THE MATHEMATICAL ASSOCIATION OF VICTORIA

THE COMMON DENOMINATOR 4/23

GRIEF IN MATHEMATICS EDUCATION

INSIDE

Robert Kaplinsky, Consultant, robertkaplinsky.com

THE FIVE STAGES OF GRIEF IN MATHEMATICS EDUCATION

If your F–12 mathematics experience was anything like mine, people thought you were good at mathematics because you were able to quickly get correct answers by robotically following steps you were given by your teacher or textbook. I know that at the time, I didn't see anything wrong with that, and I used this process to get through my university work and graduate with a degree in mathematics.

Unfortunately, my beautiful, fake reality started to crumble in my first year of teaching when the person leading a professional development on dividing fractions asked everyone a seemingly simple question: why do we invert and multiply?

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THE COMMON DENOMINATOR
The MAV's magazine published for its members.

Magazine 289, October 2023

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The Common Denominator is edited and produced by Louise Gray, Stitch Marketing.

Print Post Approved Publication No: PP100002988

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FROM THE PRESIDENT

Kerryn Sandford

My last column focused on the theme of change and that theme continues with the recent launch of the Victorian Curriculum: Mathematics 2.0.

For many mathematics educators across Victoria, this will be the first major change to a curriculum structure that they have experienced. For others like myself, it is the latest of many. This new curriculum is almost as exciting and as much of a game changer as the introduction of the VELS (Victorian Essential Learning) curriculum was, back in its day. I look forward to unpacking it with my team and am thankful for the extension of the implementation timeline that was announced at Principal Area Forums to provide schools and educators with the time to do exactly this. I am encouraged by the promise of additional supports that will be published by VCAA and know that the MAV is also hard at work developing resources and professional learning to help schools and educators make the most of this new curriculum.

For me, the new curriculum provides a lot of scope for educators to heed the advice provided by Robert Kaplinsky in his article (page 1) about the need to change how we approach the teaching of mathematics. Robert makes very strong points about the changing needs of learners and how teaching for procedural fluency on its own will not be enough to support students to develop both the mathematical and numeracy competencies that are so sorely needed for life beyond school. This new curriculum, with its emphasis on mathematical modelling and statistical investigations, invites educators to consider the links between mathematical concepts and students' lived experiences and real-world realities. Robert also makes the point that for many educators to really adopt the changes required to implement this curriculum as intended, there is a need for additional support and professional learning. If you would like a MAV consultant to come out and work with your team to unpack the new curriculum and consider what changes they might need to make to their practice, please reach out to Danijela Draskovic, ddraskovic@mav.vic.edu.au (secondary) or Dianne Liddell dliddell@mav.vic.edu.au (primary).

In my last column, I talked about the importance of educators considering how to better incorporate Aboriginal and Torres Strait Islander perspectives and knowledge into their teaching of mathematics and it is wonderful to see so many ways in which this new curriculum supports that work. I am so proud to see teachers from my own team mentioned in Caty's article (page 8), on the work of ATSIMA. The ATSIMA conference is coming up in October in Yirrkala, and I am excited to attend, representing both the MAV and my school. I will bring back as much learning as I can to share with all of you so please, stay tuned!

2023 MAV CONFERENCE

MAV23 promises to be an enriching and engaging experience with diverse content. Each day, you can look forward to attending one of the five captivating keynotes, where renowned speakers will share their insights and expertise on various relevant topics.

The conference offers an impressive selection of 100 sessions daily. These sessions will cover a wide array of subjects, providing valuable learning opportunities and fostering discussion on important industry trends, innovations, and best practices. See the sessions on offer by viewing the synopsis at www.mav.vic.edu.au/Conference/Annual-Conference.

By participating in the MAV23 Annual Conference, you can network with professionals, educators, and enthusiasts from your field and beyond, creating connections that can benefit your personal and professional growth. Don't miss this fantastic opportunity to gain knowledge, inspiration, and valuable connections.

THE MATHS EVENT OF THE YEAR

It's the highlight of the Victorian mathematics education calendar! Register now at www.mav.vic.edu.au/Conference/Annual-Conference.

VICTORIAN MATHS CURRICULUM

Michael MacNeill – VCAA Curriculum Manager for Mathematics

THE VICTORIAN CURRICULUM F–10 MATHEMATICS VERSION 2.0

The revised Victorian Curriculum F–10 Mathematics Version 2.0 (Mathematics Version2.0) released last term represents a refreshed opportunity for Victorian teachers and their students to engage with our subject with a renewed sense of enthusiasm.

Mechanisms within the curriculum can achieve this in several ways, including clarity of expression in the content and increased connection to technology-supported learning, and computational and algorithmic thinking.

Importantly, the revised curriculum now features mathematical modelling and statistical investigations, where students may increasingly develop skills that permit them to seek connections between the more abstract ideas and with their own real-world experiences.

The revised curriculum has ensured a continuity of learning progression through alignment with the Victorian Early Years Learning and Development Framework (VEYLDF) across Levels F–2, providing greater opportunity for students to engage with play and curiosity-based learning.

