



THE MATHEMATICAL
ASSOCIATION OF VICTORIA

THE COMMON DENOMINATOR

3/24

CRITICAL MATHEMATICAL THINKING



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Dr Chrissy Monteleone, Australian Catholic University

ASKING THE RIGHT QUESTIONS TO PROMOTE HIGH LEVELS OF MATHEMATICAL THINKING

Critical thinking, essential for both education and future job prospects, involves analysing situations and making judgments. Mathematical thinking, crucial for problem-solving, is often presented in mathematics education curriculum as processes or proficiencies.

Defining critical mathematical thinking (CMT) is best done through the representation of a conceptual framework (see Figure 1 on page 4) that brings together critical and mathematical thinking literature.

Continued on page 4

FROM THE PRESIDENT

Kerryn Sandford

THE COMMON DENOMINATOR

The MAV's magazine published for its members.

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Volunteers form the backbone of MAV, playing an essential role in steering the organisation towards its vision for confident, capable, and engaged lifelong learners of mathematics. This dedication was highlighted at MAV's AGM in May, where four new Directors were appointed, and two individuals were honoured with life memberships.

Dr Matthew Sexton, Jessica Kurzman, Paul Stanscia, and Dr Scott Cameron joined the board. These individuals bring a wealth of experience and dedication to their roles, ensuring that MAV's strategic direction and operations remain aligned with its vision. Their commitment is crucial in maintaining MAV's focus on membership and support for all maths educators, ensuring that these remain at the heart of what MAV delivers.

We congratulate Kate Copping and Max Stevens who completed their maximum terms. Max and Kate will continue as valued volunteers in their roles on MAV committees. We farewell Mei Ong and thank her for the enormous contribution she made during her time on the board.

Peter Saffin and Helen Haralambous were recognised with life memberships, in respect to their significant contributions to mathematics education in Victoria. Helen's career with MAV spans over 12 years, during which she has made

profound impacts on professional learning and student activities. Her leadership has driven significant curriculum changes and professional development initiatives, including the MYLANDS projects, Regional Maths Camps, and Maths Games Days. Helen's efforts have notably enhanced the VCE program, demonstrating her unwavering support for mathematics education. Her dedication has greatly valued mathematics in society, making her a deserving recipient of life membership.

Peter's tenure as the leader and CEO of MAV for over six years was marked by significant advancements, particularly during the challenges posed by COVID-19. He spearheaded numerous initiatives in professional development, conferences, policy, and governance, increasing MAV's impact and membership. Peter's leadership facilitated the integration of new technologies and digital formats, fostering partnerships and influencing curriculum reforms. His efforts to promote the importance of mathematics in society and ensure equitable access to MAV's resources have substantially advanced mathematics education in Victoria.

Volunteers are crucial to MAV's success. To learn more about how you can volunteer and play a greater role in MAV's success contact, Jen Bowden jbowden@mav.vic.edu.au.

BUILD ME UP

The landscape of mathematics education is evolving, with a revised curriculum and pressure through teacher shortages, MAV is working to support our schools and build teacher capacity.

Build Me Up is an professional learning program for secondary maths educators seeking to enrich their teaching practices. Build Me Up offers a dynamic learning experience through 12 online modules. The modules are self-paced, on-demand and feature a wealth of resources, including engaging videos and access to our online MAV Community. Live Q&A sessions held each term offer tailored support to address specific challenges faced by teachers.

Many teachers find themselves teaching out of their field, struggling with confidence, and grappling with misconceptions that can impede student progress. Build Me Up steps in to bridge this gap.

Thanks to the Department of Education's Strategic Partnerships Program, this program is free for all government Secondary Schools, and MAV offers it to non-government schools at a low cost.

Interested?
Complete the expression of interest form or email office@mav.vic.edu.au.



UPCOMING MAV EVENTS

For more information and to reserve your place at any of the events below, visit www.mav.vic.edu.au.

EVENT	DATE	YEARS	PRESENTERS
Mathematics Masterclass: Reaching more students in less time	19/7/24	F-10	Pam Harris
Springboard series: Strategies to support student assessment of mathematics	21/7/24 Virtual	F-6	Donna McNeight
Nurturing numerical fluency in young minds through playful exploration	7/8/24 Virtual	Early years	Dr Rachel Pollitt and Sakan Pyseth
Mathematics and real life connections	7/8/24 Virtual	7-10	Claire Delaney
Writing and testing pseudocode with Python for VCE Methods and Specialist Mathematics	15/8/24 Virtual	VCE	Toan Huynh
Learner agency	21/8/24 Virtual	F-6	Larissa Raymond
Learner agency	22/8/24 Virtual	7-10	Larissa Raymond
MAV annual conference: Curriculum, pedagogy and beyond	5/12/24 6/12/24	All	Various

NATIONAL SUMMIT

Kerryn Sandford, MAV President and Jennifer Bowden, CEO, MAV



At the recent National Summit for Aboriginal and Torres Strait Islander Mathematics Education, leaders from the Aboriginal and Torres Strait Islander Mathematics Alliance (ATSIMA) and the Australian Association of Mathematics Teachers (AAMT), along with representatives from state and territory mathematics associations, gathered at the University of Adelaide. This significant event marked a pivotal moment in our collective efforts to address the persistent educational gaps faced by Aboriginal and Torres Strait Islander students.

The Summit brought together two leaders from each state and territory, united by

a shared commitment to mobilise the mathematics education community. A key outcome of the Summit was the creation of a Commitment Statement, signed by all attending representatives.

This statement underlines our dedication to fostering equity and excellence in mathematics education across Australia. From this foundation, each mathematics association has begun drafting detailed action plans tailored to their specific regional needs.

MAV is actively working on our action plan and aim to work with local communities and schools. We believe that authentic engagement with local communities is crucial to the success of our initiatives.

We invite you to be part of this journey. Share your stories with us, engage with our initiatives, and help us shape a future where mathematics education empowers all students. Together, we can bridge the gap and foster a brighter, more inclusive future for every learner.

COMMITMENT STATEMENT

Our responsibility is to drive a cultural shift to make a systemic difference in mathematics education for Aboriginal and Torres Strait Islander learners. We commit to:

- truth-telling which recognises the past and builds capacity for the future
- building relationships by listening to and learning from and with Aboriginal and Torres Strait Islander Communities
- creating sustainable partnerships based on trust and respect
- leading and supporting culturally responsive practices and
- advocating for a shared understanding of success

In doing so, we agree to be unwavering and accountable in actioning this commitment to achieve positive outcomes for Aboriginal and Torres Strait Islander learners.

CRITICAL MATHEMATICAL THINKING

Dr Chrissy Monteleone, Australian Catholic University

CONT. FROM PAGE 1.



Figure 1. CMT Conceptual Framework (Monteleone, 2023)

Each theme is explained below:

- Interpreting, a crucial aspect of critical thinking, involves forming logical judgments or conclusions
- Analysing, recognised as vital in critical thinking, includes cognitive skills and affective dispositions
- Evaluating claims and thought processes is essential for promoting mathematical thinking
- Explaining involves providing reasons for decisions made
- Creating entails generating innovative ideas.

HOW DOES CMT LINK TO THE EARLY YEARS LEARNING FRAMEWORK (EYLF)?

In the elaborations of the outcomes within the EYLF, mathematical thinking may occur when children problem solve. For example, one outcome from the EYLF, Children and Confident and Involved Learners, highlights mathematical thinking opportunities:

- Create and use representation to organise, record and communicate mathematical ideas and concepts
- Make predictions and generalisations about their daily activities, aspects of the natural world and environments, using patterns they generate or identify and communicate these using mathematical language and symbols
- Contribute to mathematical discussions and arguments. (AGDE, p. 53, 2022)

HOW DOES CMT LINK TO THE AUSTRALIAN CURRICULUM?

For primary aged children, the Australian Curriculum (2022) includes general capabilities that teachers are to address across all subject areas, including mathematics. One general capability that aligns with critical mathematical thinking is critical and creative thinking. Within this capability, students are encouraged to develop critical and creative thinking skills, which involve reasoning, logic, resourcefulness, imagination, and innovation across all subjects.

These skills are essential for effective learning, helping students become confident problem-solvers and thinkers. Critical thinking involves recognising arguments, evaluating evidence, and solving problems, while creative thinking involves generating new ideas and finding innovative solutions. Both types of thinking are interconnected and promote intellectual flexibility, open-mindedness, and persistence.

In the Australian Curriculum Mathematics F – 6, the four proficiencies help enhance CMT. They include understanding, fluency, problem-solving and reasoning.

WHAT HAPPENS WHEN TEACHERS ASK THE RIGHT QUESTIONS?

In mathematics education, one way to categorise teacher questioning is factual, probing and guiding.

Factual questions tend to provide very little information about a student's understanding of a concept or content and, are often lower

order (Sahin & Kulm, 2008). Probing questions extend student's understanding, knowledge, and mathematical thinking, moving students from low level to higher order thinking (Sahin & Kulm, 2008).

