Salad Dressing Differentiation Lesson Plan
(2) 50 min periods

Materials:
Newman's Own Italian Dressing (well shaken) or alternative brand
Lecture slides on Earth Layers and layer formation
Copies of Density Lab Handout for students
Density Lab Teacher Edition
Lab materials, listed on the Lab Handout.
Soap and paper towels for cleanup

Prep:
Have all lab materials gathered and ready.

Context & Learning Goals: This lesson is meant to help students understand that materials of different densities will separate out over time into layers, and that this is the reason Earth's interior is layered. They should learn that MORE DENSE things sink to the bottom and LESS DENSE materials rise to the top through a lab activity. In the lecture portion, the formation of Earth's interior layers is discussed and related to the lab activity.

Lesson Plan & Instructions:
1. Give the Pre-Lab questions from the Density & Differentiation lab as a warm up to students, allowing them a couple minutes to write answers, then ask a few students to share with the group what they wrote.
2. Continue warm up by taking out well-shaken italian salad dressing and asking the class what it looks like after you leave it in your fridge a week. Same or different? Students should be able to recognize that the dressing will separate into layers. Ask why, and accept guesses for a while. Correct answer: the materials of different densities (oil, vinegar, etc) separate out. Brainstorm other examples (unhom. milk, natural peanut butter...)
3. Introduce Lab activity by first briefly reviewing or introducing density with a formal definition and equation (density is mass divided by volume), to whatever degree appropriate to the students background/previous knowledge. Note: Lab uses Oil & Vinegar - two main components of italian dressing.
4. Review/Demonstrate the Lab procedure steps. Remind them to weigh empty beakers before beginning anything with oil/vinegar. Demonstrate measuring fluids briefly in front of the class: oil and vinegar are first poured into a graduated cylinders for precise measurement, and then from there poured into the beakers. Explain how to use a mass balance if students are unfamiliar (depending on their previous knowledge), and then walk through the rest (no need to demo mixing...).
5. Do Lab activity in small groups of 3-5 students (see handout and Teachers edition handout for more info/tips). Most groups will not finish before the end of the day for 50 min. class periods. **A good break point is to have them complete steps 1-5 (measuring the mass of the oil and vinegar), then do the mixing the next day. Very slow groups may only finish measuring oil. As long as they have the density(ies) calculated, the next day they can just measure 75 mL of oil & vinegar into beakers directly to do the steps involving mixing. **ALLOW TIME FOR CLEAN-UP. Have plenty of soap and paper towels for oily hands, beakers, etc.
6. After all groups have finished lab, including the lab Questions, lead wrap-up discussion about lab findings and the post-lab questions.
7. Give lecture on Earth Layers and Earth Differentiation.

Follow-up: Leave Italian Dressing in classroom undisturbed for a week, or until the end of the Solid Earth unit. Periodically check up on it have the class informally practice scientific observation by describing how it is changing.