

THROUGH THICK AND THIN

TRADE LINK: CAR PAINTING

RATIONALE:

Viscosity is the measure of how thick and “sticky” a liquid is. Students should have the opportunity to explore the properties of viscosity through discovery. Students at this level will explore the viscosity of a number of different everyday products and determine the intermolecular interactions within a fluid.

Students will relate this activity to car painting, that is one of the contest areas found in Skills Canada competitions. This is an excellent example of putting Skills for Success to work – if students understand viscosity, they will have a greater chance of understanding one of the important elements that people in the car painting industry must understand and apply in their day-to-day careers.

METHOD:

In this activity, students will be asked to “test” the viscosity of a number of different products and “rank” the viscosity of each to determine the effect that viscosity would have on items, such as painting a car. Students will be responsible for testing viscosity in both hot and cold temperatures. Students will begin by pouring liquid from one cup to another and charting how long it takes the liquid to transfer. Then, students will be asked to drop a marble into each of the cups to view the effect viscosity has. Students will then view a demonstration of viscosity levels after items have been refrigerated. Lastly, students will test viscosity and pipe flow by having them drink edible products through a straw. Students will then be able to determine why viscosity is a factor in painting a car.

MATERIALS:

- Dixie Cups
- Graduated cylinders
- Stopwatch (or use stopwatch function on smartphone or ipod)
- Marbles
- Corn starch
- Water
- Liquid glue
- Nail polish
- Yogurt
- Honey
- Smoothie
- Tarp (something to contain the mess)

TEACHER BACKGROUND

Duration: Two 45-minute classes

Group Size: Individuals

Setting: Outside

Grade: 7 – 9, grade 10
for extension activity



GETTING STARTED:

Viscosity is a measure of how thick or “sticky” a liquid is. It is evident by how things are poured and how long those things take to pour. If two cups were sitting on a tabletop, both spilled, which one would you need to clean first? In this activity you will be exploring and charting the viscosity of a number of products. The goal is to determine which one flows fastest and slowest. At the end of the activity, students will know more about density and how the density of fluids impacts different careers, specifically car painting.

THE ACTIVITY (SKILLS FOR SUCCESS):

The teacher will decide what method is more appropriate for their class. Discuss with the class what viscosity is, why it matters for different careers. Discuss the car painting skilled trade with students so they understand what this trade entails.

There are a couple of ways to measure viscosity of liquids. One way is by measuring the amount of time it takes marble or steel balls to fall given distances through the liquids. The other way is to calculate the density of the fluid in question. The teacher should determine what method is best to use with their particular class. (Numeracy – Measurement)

TO FIND THE DENSITY OF A FLUID:

1. Have each group choose a fluid to measure the viscosity of (or assign each group a fluid).
2. Have students calculate the density of the fluid.
 - Weigh the empty graduated cylinder.
 - Fill the cylinder with fluid, and record the volume.
 - Weigh the full graduated cylinder. Subtract the weight of the empty graduated cylinder to determine the weight of the fluid.
 - The density of the fluid is the weight over the volume.

$$\rho_f = \frac{\text{weight of fluid [kg]}}{\text{volume of fluid [cm}^3\text{]}}$$

Note: 1 cm³=1 ml.

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(CONTINUED)

DAY 1:

Students are given the following details to carry out this activity:

1. Watch Mythbusters clip on viscosity – <https://www.youtube.com/watch?v=V4TEqb-728k>
2. Discuss with the teacher viscosity and which liquids students think will flow slowest and fastest.
3. Set-up area and pour liquids into Dixie cups and set them up for inspection.
4. Pour liquids from one Dixie cup to another and time how long it takes to transfer all of the liquid from one to the other. (Numeracy)
5. Make sure Dixie cups are at the same level and drop a marble from a foot in the air into each of the fluids. Determine how much splatter was created on the side of the cup, did any spill over? Record the number of “drops” on the side or outside the cup. (Numeracy)
6. Use the edible items and time how long it takes you to drink the variety of items through a straw.
7. If using the optional method to calculate density, teachers will set up graduated cylinders, scales, measured fluids and give students directions on how to carry out finding density. (Numeracy)

DAY 2:

1. Collect data from each test and chart results obtained by each of the students. (Numeracy)
2. Discuss how viscosity would affect painting a house, car, etc. Would the viscosity make any difference on the end product? (Communication)
3. Chart viscosity information in a digital form for record keeping purposes. (Digital)
4. If the teacher chooses to use this as a formal lab report, have students write up their findings of density. As an application, have them include how this fits in with the car painting trade. (Writing)

BRANCHING OUT:

1. Older students should be able to calculate viscosity using the appropriate formulas and make accurate predictions based on information.
2. Younger students can watch a demonstration and work together to determine what affect viscosity has on everything.

INFORMATION BITE:

A career in car painting involves cleaning and preparing panels for paint applications. Car painters are required to mix and apply undercoats and clear coats as well as refinish plastic substrates. They perform the prepping and painting of objects on steel body panels. In addition they remove surface paint defects on automotive parts. In these cases, they perform a colour tinting to a blendable match. Car painters use a variety of equipment including sanders, blow guns, painting tools, spray guns and polishers.

WHAT ABOUT SKILLS FOR SUCCESS?

The Skills for Success that are most in use in this trade are numeracy, thinking, and document use. As car painters are mixing together different substances and these must be mixed in certain ratios, it is very important that they have a very good grasp of numeracy. Car painters working with different equipment need to know the best equipment to use for different project and must plan their time accordingly. Using reading and collaboration are other Skills for Success that will be important in this trade. This career also requires good communication and interpersonal skills as car painters are in contact with customers to determine requirements and cost estimates.