Guiding questions are considered questions that direct students to derive concepts or procedures to solve problems.

ASKING PROBING QUESTIONS TO ELICIT STUDENTS' CLARIFYING

This learning experience requires students to find the middle of the wall to place a framed photo.

This is a framed photograph of Joey (hold up a photo frame, see Figure 2). I would like to hang this photo frame in the middle of a wall. Now, imagine this piece of paper is a blank wall (show a piece of A3 paper) and this is the picture frame I need to hang (show smaller photo frame, see Figure 3). How can I hang this frame in the middle of the wall?



Figure 2.



Figure 3.

When the teacher posed probing – clarifying questions, the student displayed critical mathematical thinking. The transcript below demonstrates the researchers recommendation of a discussion between a Teacher (T) and a Student (S).

T: Is there another way you can check?

S: That there on the sides. There, that's the long way of them. And that is the length.

T: The length, I heard that very special word length. How can we check it?

S: ... If you put it with a measuring tape on the even number, you know it's the middle because the odd number that doesn't add up, it would totally be in the middle. It's the same length as the other, so that's the middle.

T: You could use the same strategy?

S: ... you could draw a line like that, two lines, above one line. Then make another one

LEARNING EXPERIENCE	TEACHER QUESTIONS
The winner of the 400 m sprint clocked 40 seconds. The fourth placed runner clocked 48 seconds. What did the second and third place runners clock?	What might you do first, second...? Can you draw something that can help you? Could a table help you to organise your mathematical thinking?
A gymnast received a total score of 48 from the 6 judges. What were the possible scores given from each stage?	What mathematics can you use first? Can you think of a way to work backwards? Would it help if you draw a representation of each judge so that you can think about possible scores?
The Australian colours are green and gold. You have been asked to design a logo of any shape for the Australian Olympic teams' jacket. It must be three-quarters green and one-quarter gold. Create a logo design.	What might be the main shape outline of your design? How can you determine three-quarters and one-quarter of the shape? How many different designs can you come up with?

Table 1.

to show where your pictures standing, and then put the other line here... So, you can do those lines. And then you put the photo on.

T: Can you show me?

S: And then what you do is you hang it up like that. Then you'll know which is the middle.

WHAT LEARNING EXPERIENCES AND TEACHER QUESTIONS CAN YOU SHARE WITH STUDENTS?

Open ended style questions or learning experiences are the best setting to support students to elicit their CMT. Possible questions that align with the upcoming Olympics are shown in Table 1.

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Dr Chrissy Monteleone is a keynote speaker at MAV's annual conference. Her keynote, *Enhancing students reasoning through teacher questioning* will feature on Thursday 5 December.

MAV's annual conference is the leading mathematics education event in Victoria. Registrations are essential, book your place now at www.mav.vic.edu.au/conference.

MAV'S 2024-2026 STRATEGIC PLAN

Kerryn Sandford, MAV President and Jennifer Bowden, CEO, MAV

The Mathematical Association of Victoria has embarked on an exciting new chapter with the launch of its 2024-2026 Strategic Plan. This plan, unveiled at the Annual General Meeting in May, marks the beginning of a vision aimed at propelling MAV forward, building on its strong foundations, and meeting the evolving needs of its members and educators across Victoria.

The MAV traditionally adopts a three-year strategic cycle, a time frame that provides ample opportunity to set goals and establish processes that support organisational growth. As the 2024 strategy cycle approached, the MAV Board recognised the need to invest heavily in the planning process, especially given the arrival of a new CEO and the fresh perspectives that came with this leadership change.

Recognising the importance of a clear and impactful strategy, MAV sought external professional support to guide the creation of the plan. This led to the engagement of Ensemble Strategy, a decision made after a careful tender process. Ensemble Strategy was tasked with facilitating a comprehensive strategic planning process that involved engaging leaders, board members, and staff to shape a clear and effective direction.

THE STRATEGIC PLANNING PROCESS

The development of the 2024-2026 Strategic Plan was thorough and inclusive, spanning nine months from inception to launch. The process was divided into five key stages: scope, engage, navigate, shape, and execute.

Scope

This initial stage involved confirming the objectives and ultimate outcomes of the strategy, ensuring the process stayed on track and aligned with MAV's goals.

Engage

In this stage, the focus was on listening to voices that would inform the strategic discussion. This included interviews with staff, directors and external stakeholders and a broader qualitative survey with MAV members to gather diverse insights.

Navigate

The data and evidence collected during the engagement stage were analysed and synthesised. This analysis generated thought-provoking questions that guided the subsequent workshops and planning.

Shape

Workshops with board members and staff were conducted to refine the findings and draft the strategic plan. This collaborative effort involved exploring different strategic pathways and testing them until there was confidence in the chosen direction.

Execute

The final stage involved drafting the strategic document, iterating, and finalising until the narrative was clear and concise. Ensuring that MAV board and staff were on the same page is crucial for the successful implementation of the plan.

A CLEAR AMBITION FOR THE FUTURE

The resulting 2024-2026 Strategic Plan sets out a clear ambition for MAV. It aims to maximise every opportunity to create a positive impact. This acknowledges that not all opportunities can be pursued; hence, a framework was established to help the Board and leaders decide which opportunities to prioritise.

The plan is designed to provide thoughtful and impactful direction for both the Board and the team, ensuring that the organisation remains focused on its strategic goals without losing sight of ongoing work. It also serves as a foundation for MAV's budget, planning, and the delivery of services and events for its members and Victorian teachers in 2024 and beyond.

COMMITMENT TO IMPLEMENTATION

While the strategic planning process was rigorous, the real test lies in its implementation. MAV's staff and board are committed to holding themselves accountable to the plan. This commitment ensures that the organisation not only meets but exceeds the expectations set out in the strategic vision.

The launch of the 2024-2026 Strategic Plan is a testament to MAV's dedication to continuous improvement and its proactive approach to addressing the needs of its community. By leveraging external expertise and engaging deeply with stakeholders, MAV has laid a robust foundation for future growth and success to be strong, connected leaders in mathematic education.

Our **vision** is an aspiration for confident, capable, and engaged lifelong learners of mathematics. The vision looks beyond just our members. It calls out the contribution we hope to make through our work, through the impact we create in the profession, for schools and for mathematics educators across Victoria.

Our **purpose** is to empower and support our members, mathematics educators and schools to improve mathematics education for every student. Our purpose is what we exist to do. It highlights our focus on working with educators and schools. It is the connection between our everyday action and the impact it has on students.

The strategic plan is summarised on page 7. You can read the 2024-2026 Strategic Plan at our website, www.mav.vic.edu.au.



THE MATHEMATICAL
ASSOCIATION OF VICTORIA

STRONG. CONNECTED. LEADERS.

CONFIDENCE IN MATHS. BETTER OUTCOMES FOR STUDENTS.

VISION

Our aspiration

Confident, capable and engaged lifelong learners of mathematics.

PURPOSE

Our why

To empower and support our members, mathematics educators and schools to improve mathematics education for every student.

BELIEFS

Our guide

- we are all maths learners with access to quality education.
- we can deliver better student outcomes together, as a vibrant professional network.
- we have the responsibility to represent our collective interests and support individual capability building through our membership.
- we can improve student outcomes by giving educators professional learning, so they become empowered, confident and capable.

IMPACT

Our outcomes

For the PROFESSION

Passionate educators, equipped, empowered and supported to improve outcomes for every student.

For MEMBERS

Members value our role and act as advocates for better maths education within and beyond schools.

For the ORGANISATION

MAV are valued leaders for the profession with the structure, members and commitment to stay relevant and thrive.

ROLE

Our work

LEADERSHIP



Sharing evidence-based practice, sharing knowledge and bringing together the profession through our work.

INFLUENCE



Elevating voice of maths educators to best represent at places of influence and affect decision-making around maths education.

STRENGTHEN



Delivering professional development with high-quality resources and consulting, enabling peer connection and engagement.

JOURNEY

Our focus

1

STRONG FOUNDATIONS

- Membership value
- High quality, relevant resources
- Secure funding

2

CONNECTED PROFESSION

- Lifelong learning
- Peer connection
- Increasing access

3

LEADERS OF CHANGE

- Scale reach
- Position for greater influence
- Collaboration across education

ENABLERS

Our building blocks



**EQUIPPED AND
SUPPORTED TEAM**



**THRIVING
MEMBERSHIP**



**SUSTAINABLE
OPERATIONS**

AI and equity: could AI drive learning equity in Maths?

Tutor-style Generative AI set to benefit students and teachers

At the heart of education every teacher, alongside every parent, has one core desire: to give each student *what they individually need* in order to learn to the best of their ability. But it's not always easy to achieve.

Nation-wide, maths teachers grapple with the challenge of educational inequality: whether it's geographical, socio-economical, or special needs based, the lack of access to educational resources holds some students back.

