

Introduce a Girl To Engineering 2021

Build a Pipeline STEM Activity: Leader Guide

Plan: Materials

- Three (3) foam cups
- Straws (non-bending, bending straws, various diameters)
- Craft sticks
- Masking tape
- Not included:
 - Scissors
 - Water
 - Paper towels
 - *Optional:*
 - Food coloring
 - *Honey, vegetable oil, other viscous liquids*
 - Timer
 - Measuring cup



Do: Procedure

1. Use the scissors to carefully poke a small hole in the bottom of one Styrofoam cup.
2. Insert a small diameter straw in the hole of the first cup ("straw cup").
3. Consider, design, and build a stand for the "straw cup" so the "straw cup" is a higher elevation than the "receiving cup" using the provided cups, straws, wooden craft sticks, and tape.
4. Configure the "straw cup" and stand to empty through the straw pipeline into the "receiving cup."
5. Pour water into the taller cup.
6. Troubleshoot, as needed:
 - a. If there are leaks, use tape to repair them.
 - b. If the structure elevating the first cup is not structurally sound, reinforce it.
 - c. If the water does not flow into the second cup, re-design the pipeline system.

Check: Testing & Modification

Evaluate what happened using the scientific method.

Act: Data Gathering Activity

Constants: Use 50 mL or $\frac{1}{4}$ cup of fluid

Variables:

- Use two fluids with different viscosities such as water and honey or water and oil.
- Change the narrow diameter straw out with the thicker diameter smoothie straw and see how the average time to move the water changes.

Using a timer, record three-time trials for each fluid type and straw diameter. After recording the times, take the average of each test and compare the results to the hypothesis.

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Then and Now

- Roman aqueducts ([gravity flow](#)) to [modern pipeline systems](#) (product types, use of pumps and compressors)
- Current US Oil & Gas Pipeline system: [PHMSA Website](#)
- Women working on pipelines: [AlaskaPublic.org](#) and [library.alaska.gov](#)

Additional Resources

[STEM Pipeline Activity](#) and [Resource Guide](#)

[Pipelines](#)

[Fluid Viscosity](#)

[Bernoulli Principle](#)

[Pipeline construction](#)

[Deming Plan Do Check Act \(PDCA\) Cycle](#)

