

Emptying Rate

Trend Task

Approach: Team

Level: Year 4 and year 8

Focus: Plan and conduct an investigation of the flow properties of liquids of different viscosity.

Resources: Video demonstrating the task, basin, 500ml plastic drink bottle with bottom cut off and small hole drilled in cap, tap water, 900ml bottle of detergent, measuring jug, laminated activity card, results sheet, stopwatch.

Questions/instructions:

Set out the supplies ready for the activity.
 In this activity your team will be doing an investigation. We will watch a video now that tells you what you are to do.
Play video.

Video Script: Your group is going to work together to do a small investigation. This video will explain what you group is going to do. You will have this equipment to work with: a drink bottle with the bottom cut off and a small hole drilled in the lid; a basin; a measuring jug; tap water; detergent; a stop watch; and a chart for writing down your results.

Your group will need to think how you will organise your investigation so that everyone is helping, and everyone has a job to do.

This is what your team will be investigating: You will be timing how long two different liquids take to empty out of the bottle from each of the 3 different measurement marks. The two liquids are tap water and detergent.

This is what you will do:

1. Plan how your team will do the activity so that everyone has a job to do.
2. Pour water into the bottle up to the measurement mark—like this [demonstrate]. When you are pouring it in, keep the hole in the lid covered with your finger.
3. Use the stop watch to measure how much time it takes the bottle to empty from each mark. You will need to put a fresh lot of water in to time how long it takes from each mark. See how I am letting the water pour into the jug so that it can be used again.
4. Write the results on your group chart.
5. When you have finished doing all of the measurements, look at all of your results on the chart. Test all of the measurements with the plain water first, then test with the detergent.

Before you start, your group needs to plan how it will do the activity so that everyone has a job to do. When you have made up your plan, you will tell your teacher about the plan before you start the investigation.

Here is the equipment that your team will use to do the investigation and a table for you to write your results in. You also have this instruction card that tells you what you are to do.

Read instruction card to team.

Your first instruction is to plan how you will do your experiment. Do this now and when you are ready I will ask you to tell me your plan. Remember you need to plan your activity so everyone has a job to do.

Allow time for discussion and then ask students to explain their plan to you. If the plan does not involve everyone, ask them to go back into discussion to do this, then report back to you.

Height of liquid	Tap Water	Detergent
9 cm		
6 cm		
3 cm		

	% responses	
	1999 ('95)	1999 ('95)
	year 4	year 8
Planning:		
to measure liquid consistently	8 (0)	16 (10)
to measure flow time accurately	9 (3)	23 (7)
to check consistency through replication	0 (0)	4 (0)
to achieve requested member participation	97 (86)	99 (100)
I will show you how the stopwatch works and then you can start your investigation.		
Demonstrate stopwatch operation then withdraw. Once the investigation activity has been completed and the results recorded on the sheet, remind the group to discuss the results among themselves.		
Allow time.		
Experimentation:		
measured liquid reasonably consistently	92 (66)	100 (97)
measured flow time reasonably accurate	79 (55)	93 (97)
checked consistency through replication	9 (3)	17 (3)
recorded results carefully	91 (73)	96 (93)
Now I would like you to tell me what you found out in your investigation.		
Reporting:		
clear, accurate	5 (0)	21 (17)
moderately clear	56 (56)	59 (62)
Now I want you to think about what the results might be if you used tomato sauce. Discuss it in your team and then write what you think the results might be for tomato sauce on the table in the spare column.		
Allow time.		
Explain to me why you think the measurements would be like that.		
very good discussion	7 (8)	23 (14)
moderate discussion	65 (56)	68 (59)

Commentary:

These results show some improvement from 1995 to 1999, particularly at year 4 level. It is pleasing to see greater use of replication in 1999 at both levels, although the low percentages leave much room for improvement.