Enter Generative AI. The future holds promise with the emergence of AI tools set to help teachers bridge this gap. We're talking about purposefully designed AI-powered tools — ones that support and not replace teachers. With it, teachers have the chance to balance the equity equation, unlocking learning accessibility like never before.

What does the future look like with AI-powered tutoring tools?

AI is already all around us, lending a hand to discover new information, solve problems beyond our capabilities, and automate easy tasks. For some, the idea of putting our students' learning into the hands of AI sounds disconcerting. It seemingly would take the learning out of the equation.

Luckily, that's not what teachers are facing into. Learning remains front and centre, now and forever. It's our shared responsibility to ensure AI doesn't provide students with answers before they've had a chance to flex their own mental muscles.

Generative AI is a mode of artificial intelligence that can craft a range of content based on user prompts. When purposefully designed and built, it can provide students and teachers with a safe, interactive, responsive tutor. It's like a learning buddy that gives individual students the tailored help they need to keep up with the curriculum.

According to Shirly Griffith, Jacaranda's Director of Publishing, *'Gen-AI tools will profoundly level the playing field. It offers equal access to personalised teaching support that enhances teacher-led learning. When done well, this is how we can use AI for good in the classroom.'*



A personal tutor for every student — outside and inside the class

While parents invest in private maths tutors to support school learning, the cost can become prohibitive. For many it's simply an unthinkable option. This creates a gap in educational opportunities, where access to resources is tied to financial means.

Imagine if schools could help bridge the gap in personal tutoring simply by using the right technological resources. Teachers are poised to influence equity in this very way.

Jacaranda's Shirly Griffith, who spent 18 years teaching maths in the classroom before delving into education resource development, invites us to envisage a world with reliable Gen-AI assistive tools at the fingertips of every student, precisely when they need it.

'It's a game changer — for teachers, for students, and for educational resource designers'

says Griffith.

In the future students will enjoy access to interactive, responsive Gen-AI tutors both when they need help and when they want to push themselves further. This fosters equality. Teachers and parents will begin to see tutoring — be it face-to-face or AI-based — as an accessible tool to support every student journey.

Jacaranda is looking to revolutionise maths education with a new personal tutor feature in its resources

The screenshot shows the Jacaranda Maths Quest 7 VC 3e interface. On the left, Lesson 5.4 'The unitary method and best buys' is displayed, including a learning intention and a unit price section. The main area shows '5.4 Exercise' with a table of chocolate weights and costs. A help overlay on the right, titled 'RESOURCES', shows a chat interface with JacTutor. The chat messages are: 'Can you help with subtopic 5.4 Exercise 2 Q1', 'Sure, please select a help option below.', and 'Assistant is in beta'. Below the chat are buttons for 'WHAT IS THE QUESTION ASKING?', 'CAN YOU SHOW ME HOW TO START?', and 'HOW CAN I CHECK MY ANSWER?'. At the bottom of the overlay is a text input field 'Ask JacTutor ... to come' and a send button.

With JacTutor, now every student can have the help of a personal maths tutor when they get stuck



A personal tutor for every student

Now every student can get the help they need, *when* they need it. JacTutor uses GenAI to create a fair and level playing field for all students.



Get guidance, not the answer

JacTutor doesn't just give the answer away. Students are given prompts to help understand *what* they should be asking to get to a correct answer.



Combat Maths anxiety

With JacTutor, students who are afraid to raise a hand in class will find a safe space to ask questions, get clarification, and try again.



Consistency over confusion

There are so many ways to learn Maths. To avoid confusion, JacTutor is built on the same trusted method used in used in Jacaranda's Maths Quest.



A safe space

To keep students safe, any concerning or inappropriate comments are automatically flagged and sent to their teacher.



Want to learn how to use AI with your maths students?

Scan the code or visit jacaranda.com.au/jactutor



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LEARNER AGENCY: A LIVING ECOLOGY

Larissa Raymond, Mathematics education consultant, MAV

HOW MIGHT WE CO-CREATE THE CONDITIONS FOR PARTNERING TO LEARN IN MATHEMATICS?

This article explores many questions and offers an invitation for deep reflection. Let's begin with the premise language matters, as do human connections.

Take a moment to reflect on the language used in the title of this article; learner agency, ecology, co-create, partnering. What do you make of these words and what might they offer us as we continue to strengthen mathematical learning experiences where all experience a sense of belonging and connecting in their learning?

Before we continue, let's take a step back and consider what is offered when we are invited to conceptualise learner agency as a living ecology. In coming to understand learner agency as a living ecology we are provided with the opportunity to more deeply recognise the complexity and the interconnectivity of several elements that shape and are shaped by each other in the emergence of learner agency being realised or not. So, what might some of these elements be? You are encouraged to take a moment to consider your own response to this question, before reading on. Possibly you noted:

- language
- relationships
- spaces, or maybe you noted other key elements.

For the purpose of this short paper, we will focus on language. In our follow up paper we will focus on relationships and spaces; the physical and emotional.

LANGUAGE

Language is a key feature of culture and like culture, it comes without saying because it goes without saying.

When conceptualising learner agency as a living ecology, we come to understand language shapes us and we shape language. In other words, as the academic Lincoln (2013) so aptly stated,

'Language as culture does not precede the individuals who share it ...[it] is created by those same individuals' (Lincoln, 2013, p.12).



When we consider the language we use when engaging in conversations with young people, we are invited to ask ourselves, to what extent does this language signal to the child, our unwavering belief in their capacity in the here and now and into the future; in other words, in their being and the becoming? How often might you hear yourself say gently, *'Is there another way you can explain your thinking?'* You can almost see the young person thinking, wondering, contemplating while at the same time recognising the teacher's stance signals a belief in them, in their capacity.

The teacher skilfully asks another question, a clarifying or probing question, a question that supports the learner to productively struggle as they move from complexity to clarity. Through the deployment of carefully crafted questions that are designed to enable the young person to discover insights for themselves and through listening for understanding, the co-creation of an environment where deep conceptual understanding is realised, is made possible.

When you hear dialogical encounters where a teacher might say,

'I noticed when you explained your strategy you were able to identify where you encountered a *'miss take'*. What might you do differently this time? What else might you do? How do you think that will go? What support, if any, might you need/like?'

What do you notice about the language and how it is shaping the learning culture? What is being signalled, and what does it mean to be a learner around here?

What do you notice when we slightly draw out the word mistake, a miss-take? Ahh, an opportunity to have another take at it, approach the problem another way... The young person is beginning to sense there is more than one strategy, one way to approach the task and once again, they are positioned agentically in their learning.

The teacher, confident the young person is equipped to take their learning forward, moves on, knowing they will soon return to continue the thread of dialogue, as

they continually support deep and deeper conceptual understanding.

The language used here is a relational language, a transformative language imbued in an ethic of care. A language that honours listening deeply for understanding, not judgement.

Over the coming weeks and term, you might like to keep a small journal, note pad or some sticky notes to jot down the questions you ask young people, the questions young people ask you and each other. Take some time to reflect on these questions and note what they might intentionally or unintentionally be signalling to the learner; the extent to which they position the learner agentially or not. You might like to share this reflection and analysis process with the young people, inviting them to discuss what they are noticing about the language used in class, how it makes them feel about themselves as a learner, as a member of a learning community.

What tweaks might you make, together, as you continue to co-create a learning culture that signals a deep belief in the other, in the here and now and into their future?

If you'd like to learn more on the topic of learner agency, consider registering for MAV's webinars (see right), you might also enjoy listening to these podcasts on learner agency as a living ecology:

Raymond, L. (2022) 'Agency is not about giving students choice', Coconut Thinking [podcast]. 2nd October. Available at <https://coconut-thinking.captivate.fm/episode/agency-is-not-about-giving-kids-choice-ft-larissa-raymond>.

Raymond, L. (2022) 'On Student agency: a conversation with Larissa Raymond and Jayne-Louise Collins, Future Learning Design [podcast]. 22nd August. Available at <https://intrepidnews.com/on-student-agency-a-conversation-with-larissa-raymond-and-jayne-louise-collins-tim-logan/>

MAV will host two webinars on Learner Agency during Term 3.

F-6 teachers are invited to attend the session on 21 August 2024, and 7-10 teachers can join on 22 August 2024. Both sessions will run virtually, register at www.mav.vic.edu.au/events.

You'll deepen your understanding of learner agency, and the translation of this into our unique mathematics learning contexts. The session will explore ways to co-create the cultural conditions for learner agency, where all learners can flourish in their mathematical learning and, in partnership with young people, how we can become more discerning designers and users of assessment practices and tools.

