Marty Reep
Lompoc, Ca 93436
Derricks to Desks Lesson Plan
Summer 2001

Falling Marbles

Lesson Plan

The Point: Students measure the effect of gravity against varying oil viscosities.

Subject Area: Science

Grade Level: 6 - College

Number of students: Whole class

Time to allot for experiment: 15 minutes

Materials needed:

- (5) Tubes, plastic, clear, 2" diameter, 24 inches long, thick-walled
- (10) End caps
- Water, 192 ounces (1 1/2 gallons)
- Oil, 32 ounces (1 quart) of each:
  - 5 degrees viscosity (~ 5w motor oil)
  - 10 degrees viscosity (~10w motor oil)
  - 20 degrees viscosity (~ 20w motor oil)
  - 30 degrees viscosity (~ 30w motor oil)
- (5) Marbles, clear glass with swirled colors (makes it easier to see them in the tubes)
- Sealant, clear (waterproof caulking)
- Stopwatch

Pre-Lesson Setup:

Constructing the tubes:

- Label each tube (Tube #1, Tube #2, etc.)
- Mark a line all the way around the middle of each tube (at 12") with a permanent marker. (This will be essential to measuring water and oil and flow rates, later).
- Put a small line of sealant on the inside corner line of five end caps.
- Push the five end caps onto the five tubes.
- Put sealant at the outer edge of the end cap and the tube.
- Let dry 24 hours.
- Pour enough water into each tube to check seal. Reseal if needed.
- When sealed completely on one end,
  - fill tube #1 with tap water, only.
  - fill tube #2 with 1/2 tap water and 1/2 oil, 5 degrees viscosity.
  - fill tube #3 with 1/2 tap water and 1/2 oil, 10 degrees viscosity.
  - fill tube #4 with 1/2 tap water and 1/2 oil, 20 degrees viscosity.
  - fill tube #5 with 1/2 tap water and 1/2 oil, 30 degrees viscosity.

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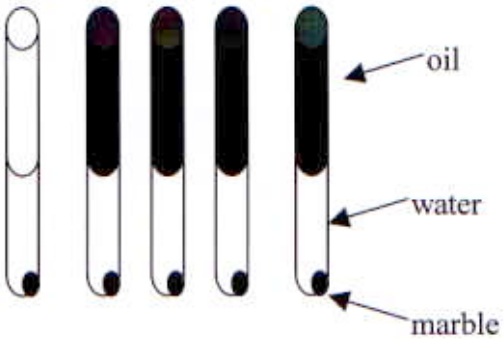
- Put one marble inside each tube.
- Put a bead of sealant in the remaining end caps.
- Put end caps on tops of tubes.
- Let dry 24 hrs.
- Check seals.
- Reseal if necessary.
- Now ready to use in class.



During Lesson:
Student #1 turns the first tube down so the marble inside rolls to the top.
He/she then turns the tube back right-side up.

Student #2 starts the stopwatch

Students #3, 4, 5 watch for the marble to fall down through the oil in the tube and cross the halfway mark. When it does, student #2 stops the stopwatch.

All students record the time for the first tube on their rate sheets.

Repeat the previous steps for tubes 2, 3, 4, & 5.

Discussion:

Students put their findings on the board for discussion.
Students describe why they think the marbles in different tubes fell at varying rates. Teacher moderates discussion and then asks what other things in life apply the same principles?

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What other people said about this lesson:

"Marbleous!"

-- Miss Nomer, Punneth Elementary, Grinnich, Connecticut.

"Oil's well that ends well...powerful hands-on learning shale last and last."

-- Tara Firma, Centerville Middle, Solid, Missouri

"Smooth. Definitely a great way to slide into this unit."

-- Derek Hiyup, Stucker High, Edgewood, Texas

"After we finished, some of the students went over to the local greasy spoon and kept working."

-- Earl "Slick" Nunn, Viscosity High, Thickwell, Georgia