Increased opportunity exists across Levels 9 and 10 for students to engage with pseudocode as a language for exploring ideas through computational thinking. There is an increased richness to how mathematical knowledge and skills are represented, increasing accessibility to the ideas and outcomes for teachers, parents and students – this is a curriculum for our subject that seeks to connect people and make relevant the ideas for all involved in the learning process.

In writing Mathematics Version 2.0, our prominent intention was to ensure that the ideas, skills and knowledge at each level were expressed with increased clarity of expectation, supporting teachers by reducing any inference.

Content descriptions were more explicitly linked to achievement standards, the proficiencies were woven through the levels, again supporting teachers, and the cross-curriculum priorities were written to promote connections across the curriculum.

WHAT'S REQUIRED FROM TEACHERS

The VCAA has developed a variety of supporting resources to assist teachers with not only understanding the curriculum but also how Mathematics Version 2.0 can begin to fit within a whole-school curriculum picture.

There remains, however, no substitute for reading the curriculum to identify points within the Levels where the topics that resonate with individual teachers are placed. Part of the support resource suite includes a comparison document so that school curriculum planners will be able to see the transition between the current Mathematics Curriculum and Mathematics Version 2.0.

WHAT TEACHERS NEED TO KNOW

While the scope of any given topic within the curriculum, that is, the extent of procedural and mathematical knowledge, has not changed dramatically, the phrasing and direction of the content descriptions will look different on a first read.

Teachers of Levels F–2 will immediately notice that Probability is absent and commences in Level 3, allowing students to consolidate the key foundational concepts of counting and fractions, as well as some experience in noticing and recording statistics for categorical data, before embarking on the discovery of randomness and chance.

Teachers of Level 10 will find reassurance that the vital knowledge and skills developed through the F–10 curriculum will continue to provide a sure footing for students seeking to engage with any of the VCE Mathematics suite.

WHAT'S CHANGED

Mathematics F–10 Version 2.0 does look different to the current version of the Mathematics Curriculum. Some of the key differences are:

- demystifying expectations on teachers by having the content written in a clearer fashion
- increasing the number of content elaborations – the ideas for lesson starting – and making these clearer to provide options for teachers to contextualise the content
- the inclusion of mathematical modelling and statistical investigation, to ensure students have the opportunity to build a bridge between the foundational mathematical knowledge with associated procedures and the real-world application
- where resequencing of ideas has occurred, a more streamlined teaching of ideas has been facilitated, optimising the opportunities students have to scaffold their learning through the levels.

WHERE TO LEARN MORE

Teachers and school leaders wishing to find out more are able to reach out to the Curriculum Manager for Mathematics at the VCAA, by visiting the VCAA website and registering for F–10 updates.

PLANNING VICTORIAN CURRICULUM 2.0 MATHEMATICS

MAV are prepared and looking forward to exploring the advancements in mathematics education with the upcoming revised Victorian Curriculum 2.0 Mathematics with our members. The revised curriculum offers improved coherence, reduced overlap of content, and connections between concepts. Enjoy the benefits of clear elaborations and achievement standards, fostering deeper understanding for our students.

MAV are collaborating with the VCAA, Department of Education, and Catholic and Independent authorities to provide support to Victorian teachers. Our commitment lies in tailoring top-tier professional development and planning assistance for your school's unique needs.

For more information about how MAV can support your school as you familiarise and move towards implementing the curriculum contact Danijela Draskovic, ddraskovic@mav.vic.edu.au (secondary) or Dianne Liddell dliddell@mav.vic.edu.au (primary) or visit www.mav.vic.edu.au/Services-and-News/In-School-Consulting.

GRIEF IN MATHEMATICS EDUCATION

Robert Kaplinsky, Consultant, robertkaplinsky.com

CONT. FROM PAGE 1.

The question caught me off guard because of something I didn't want to admit to myself: I had no idea.

THE FIVE STAGES OF GRIEF

Over the next couple of minutes, I progressed through four of the five stages of grief. I started with denial and told myself that if I'd made it to this point in life, knowing why we did it didn't matter. Next came anger when I got frustrated that the leader would ask us such an unimportant question. Then came bargaining when I told myself that I could just look up why in a textbook if I ever needed to know it. Then came depression when I realised that there might actually be cracks in my façade that were too scary to acknowledge.

And honestly, I lived there for a while because I was not ready for the fifth stage: acceptance. Acknowledging that somehow, I, the person everyone commended for being so good at mathematics, was actually not good at mathematics, was not easy. So many thoughts raced through my head. Was I the only one who didn't understand this? What if this was just one of many things I could do in mathematics but had no idea why it worked? If others didn't understand this, what did that mean about how we were taught mathematics?

Acceptance eventually came with a realisation that if I wanted to be the best possible mathematics teacher for my students, I was going to have to make a change. I couldn't be angry about the way I was taught mathematics *and* do the same damn thing to my students. While it wasn't my fault that this had been my mathematics experience, it would be my fault if I continued to do to them what had been done to me.