CURRICULUM, PEDAGOGY AND BEYOND

MAV24 CONFERENCE

5 AND 6 DEC 2024

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THE MATHEMATICAL
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STIMULATING THINKING

Jessica Kurzman, Maths leader, St Patrick's Primary School

A picture sparks 1000 maths concepts! Use this picture as a prompt to stimulate thinking. If you have other ideas for investigations or lessons that could stem from the ideas here, add them to the conversation on our social channels. You can find us on Facebook and Instagram @maths.vic, LinkedIn @maths-vic and on X, @maths_vic.

EARLY YEARS

- How many circles make up the Olympic symbol? How many ways can you show that same number using materials so they are easy to count?
- What shapes can you see in this picture? Can you describe them without saying their names? Try drawing them!
- Each Olympic event awards three medals. Can you think of some numbers that are more than 3? Try writing down these numbers and drawing pictures to show that many items for each one.
- What shape are the medals? What are some other things you can see that are the same shape? Can you draw them?
- Count the arches in the picture. How can you make sure you count them all? What is one more than this number? What is one less than this number?
- Estimate the number of windows in this picture. Do you think there are more or less than 10 windows? Tell me why.
- Ask some friends if they want to watch the Olympics. Record their answers under the headings 'yes' and 'no'. What did you discover?
- Imagine you're competing in the Olympics, throwing a shot put using 3 mini bean bags. Throw the bean bags one at a time. Which throw was the longest? Which throw was the shortest? Can you try again and see if you can throw them further this time?
- The athletes who just finished their race (and each had 2 feet) took off their shoes. There were 10 shoes. How many athletes must there have been? What if there were 14 shoes? 20 shoes?

FOUNDATION - YEAR 2

- What do you notice and what do you wonder about this medal tally board?

	Gold	Silver	Bronze
Australia	5	2	6
India	3	4	7
Pakistan	8	3	6
France	3	8	11
USA	13	4	5

- Create a repeating pattern using symbols that represent gold, silver and bronze medals.
- If Australia wins 30 medals altogether, and at least two of each type, how many of each medal might they win? How many different combinations can you come up with?
- The opening ceremony will go for four hours. What time might it start and what time might it finish?
- Imagine Australia won all of their gold medals in either swimming or athletics. If they won 20 gold medals, how many might they have won in swimming, and how many in athletics?
- A javelin competitor threw the javelin more than 50 metres, but less than 100 metres. How far might the javelin have been thrown?
- A box carrying gold medals dropped on the floor! I could see straight away that there were 17 medals. Draw a picture showing how the medals looked on the floor. Show how it was easy for me to see the total without having to count them one by one.
- There are weights of different sizes used in weightlifting. They are: 20kg, 10kg, and 5kg. If the total weight on the barbell (pole) is 100kg, what might the combination of weights be? How many different combinations can you think of?

YEARS 3 - 6

- In Paris, the train system is called the Paris Metro. It takes four minutes to get from Gare du Nord station to Stade de France (National Stadium). If the train leaves Gare du Nord at 8:17pm, what time would it arrive at Stade de France? Can you show some other possible departure and arrival times?
- Here is part of a medal tally:

	Gold	Silver	Bronze	Total
China				33
Peru				21
Japan				17
Spain				30
UK				51

- If a gold medal earns three points, a silver medal two points and bronze medal one point - can you fill in the missing parts of the table? No country received all bronze medals! How many different possibilities are there?
- Record the information from the completed tally board in a side-by-side column graph.
- The Olympics are held every four years. Will there be an Olympics in 2063? 2099? 2135? Prove your answer using an efficient strategy!
- The world record for the men's 100m sprint is 9.58 seconds. If this record is not broken at the Olympics, but the top 3 runners in the final finish within 0.20 seconds of the world record, and at least 0.03 seconds apart. What might each of their times be? How many different possibilities can you come up with?
- If half of the medals won by the USA are gold, one third are silver and one sixth are bronze, how many medals might they have won, and how many of each medal type would that be?
- Design a new flag for an imaginary country that is going to compete in the Olympics. The flag must show symmetry in 2 different ways.



YEAR 7 AND BEYOND

- A flight from Melbourne to Paris takes approximately 22 hours and 45 minutes. What time might it leave Melbourne? What time might it arrive? Make sure you record the local times at the departure point and arrival destination. How many different possibilities can you come up with?
- Investigate the different types of equipment used in Olympic sports. How many different three-dimensional objects are used? Present the information in a graph to show a comparison of the different objects.
- Divide the Olympic venue map (website 3) into the Cartesian quadrants. Label the axis. Identify the location of six venues that are used during the Olympics, and provide their Cartesian coordinates.
- The population of France is approximately 2 102 650. If it grows by 1% each year. What would the population be in 2030?
- A swimmer competes in the 200 metre freestyle event, maintaining a constant speed of two metres per second. How long will it take for the swimmer to complete the race? What if they doubled their speed, but only swam 50m, how long would it take them to complete that race?
- Imagine the pool has a volume capacity of 2 500 000 litres. If the organisers decide to fill the pool with water bottles, each with a volume of 500 millilitres. How many of these water bottles would be needed to fill the entire pool?
- If 30 athletes are competing in swimming, 25 athletes are participating in cycling and 12 athletes are competing in both swimming and cycling. How many athletes are participating in at least one of these Olympic events?

REFERENCES

1. olympics.com/en/paris-2024
2. olympics.com/en/paris-2024/schedule
3. press.paris2024.org (search 'map Olympic competition venues')

ONE MINUTE WITH PENNY ADDISON

I AM ...

A policy person whose heart is still very much in the classroom! My role is to look after Victorian mathematics education (policy, strategy and supports) for Victorian government schools. Lucky me!

VICTORIAN MATHEMATICS EDUCATION IS...

The most interesting area I've ever worked in – so many passionate educators but also a lot of work to do to ensure that every student leaves school strongly numerate and with the knowledge, skills, capabilities, and dispositions they need to support their chosen pathways and to make decisions in a mathematics-rich world.

MATHS EDUCATORS...

Really are some of the most passionate people I meet!

TEACHERS APPROACH THE CURRICULUM...

In lots of ways. How then do we best support them to confidently and capably design and deliver high-quality mathematics programs that flexibly respond to the strengths, needs and aspirations of students and their school communities?

THE DEPARTMENT WORKS WITH VCAA...

To join up the what and the how of improving mathematics education. By this I mean that VCAA provides the curriculum, but also works closely with the department to make sure this curriculum is enacted in classrooms in an evidence-based way, responding to the needs and aspirations of students, families and school communities.

THE CHANGES TO THE MATHEMATICS CURRICULUM

Have set a higher bar. One area is the strengthening of rigour across many content descriptions. Another is the mathematics proficiencies being visible, as well as the introduction of content on mathematical modelling and statistical investigations.

INTERNATIONALLY, I SEE...

A trend toward the criticality of proficiency-rich instruction and mathematics identities



– not just kids' identities, but the identities of educators, leaders and parents/carers.

TEACHERS IN VICTORIA...

Work so hard. I admire them! I think it was Michael Fullan who said, 'Scratch a good teacher, and you will find a moral purpose.' Teachers care about kids. They want to make a difference.

I'VE LEARNT TO..

Keep one eye firmly on students and their learning, and one eye firmly on what's emerging in the educational evidence base... whilst also wading through lots of emails and tasks!

A BIG CHANGE IN 2024...

May be generative Artificial Intelligence and its impact on mathematics education.

DIVERSITY IN THE CLASSROOM...

Is another area of challenge in mathematics – student background characteristics, such as gender, socioeconomic background,

Indigenous status, immigrant background and language spoken at home, have been shown to impact on student performance in mathematics. We do need to get better at this, learning with and from each other.

MY CAT IS...

My real boss. Please check out Abacus, our super smart cat, in our new Mathscots episodes!

MATHSCOTS....

Provides an engaging way to support young learners to engage positively with mathematical concepts. We know lots of kids develop maths anxiety quite young. We want to shift this, which means intervening as early as possible in partnership with families, who do influence children's attitudes and dispositions towards mathematics.

GREAT ADVICE I'VE RECEIVED...

If you're doing the talking, you're not doing the listening.

STUDENT GAMES DAYS

MATHEMATICAL ASSOCIATION OF VICTORIA VICTORIAN CHALLENGE AND ENRICHMENT SERIES

Date: Various, see below. Most events run from 9.30am - 2.30pm.

Cost: Thanks to the Department of Education, the events are free to all Victorian government schools.

Registration is essential: www.mav.vic.edu.au/events

A VCES Games Day offers an engaging platform for high ability students to actively participate in a diverse range of maths games carefully designed to challenge their mathematical thinking and reasoning skills.

Our aim is to provide students with opportunities to enhance their productive learner dispositions through team challenges, all while fostering curiosity and a sense of fun. We encourage you to seize this opportunity and register teams from your school to participate.

