

Example lesson plan: Mathematics

PLANNING AND PROGRAMMING

Year level: 8

Year: 2015

Duration: 8 weeks

School: Murray Bridge High School

Subject: Mathematics

Author: Luke Starczak

Mathematics Year 8 Achievement Standards				
<p>Unit outline: They choose appropriate language to describe events and experiments. They explain issues related to the collection of data and the effect of outliers on means and medians in that data.</p>			<p>Guiding question: How can students improve bicycle safety in their community?</p>	
<p>General capabilities:</p> <ul style="list-style-type: none"> Literacy Numeracy ICT Capability Critical and Creative Thinking Personal and Social Capability Ethical Understanding Intercultural Understanding 			<p>Cross-curriculum priorities:</p> <ul style="list-style-type: none"> Sustainability 	<p>Overarching ideas:</p> <ul style="list-style-type: none"> Geometry and Measurement Data representation and interpretation
Content Descriptions	Potential resources	Learning activities	Assessment tasks	Achievement standards
<p>Geometry</p> <ul style="list-style-type: none"> • Find perimeters and areas of parallelograms, trapeziums, rhombuses and kites (ACMMG196) • Investigate the relationship between features of circles such as circumference, area, radius and diameter. Use formulas to solve problems involving circumference and area (ACMMG197) <p>Data collection (surveying)</p> <ul style="list-style-type: none"> • Investigate techniques for collecting data, including census, sampling and observation (ACMSP284) • Explore the practicalities and implications of obtaining data through sampling using a variety of investigative processes (ACMSP206) • Explore the variation of means and proportions of random samples drawn from the same population (ACMSP293) • Investigate the effect of individual data values, including outliers, on the mean and median (ACMSP207) 	<ul style="list-style-type: none"> • Haese Mathematics <ul style="list-style-type: none"> ○ Statistics, pp 379–406 ○ Probability, pp 305–330 • Pearson Mathematics, pp 504–591 • Bike safety – SAPOL • Motor Accident Commission (MAC) – Be Safe Be Seen • Bike SA – bike maintenance course (1.5 hour) • RAA • Transport Accident Commission – Strings video • RiAus <ul style="list-style-type: none"> ○ Staying safe on the road: Protecting vulnerable road users ○ The science and myths of low level speeding 	<p>Introductory activities</p> <p>(How will I capture the students' interest and use what they already know?)</p> <p>Pre-test – Bike Education Student Survey – Statistics</p> <p>Student forum</p> <p>Activity – How far have I ridden?</p> <p>Formative activities</p> <p>(What activities can help the students understand the key ideas?)</p> <p>Progress reviews</p> <p>Post-test – Bike Education Student Survey – Statistics</p>	<p>Summative activities</p> <p>(What activities – oral, written, visual – can I assess to check whether the students understand the key ideas?)</p> <p>1 Investigation: How far have I ridden?</p> <p>2 Presentation: Present ideas to a wider audience.</p> <p>3 Test: Data representation and interpretation.</p>	<ul style="list-style-type: none"> • Convert between units of measurement for area and volume • Perform calculations to determine perimeter and area of parallelograms, rhombuses and kites • Name the features of circles and calculate the areas and circumferences of circles • Explain issues related to the collection of data and the effect of outliers on means and medians in that data.

YEAR 8 MATHEMATICS BIKE EDUCATION: LEARNING DESIGN

Aligning *what* and *how* of teaching and learning in the Australian Curriculum

What is the intended learning and why is it important?

- Students:
- understand the importance of statistics in today's society and how statistics can be used to improve people's safety and wellbeing.
 - learn the bike (road) laws and conventions, bike safety routines and bike equipment management.
 - Increase willingness to ride as a mode of transport.
- This program is being delivered so that students engage in a bike education program because currently the number of people using bikes as regular transport is decreasing. One of the key reasons being that as students reach middle school age they are no longer allowed to ride on the footpath and quit riding due to their fear of accidents and misunderstanding road rules.

What do we want them to learn?

- What do they bring?
- Few students ride regularly and have a sound understanding of how to use a bike and the road rules.
 - Of those that don't ride, the reasons for not doing so are:
 - *It's not cool—only younger kids ride bikes*
 - *It's too hard and time consuming*
 - *I'm scared of getting into an accident.*

What could the intended learning look like at this level?

- Students:
- can accurately explain definitions of key terms in measurement and statistics
 - convert between units of measurement for area and volume. Perform calculations to determine perimeter and area of parallelograms, rhombuses and kites
 - name the features of circles and calculate their areas and circumferences
 - explain issues related to data collection and the effect of outliers on means and medians in that data
 - list all relevant bike and driving laws relating to bike riding
 - name all parts of a bike and perform basic maintenance
 - fit a helmet correctly
 - demonstrate their understanding of laws and safety throughout.

How will we know if they got it?

What evidence will enable us to assess the intended learning?

