the mantle, describe the rock as moving like super-thick toothpaste. If you're in the outer core, describe the swirling liquid metal.
- **Discussion Points:**
  - Share your story aloud. What was the most interesting fact you learned?
  - What would be the biggest challenge for a real explorer in that layer?
- **Explorer's Log Entry:** Paste or write your story in the log. Add an illustration of your imaginary exploration vehicle.
- **Challenge Extension:** Research how scientists use seismic waves (P-waves and S-waves) from earthquakes to "see" inside the Earth.

Day 4: Making Waves in the Mantle

- **Learning Objective:** The student will demonstrate an understanding of convection currents by creating a simple model.
- **Activity: Mantle Movers Simulation**
  1. Explain that the mantle, while mostly solid, moves very slowly over millions of years through a process called convection. Heat from the core causes hotter, less dense

material to rise, and cooler, denser material to sink. This creates giant circular currents.
    2. **(Adult supervision required for heat source)**. Fill the clear beaker or jar with cool water. This represents the mantle.
    3. Place the heat source under the center of the jar. This represents the Earth's core.
    4. Add a few drops of food coloring and the thyme flakes.
    5. Watch closely for 5-10 minutes. You will see the colored water and flakes heat up, rise to the surface, move to the sides, cool down, and sink again, creating a convection current.
- **Discussion Points:**
    - Where did the water move the fastest? Where did it sink?
    - How do these currents in the real mantle affect the crust that's "floating" on top of it? (This is what moves tectonic plates, causing earthquakes and volcanoes!)
- **Explorer's Log Entry:** Draw a diagram of the experiment. Use arrows to show the direction of the convection current. Label the "core" (heat source) and "mantle" (water).

Day 5: Final Project - Earth's Interior Travel Agency

- **Learning Objective:** The student will synthesize and apply their knowledge from the week to create a persuasive and informative final project.
- **Activity: Planetary Travel Brochure**
    1. Imagine you work for a futuristic travel agency that can take tourists on a trip to the center of the Earth. Your job is to create a travel brochure to attract customers.
    2. The brochure should be folded paper (or a digital equivalent) and must include:
        - A catchy title (e.g., "Core Adventures Inc." or "See the Center of it All!").
        - A section for each "destination" (each layer of the Earth).
        - For each layer, include: what tourists will see, what "activities" they can do, and what "gear" they will need (e.g., "a pressure-proof suit for the inner core!").
        - Use information from the entire week: composition, temperature, density, and convection currents.
        - Make it colorful and creative with drawings and exciting language.
    3. Present your travel brochure as if you are pitching the vacation package.
- **Assessment (Summative):** The brochure serves as the final assessment. Evaluate it based on:
    - **Scientific Accuracy (5 pts):** Are the descriptions of each layer correct?
    - **Completeness (5 pts):** Does the brochure include all four layers and the required elements?
    - **Creativity & Effort (5 pts):** Is the brochure engaging, colorful, and well-presented?
- **Explorer's Log Entry:** Write a final entry reflecting on the "expedition." What was the most surprising thing you learned about what's beneath your feet?