VENUE	TERM	DATE
Wodonga Primary School	3, 2024	Year 5 and 6 7 August
Myrtleford P-12 College	3, 2024	Year 7 and 8 8 August Year 9 and 10 9 August
Elwood Primary School	3, 2024	Year 5 and 6 14 August
Heathmont Secondary College	3, 2024	Year 7 and 8 15 August
Geelong High School	3, 2024	Year 9 and 10 16 August
Mornington Primary School	3, 2024	Year 5 and 6 30 August
Balwyn High School	3, 2024	Year 7 and 8 5 September
Balwyn High School	3, 2024	Year 9 and 10 6 September
Grahamvale Primary School	3, 2024	Year 5 and 6 11 September
Mirboo North Primary School	4, 2024	Year 5 and 6 16 October

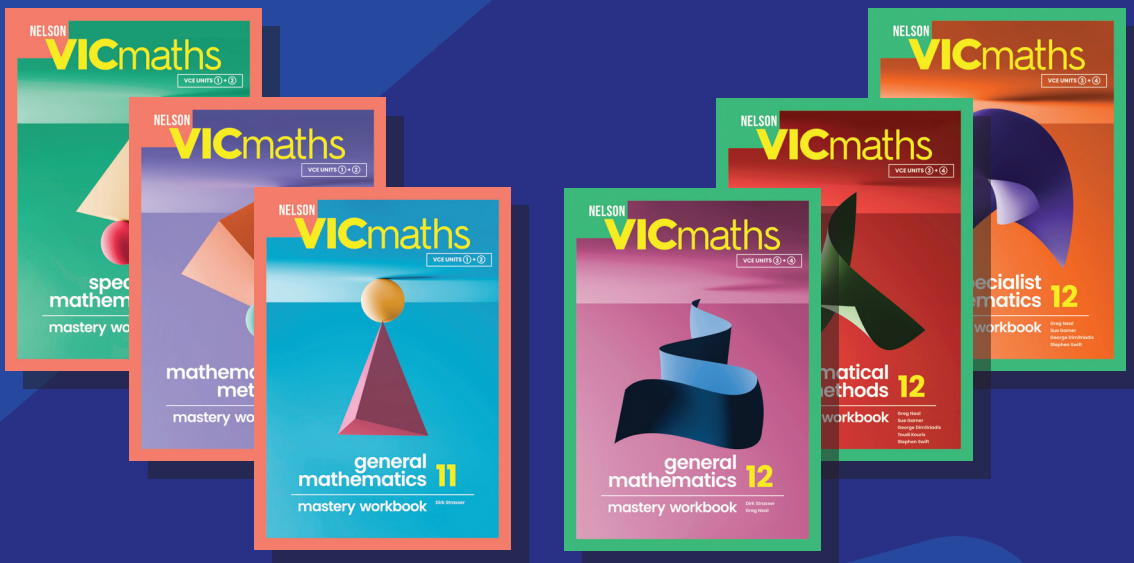
VENUE	TERM	DATE
Mirboo North Secondary College	4, 2024	Year 7 and 8 17 October Year 9 and 10 18 October
Virtual Games Day	4, 2024	Year 9 and 10 14 October Year 7 and 8 21 October Year 5 and 6 28 October



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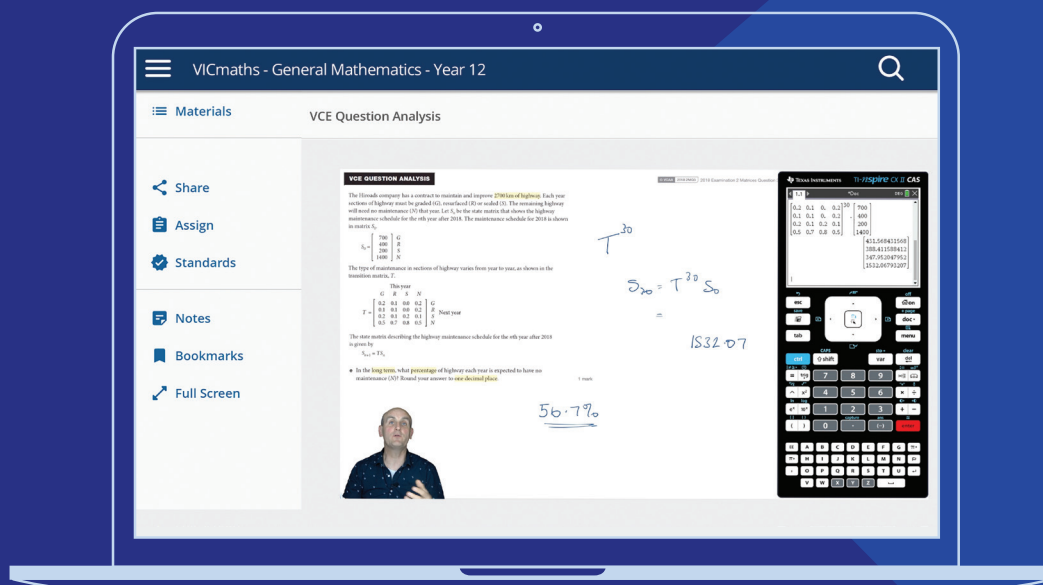


Workbooks contain write-in matched examples that pair with each of the worked examples in the student book.

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MATHS IN MOTION

ACHPER Victoria

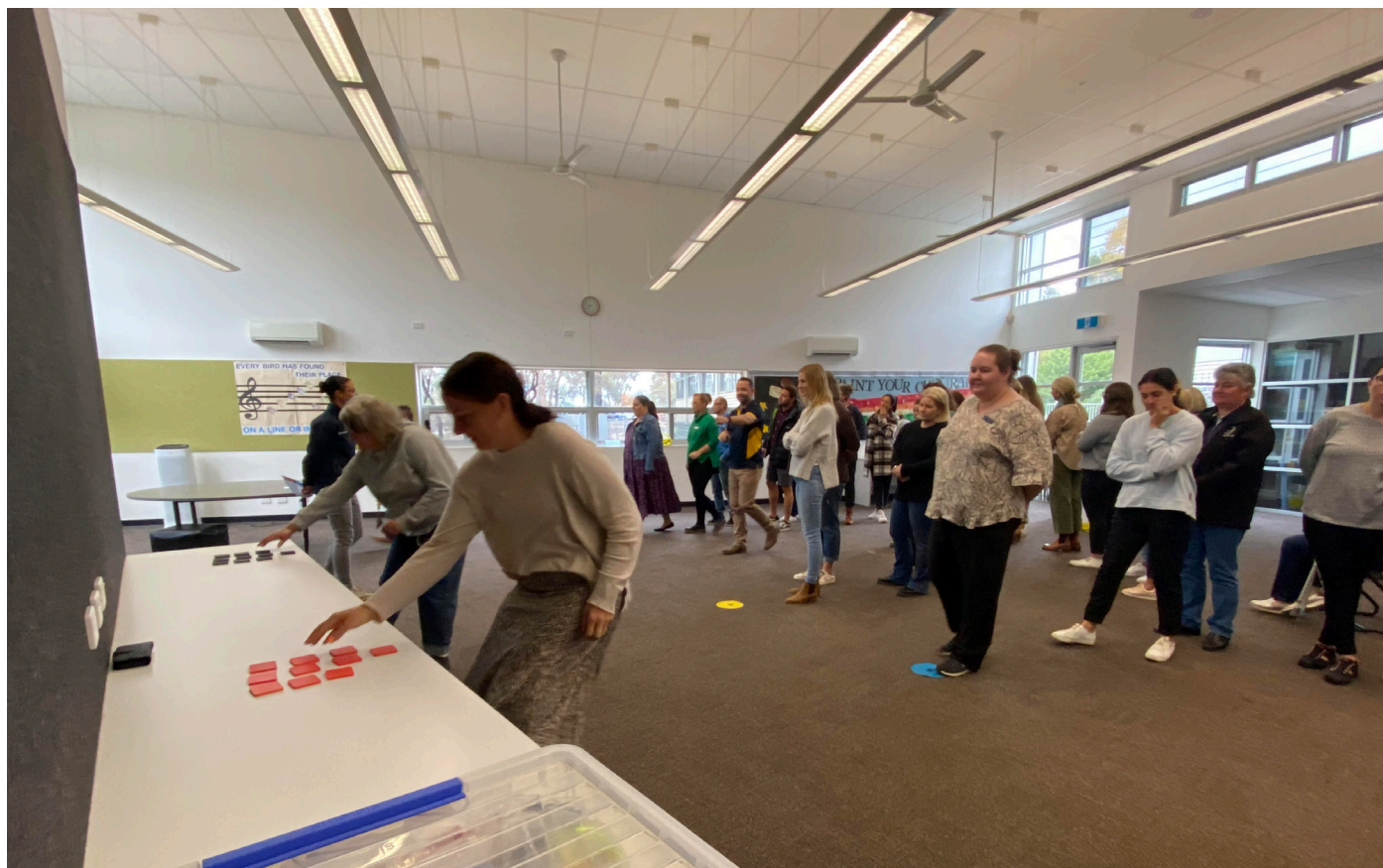


Figure 1. Teacher's getting active at MAV's Bendigo Roadshow.