- Post-test of student knowledge.
- Students running teaching sessions on what they have learnt.
- Students successfully maintaining bikes.
- Students creating their 'projects' based on an area of interest and presenting this project at the final presentation event.

How will we engage, challenge and support their learning?

- Engagement:** Use a variety of technologies; invite multiple guests to speak to class and run practical sessions; provide opportunities to ride inside and outside school
- Challenge:** Complete a mathematics investigation challenging students' understanding of circles' properties; provide opportunities for group work to plan, create, present and reflect on large scale projects promoting bike safety and riding to and outside school; develop critical thinking skills through tasks that require analysis of laws and requirements to justify students' reasoning behind suggested improvements.
- Support:** teacher directed information sessions; provide students with information from various visiting experts; allocate dedicated lesson time and provide information specific for student projects; schedule weekly teacher meetings to discuss progress and support success.

So what will we do to get there?

Design the teaching and learning plan

- In order to design the teaching and learning unit the following documents have been used:
- *Mathematics for Year 8* (2007, Haese and Harris Publications)
 - Australian Curriculum
 - SA Teaching for Effective Learning (TfEL) Framework
 - National Principles for School Road Safety Education
 - Department for Planning, Transport and Infrastructure (DPTI):
 - A guide for new and rusty riders
 - Cycling & the Law
 - RIAus and Motor Accident Commission (MAC)
 - Staying safe on the road: Protecting vulnerable road users
 - The science and myths of low level speeding.
- Lesson plans follow, detailing the teaching and learning plan.

YEAR 8 MATHEMATICS BIKE EDUCATION: LESSON-BY-LESSON PLAN

School: Murray Bridge High School

Author: Luke Starczak

STUDENT FORUM					
Week	Key ideas	Learning activities and resources	Assessment	F	S
0	<p>Students critically inquire into what are the main road rules related to safe bicycle use.</p> <p>Students understand that they can influence others' attitudes toward bicycle riding and possibly increase number of bicycle riders.</p> <p>Students design a group project around bicycle safety that focuses on one of these four key outcomes:</p> <ul style="list-style-type: none"> • Organising a major event • Getting more students on bicycles • Creating a social media message or product around bicycle riding and safety • Designing a product or initiative that improves bicycle safety. 	<p>Student forum</p> <ul style="list-style-type: none"> • Bike safety – SAPOL • MAC – Be Safe Be Seen • RAA • DPTI • Bike SA 	<p>Attend the student forum.</p> <p>Pre-test: Bike education.</p>	✓	✓

STUDENT-INITIATED PROJECTS					
Week	Key ideas	Learning activities and resources	Assessment	F	S
	<p>Introduction to the program</p> <ul style="list-style-type: none"> • Recap the student forum • Class discussion on what they remember the rules to be when riding on the roads • Talk about the actual rules. 	<ul style="list-style-type: none"> • TAC – Strings video • DPTI (2015) Cycling & the Law 			
	<p>Brainstorming program ideas</p> <ul style="list-style-type: none"> • Narrow down to 4 projects • Individually, students select which project they want to be involved in. 	Identify topic for project.			
	<p>Introduction to measurement</p> <ul style="list-style-type: none"> • What it is and how it is used in society. 	Haese R, Haese S, Bruce M, Harris K, Olsnicy A & Haese M (2007) <i>Mathematics for Year 8</i> , Haese & Harris Publications, pp. 169–172			

STUDENT-INITIATED PROJECTS					
Week	Key ideas	Learning activities and resources	Assessment	F	S
2	Measurement <ul style="list-style-type: none"> Perimeter <ul style="list-style-type: none"> Notes and discussion about how to calculate perimeters for different shapes Textbook questions. 	<i>Mathematics for Year 8</i> , pp. 174–177	Measurement investigation In small groups, students measure the dimensions of a variety of different shapes to calculate perimeter and area before drawing labelled scale diagrams of each shape (minimum 10 diagrams).		
3	Measurement <ul style="list-style-type: none"> Circumference <ul style="list-style-type: none"> Notes and discussion about how to calculate the circumference of a circle Textbook questions. 	<i>Mathematics for Year 8</i> , pp. 178–185	Investigation: How far have I ridden? Students are given the formula to calculate the circumference of a circle. They calculate the distance travelled on three bikes with different wheel sizes when given the number of revolutions. Extension activity: Students are given the formula to calculate average speed. Using the wheel size of the road bike, they calculate average speed when given the number of revolutions and time taken.		✓
	Whole class talk about vulnerable road users <ul style="list-style-type: none"> RiAus Inquiry Task 1. 	RiAus Staying safe on the road: Protecting vulnerable road users p. 6			
	Identify project specifics within the 4 groups <ul style="list-style-type: none"> Students to present an outline, timeline and goals by the end of their discussion. 		Present an outline, timeline and goals for the project.	✓	
4	Vulnerable road users discussion <ul style="list-style-type: none"> RiAus Inquiry Task 2 Watch Scinamations. 	RiAus Staying safe on the road: Protecting vulnerable road users pp. 6–8 Scinamations Going for a Walk Going for a Ride			

