PRE OR POST-VISIT ACTIVITY :
CALM DOWN! SPEED AND ROAD TREATMENTS INVESTIGATION

Using streets close to the school, students collect primary data to explore the effect of traffic calming treatments on vehicle speeds. Students plan for, and design, the investigation themselves, then analyse the data and consider the effectiveness of the road design under examination.

Learning context

Science classes

Maths classes

Victorian curriculum learning areas and level

Science	**Level 9–10**
Mathematics	**Level 9**
Capabilities	**Level 9–10**

○ Critical and Creative Thinking

Victorian curriculum strands and sub-strands

Science	**Science Understanding**
	Physical sciences
	· The description and explanation of the motion of objects involves the interaction of forces and the exchange of energy and can be described and predicted using the laws of physics (VCSSU133)
	Science as a human endeavour
	· Investigate the characteristics of effective questions in different contexts to examine information and test possibilities (VCCCTQ043)

Mathematics	**Number and Algebra**
	Linear and non-linear relationships
	• Find the distance between two points located on a Cartesian plane using a range of strategies, including graphing software (VCMNA308)
	• Find the midpoint and gradient of a line segment (interval) on the Cartesian plane using a range of strategies, including graphing software (VCMNA309)
	• Sketch linear graphs using the coordinates of two points and solve linear equations (VCMNA310)
	• Graph simple non-linear relations with and without the use of digital technologies and solve simple related equations (VCMNA311)
Capabilities	**Critical and Creative Thinking**
	Questions and Possibilities
	• Investigate the characteristics of effective questions in different contexts to examine information and test possibilities (VCCCTQ043)

Learning intention

Collect primary data on vehicle speed and acceleration to analyse the effects of road calming treatments on vehicle behaviour

Success criteria

○ Plan and conduct an experiment to collect accurate and repeatable data on vehicle speeds

○ Mathematically manipulate, graphically display and analyse data

○ Apply scientific theory of the laws of motion to experimental findings and apply this knowledge to a real-world road design challenge

Resources

Student investigation sheet	**Calm down! Vehicle speeds and road treatments – electronic or hardcopy.**
	Long measuring tape or trundle wheel
	Stop watches or equivalent
	Optional – umpires flag or similar (for signalling)
Website	**www.roadtozero.vic.gov.au**

Learning activity description

Pre-class preparation

Location scout!

For this investigation, you will need to locate two roads (or two sections of the same road) that have the same speed limit (40km/h or lower) but differ in design. This means choosing:

○ One straight stretch, 100m long with no road treatments

○ Another straight stretch, 100m long with a road calming treatment midway, e.g. raised safety platform, road hump, kerb outstand, chicane, slow point.

Selection criteria

You are looking for roads:

○ Close to your school

○ With clear lines of sight for student observation of the road (minimal roadside vegetation and parking zones)

○ With a barrier (school or park fence) for students to stand behind. This needs to be set back off the road, ideally with a footpath between the road and barrier, for safety reasons.

○ 40km/h speed zones or lower

○ With relatively constant traffic flow (for speed of data collection, don't choose a very quiet street!)

Safety note

Your students will be collecting data by observing vehicles travelling on active roads. Please plan the route to and from the chosen location carefully, ensuring students remain safe at all times.

Part 1 — Planning

1. Remind students of the four principles of *Towards Zero* (listed below). All of these will contribute to achieving the goal of a future with zero lives lost and zero serious injuries on the roads. Explore the *Towards Zero* website for more information.

    Safe roads – Roads play a vital part in helping reduce crashes and minimise the severity of injuries if there is an accident.

    Safe speeds – The appropriate speed for the conditions, including the state of the road, amount of traffic, number and type of other road users as well as weather. Speed limits indicate the safe speed for that road in normal weather conditions, but if the weather or light is poor, then drivers should reduce their speed to be safer.

    Safe people – Road safety is a shared responsibility. Everyone can play an important role in helping reduce road trauma. Death shouldn't be seen as an inevitable consequence of making a mistake on our roads.

    Safe vehicles – Vehicle safety has gradually improved over time. Vehicles are getting better at helping to avoid a crash and protecting drivers and passengers in crashes. If everybody upgraded their vehicle to the safest in its class, road trauma would drop by a third.

    In this investigation, students will be revisiting the principles explored in the Road to Zero Physics Challenge Program: safe speeds and safe roads.

2. Distribute *Student investigation sheet: Calm down! Vehicle speeds and road treatments.*

3. Inform students that they are going to plan and conduct an investigation about how roads can be designed using treatments that encourage drivers to maintain lower speeds and be aware of other road users. These treatments are known as traffic calming treatments. Discuss treatments that students are aware of and create a list.

Part 2 — Data collection

Investigation method

It is encouraged that students plan their own investigations, and for this reason there may be multiple methodologies undertaken in this investigation. You may encourage different approaches, or prefer to have all students using the same method – this makes sharing datasets easier, and students can combine class data for calculating averages, etc.

If time is limited, you may prefer to provide students with set methods and materials.

Suggested investigation materials and method

○ Trundle wheel, long measuring tape or app

○ Stop watches

○ Optional – umpires flag or similar (for signalling)

1. Measure 100m of the straight length of road with no road treatments.

2. Position a student (A) at the start of the 100m course, and another student (B) at the end. A third student (C) is responsible for timing.

3. When a car passes A, they raise their arm or a flag. This signals to C to start the stop watch. When the car passes B, they signal to C to stop timing.

4. Repeat steps 1 to 3 (described above) with the second 100m stretch of straight road, with the road treatment at the midway point.

5. Variations to method:

   – Both sections can be on the same stretch of road – this enables comparison of the speed of the same car on both sections

   – Additional time check points along the road with the treatments allows for more refined analysis of speed, acceleration and driver behaviour.

Lesson 3 — Analysis, discussion and conclusion

Data sets can now be analysed. Depending on the time available, students should be encouraged to do as much of this in groups as possible. Encourage discussion and sharing of data among the groups, and remind the students to consider:

○ Combining smaller datasets

○ Determining averages

○ Different ways of graphically representing their data

The following discussion questions may assist:

1. On average, what was the difference in speed on both sections of road?

2. Why do you think there was a difference in speed?

Conclusion

As well as responding to the research question and hypothesis, students can comment on the effectiveness of the road treatment investigated as a means of encouraging slower speeds and driver concentration.

Name:

STUDENT INVESTIGATION SHEET:
CALM DOWN! VEHICLE SPEEDS AND ROAD TREATMENTS

Research question: What affect can road design have on car speeds?

Background information: In local streets and near schools, there are many different types of road users, including vulnerable pedestrians and cyclists. One very effective way to make roads safer in such areas is to lower the speed limit to 40km/h or under. But, what happens if someone is speeding or not paying attention? Have you considered that a road can be designed to force drivers to keep their speed down or pay attention at dangerous spots, such as near schools or at pedestrian crossings? Today you will collect data to explore if road treatments that calm (slow) traffic can make people drive more safely.

Location:

The traffic calming road treatment we will be investigating is:

Hypothesis:

Materials:

Methods:

Results table 1 – Straight road (no traffic calming road treatments)
Length of road: 100m

Trial number	Time taken to travel road length	Average speed of car (s=d/t)
1		
2		
3		

Results table 2 – Straight road with traffic calming road treatment
Length of road: 100m

Trial number	Time taken to travel road length	Average speed of car (s=d/t)
1		
2		
3		

Conclusion

What did you find out? How effective was the traffic calming treatment at reducing vehicle speeds?

Was your hypothesis correct or incorrect?