The Active Schools (AS) initiative is a \$45.4 million investment from a joint ministerial statement to ensure that all Victorian students have the skills, confidence, and motivation to be active in life.

ACHPER Victoria manage the implementation of this initiative, via an Expert Support Service, on behalf of the Department of Education, focusing on a multifaceted and sustainable whole of school approach to shifting inactivity.

WHAT IS AN ACTIVE SCHOOL?

With children spending half their waking hours at school, it's critical to encourage them to move more and sit less. Support and encouragement are critical for children to move more and sit less throughout their day. An Active School promotes physical activity across the curriculum, general school life, and within the local community.

There is a wealth of evidence supporting the role that schools can play in promoting physical, activity and health of students.

Benefits of being active at school include improvements in:

- classroom behaviour
- brain function
- concentration
- learning outcomes
- motivation
- social interactions
- physical health
- emotional and psychological well-being.

MAV AND ACTIVE CLASSROOMS

Active Classrooms is one of six Key Priority Areas within the AS Framework. Active Classrooms create active learners through creative content delivery and intervention strategies i.e. active breaks, active learning, active homework, and changes to the physical environment. To support maths teachers to embed active movement within curriculum, the Expert Support Service and MAV have partnered across several initiatives.

MAV BENDIGO ROADSHOW

Through the MAV Bendigo Roadshow, using minimal manipulative resources, Active Schools staff delivered strategies to delegates around how maths concepts can be energised within the classroom environment through open-ended dynamic activities and practical intervention strategies.

Delegates engaged with active primers, exploration, and reflection activities, followed by group discussion around benefits and ideas to provide an engaging learning environment from students' initial entry into the classroom through to lesson end.

Through deeper discussion, delegates identified differentiation and extension strategies, highlighting the versatility across activities in meeting each students' current levels of knowledge to facilitate desired student outcomes across the curriculum strands of number and algebra, measurement and geometry, and statistics and probability.

Delegates completed their professional learning by identifying ties to curriculum via active learning within their classroom setting.

The key takeaway was that their existing curriculum did not require replanning, only an adjustment in 'how' they approach mathematical concepts via an active classroom environment. Delegates were provided with several resources, enabling further access to strategies for implementation.

FEEDBACK

Post-session feedback from delegates was highly positive, reflecting that the activities they engaged with are to be planned into their existing curriculum.

Delegates also requested future Active School Professional Development opportunities in delving further into tying mathematics links to both literacy and physical education.

Some feedback quotes from delegates when asked, to note takeaways from the entire conference include.

- Numeracy and mathematics, games are great for engagement.
- Using games to engage students. Using movement in maths ideas to create critical thinkers and problem-solving strategies.
- Value of hands-on manipulatives for all age groups. Differentiation is possible in one activity.

CONNECTIONS TO THE OLYMPICS

The Olympics is the perfect time to consider how you tie active movement into your classroom and homework tasks through employing simple adjustments to your existing primers, exploration, and reflection activities.

The Victorian Curriculum: Mathematics 2.0 can be energised through open-ended dynamic activities and practical intervention strategies, this can be integrated into any topic area: number, fractions, money, patterns, measurement, shape, chance, data ... and the list goes on.

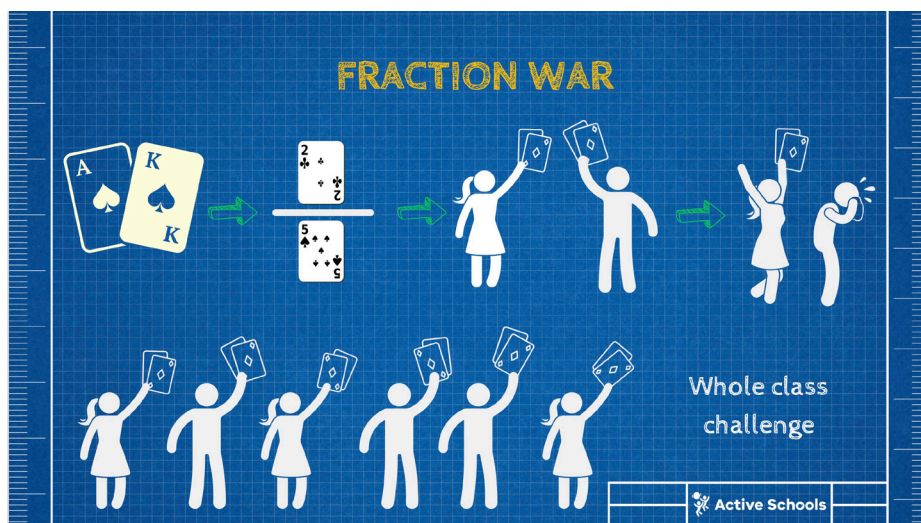


Figure 2. ACHPER has a range of useful resources, visit <https://activeschools.achper.vic.edu.au>.

From stadiums to spectators, athletes and their events, distance and time, length to height, fast to slow, results to medals, and more. How can your students create practical real-world learning in their classroom?

Tips to consider:

- Environment: What areas of the school are accessible for recreating Olympic events?
- Know your learners: Which Olympic events resonate with your cohort? How can you take advantage of this?

An example: How can you use data from a 100m race, using your own class and other classes' results?

- **Level F-1:** Name, represent, and order numbers. Collect, sort, and compare data. Describe position and location.
- **Level 2-4:** Recognise and extend the application of place value to tenths and hundredths. Create and compare different graphical representations of data sets.
- **Level 5-8:** Interpret, compare, and order numbers with more than 2 decimal places. create different types of displays of numerical data, including dot plots and stem-and-leaf plots.

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A BOXPLOT ODDITY

Andrew Stewart

While playing around with various Olympic datasets, the following one provided some unusual analysis and explanation. As the IOC announces further Summer Olympic host cities, you may wish to see how this situation develops.

The 23 cities that have hosted the 30 Summer Olympics of the modern era (1896 – 2024) are shown in Table 1, together with the year(s) in which they hosted and the total number of times that they have hosted the Games. The Summer Olympic Games scheduled for 1916, 1940 and 1944 were cancelled due to World Wars.

Figure 1 shows a boxplot of the *Times hosted* values.

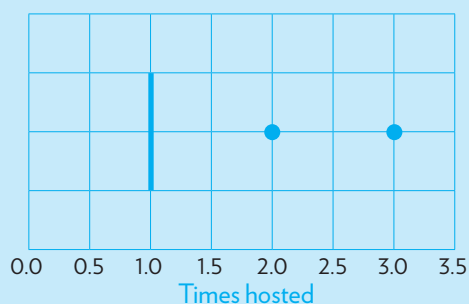


Figure 1. Boxplot.

1. Explain why the boxplot has this shape
2. Los Angeles is scheduled to host the 31st Summer Olympics in 2028, so their *Times hosted* value will increase from 2 to 3. Explain why including this information will, or will not, change the boxplot.
3. Brisbane is scheduled to host the 32nd Summer Olympics in 2032, becoming the 24th city to host a Summer Olympics. Explain why also including this information will, or will not, change the boxplot.

City	Year(s) hosted	Times hosted
Amsterdam	1928	1
Antwerp	1920	1
Athens	1896, 2004	2
Atlanta	1996	1
Barcelona	1992	1
Beijing	2008	1
Berlin	1936	1
Helsinki	1952	1
London	1912, 1948, 2012	3
Los Angeles	1932, 1984	2
Melbourne	1956	1
Mexico City	1968	1
Montreal	1976	1
Moscow	1980	1
Munich	1972	1
Paris	1900, 1924, 2024	3
Rio de Janeiro	2016	1
Rome	1960	1
Seoul	1988	1
St. Louis	1904	1
Stockholm	1912	1
Sydney	2000	1
Tokyo	1964, 2020	2

Table 1. From https://en.wikipedia.org/wiki/List_of_Olympic_Games_host_cities



See page 25 for the solutions.

Visit the MAVshop to see all the VCE resources available including solutions to past VCAA exams, SAC suggested starting points and VCE trial exams. www.mav.vic.edu.au/mav-shop.

EMBRACING THE POTATO OLYMPICS

Paul Nicholson, Mathematics leader, Bell Primary School and Jack Fray, STEM specialist, Bell Primary School



Figure 1. A student measuring the amount of water that has been 'splashed' out of the jug, by their (not so graceful) potato diver.

Citius, Altius, Fortius. These Latin words, meaning Faster, Higher, Stronger, encapsulate the dreams and aspirations of every Olympic daydreamer. Similarly, the motto of the Potato Olympics, *Intellectus, Ratiocinatio, Problematis Solvendis, Facundia, Positivum Dispositio* embodies the core mathematical proficiencies: understanding, reasoning, problem solving, fluency, and positive disposition.

Designed by AMSI (Australian Mathematics and Science Institute), the Potato Olympics have become a cherished tradition in primary schools across Australia. This unique event engages students in an immersive, memorable experience that blends fun with foundational learning.