STUDENT-INITIATED PROJECTS					
Week	Key ideas	Learning activities and resources	Assessment	F	S
4	<p>Group project work (this is repeated each week)</p>	<p>Introduction: Teacher identifies learning intentions and success criteria for the lesson.</p> <p>Activity:</p> <ul style="list-style-type: none"> • Students work on their projects. • Teacher walks around and meets with each group to discuss what has been achieved, whether their goals need to be modified and asks the students if there is anything they can do to further support them or to sort out any issues they may be having. <p>Conclusion: All groups share back with the teacher what they have achieved in this time.</p>			
	<p>Cycling SA presentation (guest speaker)</p> <ul style="list-style-type: none"> • How to fit a helmet • Scan, Signal and Scan again • How to negotiate: <ul style="list-style-type: none"> – T-intersection – Roundabout • Practical session <ul style="list-style-type: none"> – Fitting a bike to your body – Riding as a group – Negotiating intersections – Riding slow (challenge activity). 	<p>Cycling SA presentation (guest speaker)</p> <ul style="list-style-type: none"> • Teach how to fit a helmet • Teach how to signal • Scan over right hand shoulder when turning • Put arm out to indicate • Students learn how to navigate: <ul style="list-style-type: none"> – T-intersection – Roundabout <p>Bicycles and helmets provided by Cycling SA in order for students to go for a ride on school courts while practicing these skills.</p>			
5	<p>Cycle clothing discussion</p> <ul style="list-style-type: none"> • Short discussion about what sorts of clothing are appropriate to use when cycling • Watch Be Safe Be Seen videos on clothing. 	<p>MAC – Be Safe Be Seen website</p>			
	<p>Group project work (as described for week 4)</p>				

STUDENT-INITIATED PROJECTS					
Week	Key ideas	Learning activities and resources	Assessment	F	S
5	Murray Bridge Cycling Group presentation	<ul style="list-style-type: none"> Types of cycling activities in Murray Bridge Communications through Facebook to organise rides Explanation of types of bikes Safety and the law talk Nutrition and hydration talk Lights explanation <ul style="list-style-type: none"> Different types of lights Lux/lumen/watts Bike security Backpack/saddle bag Introduction to Strava as a means to record and connect Clothing for cycling. 			
	Group project work (as described for week 4)		Progress review 1 One paragraph <ul style="list-style-type: none"> Goals you have met Goals you haven't met How you are going to get back on track? 	✓	
6	Pre-test: Why are statistics important? Class discussion and teacher notes: <ul style="list-style-type: none"> Census data vs sample data What is bias in statistics? How do we determine what a reasonable sample size is? RiAus Activity 1 & 2. 	<i>Mathematics for Year 8</i> , pp. 379–399 RiAus Staying safe on the road: Protecting vulnerable road users pp. 20–21	Pre-test: Statistics Students state definitions for: <ul style="list-style-type: none"> mean median mode range. They sort data into a frequency table and frequency graph to identify range, mean, median and mode.		
	Group project work (as described for week 4)				
	Bicycle Express presentation – bike maintenance session (guest speaker)	<ul style="list-style-type: none"> Safety and rules talk Tyre pressure for different bikes Demonstration on how to fix a puncture and change a tyre Maintenance check before riding or after a ride Explanation of how to service a bike. 			

STUDENT-INITIATED PROJECTS					
Week	Key ideas	Learning activities and resources	Assessment	F	S
7	Class discussion and teacher notes <ul style="list-style-type: none"> Categorical data <ul style="list-style-type: none"> – Frequency and tallies – Graphing Numerical data <ul style="list-style-type: none"> – Graphing RiAus Activity 2. 	<i>Mathematics for Year 8</i> , pp. 380–386 RiAus Staying safe on the road: Protecting vulnerable road users pp. 25–30			
	<ul style="list-style-type: none"> Measuring the centre and spread <ul style="list-style-type: none"> – Mean – Median – Mode – Range RiAus Activity 3. 	<i>Mathematics for Year 8</i> , pp. 391–398 (Reference) RiAus Staying safe on the road: Protecting vulnerable road users pp. 25–30			
	Group project work (as described for week 4)		Progress review 2	✓	
8	Class discussion and teacher notes <ul style="list-style-type: none"> Grouped data <ul style="list-style-type: none"> – Stem and leaf plots. 	<i>Mathematics for Year 8</i> , pp. 387–390	Progress review 3		
	Teacher directed discussion reviewing the last lesson <ul style="list-style-type: none"> RiAus Activity 4 & 5. 	<i>Mathematics for Year 8</i> , pp. 398–402 (Reference) RiAus Staying safe on the road: Protecting vulnerable road users pp. 30–36			
	Group project work (as described for week 4)				

PRESENTATION EVENT