My own introduction to the Potato Olympics was as a parent and came during one of Victoria's lockdowns. Tom Wolfendale and Danielle Shaw, the Primary Mathematics Specialist at Brunswick North Primary School, sent home challenges via Google Classroom to re-engage many students. These challenges successfully brought families together, laughing,

throwing potatoes, and engaging in meaningful mathematical activities.

I realised that the Potato Olympics could represent something far greater than its individual events. It symbolises hope; that every student can learn, that learning can be engaging and memorable, and that learning can connect us to the real world. From that first experience, I became a dedicated advocate of the Potato Olympic Dream.

FLEXIBLE IMPLEMENTATION

The beauty of the Potato Olympics lies in its flexibility. Schools can follow the original format or adapt it to suit their needs. Events can include distance throwing, velodrome, gymnastics, weightlifting, diving, and spinning, it's even adaptable to events like Breaking, a demonstration sport that will feature at the 2024 Paris Olympics.

At Bell Primary School, the Potato Olympics have evolved into a two week extravaganza, now a Year 4 rite of passage. Our teachers go all out to make it as fun and immersive as possible.

Students design their potato athletes, measure their features, and give them punny names like Hash Barty, Lionel Mashie, or Sweetina Williams. They share their athlete profiles on Google Classroom, representing their school houses and building anticipation.

Our Opening Ceremony is a highlight, complete with entertainment performances, athlete oaths, a torch relay, lighting of the flame, and an athlete parade. This parody of the Olympic Ceremony allows us to integrate cross-curricular learning from English, Humanities, and the Arts. Athletes wave flags featuring mathematical concepts, such as fractions, symmetry, shapes, and patterns, fostering deeper mathematical understanding.

The competition kicks off with distance events like shot-spud (shot put), hammer-tater (spinning and throwing), and SpudSpear (overarm throw). These events, while requiring careful management, teach students to measure distances, convert units, and compare results with estimations.



Figure 2. Students work collaboratively with appropriate tools to measure distances.

Injured athletes (potatoes) are humorously shared on Google Classroom, adding to the communal spirit.

Our thematic competitions include aquatics (diving and swimming) to explore STEAM concepts and volume measurement, chance (using coins for rugby, archery, and bowling), time and speed (with stopwatches for breaking and gymnastics), and mass (using weights and balance for weightlifting). After the games, students analyse and display data, showcasing their results during the closing ceremony, where they celebrate with a dance and receive Gold, Silver, or Bronze potatoes (small golden pebbles with smiley faces).

The Potato Olympics embodies the spirit of joyful learning and mathematical excellence. It reminds us that education is not just about acquiring knowledge but also about fostering a sense of wonder, creativity, and perseverance. As educators, let's continue to champion experiences like the Potato Olympics, encouraging others to modify the games to suit their students' age, cultural beliefs, and abilities, ensuring that



Figure 3. Our Potato Olympics embodies three themes: diversity, inclusion and maths fun.

Athlete Name: Mash Barty	Coach's name: Phoenix
Type: Potato	
Nationality: Platypus	
Volume: 125 cubic cm	
Length: 9cm	
Circumference: 19cm	
Weight: 100g	
National Colour: Blue	

Mine is the M.A.S.H

M: Most S: Spud
A: Amazing H: Here

Class: 4B

Figure 4. Each student creates a profile for their potato competitor.

all can participate and have fun. Together, we can inspire the next generation of thinkers, innovators, and problem solvers, guiding them to reach new heights in their mathematical journeys. And lastly, when your Potato Olympics draws to a close, do remember to encourage your class to retire their athletes to the compost pile!

For more Olympic investigation ideas, be sure to read the Term 3 2024 edition of MAV's primary journal, *Prime Number*. If you give the Potato Olympics a try, we'd love to hear about your experience and the learning outcomes. Email office@mavvic.edu.au.

TRANSITION TO SECONDARY SCHOOL

Jess Mount and Renee Ladner, Mathematics education consultants, MAV



The transition from primary school to secondary school is a momentous occasion in many respects. As the years progress, attitudes towards mathematics often change and can be influenced from several aspects such as 'curriculum, pedagogy, assessment strategies, social interactions and students' relationships with others' (Attard, C. 2010, p. 53). With the understanding that once negative associations are made towards mathematics, they are very difficult to change and are at risk of building into one's adult life (Attard, C. 2010).

Whilst primary school students have been at school for seven years by the time they finish, it is still significant to transition into secondary school. Sometimes the enormity of the event is overlooked as we think students are familiar with a school environment and are now of an age where a new school, new teachers and new friends are perhaps not as daunting.

However, the first few weeks of secondary school is a big adjustment as students navigate different classrooms, what

materials are required for each class, homework demands, different teacher names to learn as well as making new friends and as teachers, it is vital that we are attentive to these huge changes in a young persons life.

We have compiled thoughts on what we, as teachers, would like other primary and secondary teachers to consider as their students make the transition.

UPPER PRIMARY

Feedback

- How do we use feedback to ensure students know where to improve, consolidate or extend their learning?
- Where is the student agency involved in reflecting on this feedback and where is it encouraged to be independently enacted on?
- At secondary level, the mathematics teacher may not have adequate time set aside to explore the content richly. It will be up to students to review and revise key concepts that may help with

the next level of mathematics and to recognise when they need to ask for help. One of the greatest assets a primary student can take with them into secondary school is being able to ask for help and recognising when they need it.

Extending and enabling prompts

- Do students understand the trajectory of their learning?
- Through feedback, are students understanding the next steps of the learning and seeing the purpose in working towards those next steps?

Timing of lessons

- In secondary contexts, students are required to move around to different classrooms and often carry resources with them to various classes. How do we encourage students to be self-sufficient in being prepared for their class and ensure they have the materials actively required for each mathematics lesson?

- Due to timetabling, secondary teachers may not have the time to continue to explore a topic or investigation in depth. Primary teachers can set student up for success by ensuring that students are familiar with mathematics within a consistent set time limit, this can help students practice that they can access the key skills, apply and review them within the set lesson time.

Efficiency in strategies

- By the end of Year 6 it is expected that students are efficient with flexible additive, multiplicative and fractional strategies to be able to hit the ground running. As always, students will have varying efficient strategies that work for them, however they need to be prepared to enact these strategies from the beginning.

Organisation

- Students in secondary school will often be required to organise themselves and bring their textbooks, pencil case, diary and computer to each class. The more independence given to students in Year 6 to be responsible for knowing which books and equipment are required for each lesson, the easier the transition into Year 7 will be.

LOWER SECONDARY

Relationships

- These are key in primary settings. Students will be used to working with one main classroom teacher in which they develop a strong relationship with over the course of the year. Students have deep trust in their teachers and feel an element of safety in their learning, knowing that their teacher will approach their learning with curiosity and not judgement. How can the secondary school encourage a similar feeling of safety to be built up within the first few weeks of transitioning to Year 7?
- Taking the time to discuss with students the routine for each class, the pace of the lessons, materials required and how students can contact their teachers is key in continuing to develop a positive mindset towards mathematics.

Keep in mind these students now need to manage a lot of new teacher relationships whilst adjusting to a new school so be patient with them!

Concrete materials

- Many students experience mathematics using concrete materials, so when the content becomes more abstract, how do they attend to these concepts without the use of concrete materials? Where possible, it is essential that concrete, representational and abstract (CRA) models are presented consistently.
- The use of anchor charts is essential for students to revisit and recall prior knowledge. Where possible they should be displayed in mathematics classrooms to enable students to utilise these resources that they are familiar with from primary school and encourage students to be independent learners.

Problem solving

- All primary school students are familiar with problem solving and thoroughly enjoy the challenge. Keeping in mind a solid cycle of practice and application of skills to be taught in real life scenarios is also essential for ensuring engagement in mathematics. Year 7 teachers should carve out time for collaborative problem solving, games, relationship building activities and build this into their curriculum planning.

Connection to the world

- All students want to understand their role and part in the community and ensure they feel a part of it. Ensuring that the mathematics being taught is being shared in relation to real life and students' own contexts is incredibly important. This is an area all teachers should actively ensure is built into their planning.

CONCLUSION

There are so many considerations when students are transitioning from primary school to secondary school, the information here touches on what we think are the most important and easy to implement.

Primary schools have a great advantage of a close student-teacher relationship where there are great opportunities to practise good organisation, build the habit of seeking help and supporting students to understand the routine of secondary school.

Secondary schools should remember that each student has arrived with a different primary school experience, and they will need to encourage and show students how to be organised, how they can access help and what their daily routine will look like.

Emphasising the student-teacher relationship throughout primary and secondary school can be the difference that students need to flourish in a mathematics classroom.

REFERENCES

Attard, C. (2010). *Students' Experiences of Mathematics during the Transition from Primary to Secondary School*. Mathematics Education Research Group of Australasia.

To discover more about how MAV can support your students transition to from primary to secondary, reach out via email to our friendly team: primary@mav.vic.edu.au or secondary@mav.vic.edu.au.

SOLUTIONS FROM PAGE 21

1. In this dataset of 23 values there are 18 1's, three 2's and two 3's. The minimum, Q1, median and Q3 will all have the value 1, hence a single vertical line will represent all four values. The IQR will equal zero ($1 - 1$), hence the upper and lower fences will also be 1. The three 2's and two 3's will each appear as a single outlier.

2. There will be no change, as one outlier value (2) becomes the other outlier value (3).

3. In this dataset of now 24 values there are 19 1's, two 2's and three 3's. The minimum, Q1, median and Q3 will all still have the value 1, hence a single vertical line will represent all four values. The IQR will equal zero ($1 - 1$), hence the upper and lower fences will also be 1. The two 2's and three 3's will each appear as a single outlier.

VIBRANT COMMUNITIES

Claire Embregts, Community strategy manager, MAV

BUILDING VIBRANT COMMUNITIES: NAVIGATING CHALLENGES AND MAXIMISING IMPACT

Community activities, the lifeblood of any thriving community, not only foster a sense of belonging and unity but also offer numerous personal benefits. Engaging in various activities with fellow community members promotes social interactions, builds relationships, enhances personal wellbeing, and contributes to the overall vibrancy of the community. Engaging in community activities creates a supportive and collaborative network, enhances community engagement, knowledge sharing, and professional growth. This personal growth and fulfilment that community engagement brings can be a powerful motivator for educators.

Let's explore the importance of community in professional practice and how to integrate engagement into your daily practice.

ENHANCING COLLABORATION THROUGH COMMUNITY BUILDING

Creating a sense of community within a professional association can significantly increase collaboration, knowledge exchange, and support among members. By fostering connections and relationships through community engagement activities, educators can enhance their professional development, gain new perspectives, and stay informed about current trends and practices in their field. Members participating in conversations, meetups, chats, and discussions can help build a strong community of practice where individuals feel valued, respected, and supported in their professional growth.

CONNECTIONS

Organising meetups and events is a powerful way for members to network, collaborate, and engage in professional learning. These connections, through meetups, workshops, conferences, or webinars, provide opportunities for educators to share best practices, participate in hands-on activities, and discuss relevant topics in their field. They facilitate community building, knowledge sharing, and peer support, creating

a dynamic professional growth and collaboration environment. By offering a platform for members to connect, meetups and events contribute to building a cohesive and engaged community of practice.

FROM LURKER TO PARTICIPANT

Engaging in discussions within the online community platform can promote ongoing communication, idea sharing, and collaboration among members. Continuous learning refers to the process of acquiring new knowledge and skills on an ongoing basis. Utilising message features, discussion boards, or blogs with the community enables educators to engage in real-time conversations, ask questions, share resources, and seek feedback from their peers. These interactive communication channels create a space for continuous learning, reflection, and dialogue within the community, fostering a culture of open communication and knowledge exchange.

BALANCING ENGAGEMENT WITH WORK COMMITMENTS

While integrating community engagement methods into professional practice can yield numerous benefits, it's essential to acknowledge the challenges. Balancing the time and resources required to participate in one-on-one conversations, meetups/events, chats, and discussions alongside other work commitments can be a common challenge for educators. However, finding ways to prioritise community engagement activities by setting boundaries and allocating time for community can help mitigate these challenges and ensure active participation and contribution within the community.

CONSIDERING BROADER IMPACT

When making decisions about community activities, it is essential to consider their broader impact on the community. Community activities provide opportunities for socialisation and recreation and contribute to the community's overall wellbeing and resilience. By understanding the key factors influencing community activities and prioritising inclusivity, accessibility, and broader impact, we can create engaging and inclusive activities that contribute to a more cohesive, resilient, and vibrant community for everyone to enjoy.



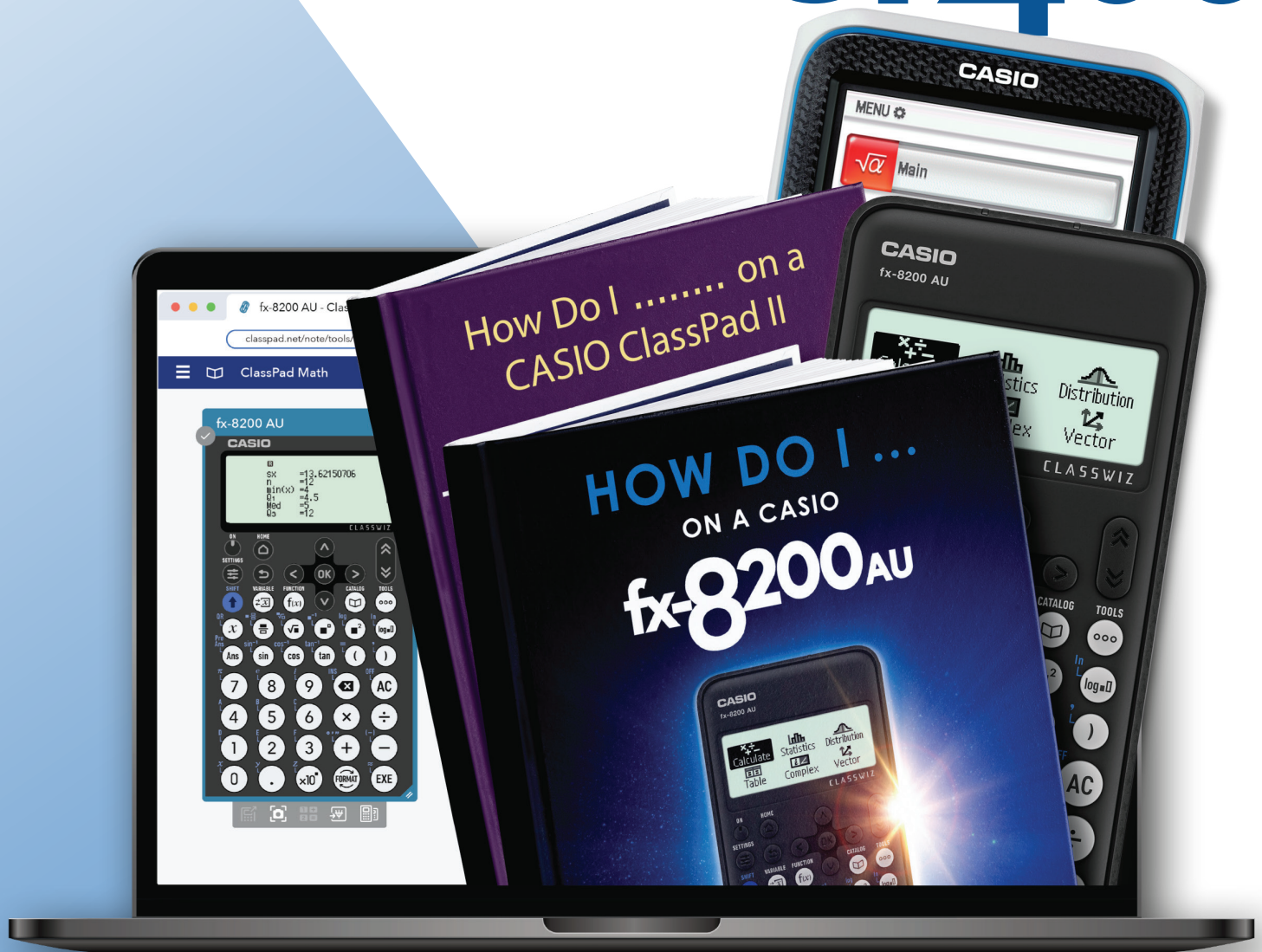
SUMMARY

Fostering a sense of community within a closed online community of practice is essential for enhancing professional practice, collaboration, and knowledge sharing among members. By leveraging the engagement methods I've described in this article, educators can build meaningful connections, engage in continuous learning, and contribute to a supportive and dynamic community of practice.

Join us in this endeavour, together, we can shape a community that not only grows in numbers but thrives in the richness of diverse interactions.

If you're a maths educator looking to grow your skills, expand your network, and access valuable resources, you can join our community at www.mav.vic.edu.au/Membership/Community.

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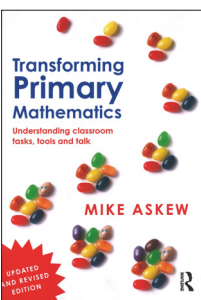
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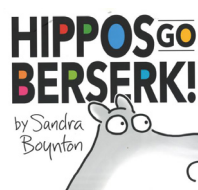
K-6

This is the mathematical adaptation of 'Spot it'. Each pair of cards has exactly one mathematical match. Be snappy, the first to find it scores a point. This fast-paced game will help:

- Improve fluency and flexibility with numbers
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K-3

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