DEEP UNDERSTANDING

Unfortunately, deeply understanding mathematics is not as simple as just flipping a switch. When you start to think about all the things you should know in F–12 mathematics but don't, it quickly becomes overwhelming. I began by thinking about a mathematics concept and considering whether I deeply understood it. I defined deep understanding using three components:

1. Knowing how to procedurally compute an answer.
2. Having conceptual understanding of why it worked.
3. Being able to apply the skill to real life.

When I looked at each standard I was supposed to teach, I kept finding that I rarely had all three components. This was disturbing.

If we agree that the way we learned mathematics was not ideal, then where we go from here? It's uncomfortable to admit that the vast majority of the mathematics we teach, no one actually uses again. Somehow no one is surprised by that statement, yet society does little to change the status quo.

When we take a step back and think about what the purpose of F–12 mathematics education is, the answer is usually related to preparing students for whatever comes after, including university and careers. I understand why we say this, but it's a lie.

Consider how the skills you'll need to be successful in university and careers in 2030 are far different than the skills you needed to be successful 50 years earlier in 1980. What does that mean then, when the skills you'll need changed dramatically over that 50 year period yet the mathematics standards we use are essentially the same? We're kidding ourselves if we think that the skills we're currently teaching students will prepare them for what's ahead. In reality, they're going to be tragically under-prepared unless what we teach and how we teach it change to truly match what students will need.

WHAT DO STUDENTS NEED?

All of this begs a challenging question: what mathematics do students need? A thought experiment I find to be very useful is to imagine that F–12 mathematics standards had never been created. Tomorrow you and your colleagues will sit down to create them for the very first time. What standards will be the same as before and what will be different?

You probably wouldn't be surprised to see a blend where some standards stay the

same while others disappear or emerge. Personally, I'd expect computation skills to be deprioritised while problem solving and applying mathematics to real life become much more important. But even if you agree with everything I've written so far and you also want to make mathematical problem solving more of an emphasis, we can't just snap our fingers and fix it.

Unfortunately, when we were F–12 mathematics students and even newer mathematics teachers, problem solving was not an emphasis. As a result, we may have rarely experienced learning mathematics through problem solving as students or been provided with professional development on how to do it as teachers.

This means that many of us would be expected to teach our students using strategies that we may not feel fully comfortable with because we also have little experience with them. It's an uncomfortable reality that can only be fixed by extensive and ongoing professional development.

RESOURCES TO TURN TO

Fortunately, there have been two game changing books that have paved the path for what mathematical problem solving could and should look like going forward. They are the two most important books I mathematics education books I have ever read. Those books are *5 Practices for Orchestrating Productive Mathematics Discussions* by Peg Smith and Mary Kay Stein as well as *Building Thinking Classrooms in Mathematics* by Peter Liljedahl. These books have given me strategies I use to consistently help students learn mathematics via problem solving.

HAVE THE CONVERSATION

To be clear, I do not have this all figured out and I expect that I'll be working on this for the rest of my career. What I do know is that the global mathematics education community cannot continue to ignore this issue and pretend like it will resolve itself. We need to have tough conversations about what mathematics we teach and how we support our educators. We're in denial if we think the way we're teaching mathematics is meeting our students' needs. We're angry because we're being put into an impossible situation without the time, resources, or compensation to make it happen. We're bargaining if we keep rationalising our inactions because we're waiting for someone with more authority to take charge and make changes. We're depressed because being an educator has not been harder in our lifetimes. But if we want to move forward with this grief, we need acceptance of this reality so that we can have meaningful conversations about the changes that are possible instead of repeating the mistakes of our predecessors.

Robert Kaplinksy will present a keynote *How I blend Building Thinking Classroom and the 5 Practices* at the 2023 MAV conference. To register, visit www.mav.vic.edu.au/Conference/Annual-Conference.

DOING IT DIFFERENTLY

Dr Carly Sawatzki – Deakin University

STUDENTS WANT TO LEARN ABOUT FINANCE IN MATHEMATICS. SO, WHAT CAN WE DO DIFFERENTLY?

Regardless of their age, school students are learning about money within their families, friendships, and online (including via media and social media). Before they hit your classroom each day, most have experienced financial exchange of some sort, usually involving technology. For example, flicking a light switch, scrolling on their phones, and tapping on public transport are all invisible financial behaviours that impact the family budget.

I have been working with academic colleagues, teachers and students to research financial education in schools in Australia and New Zealand for more than a decade. Over this time, I have learned that while teachers believe that financial education is important, they often struggle to know what and how to teach about money. This is an issue that I will explore fully in my keynote address at MAV's Annual Conference. The purpose of this article is to give an overview of recent curriculum developments and other projects that are relevant to teachers of mathematics.

WHAT DO WE KNOW FROM EDUCATIONAL RESEARCH?

Educational researchers in Australia and overseas argue that we can be doing more to prepare young people for the sorts of problems and risks modern financial life is throwing up - and mathematics education has an important role to play.

I recently led a Deakin University study that revealed practical insights for secondary school leaders and teachers.

The first insight is that secondary school students want better opportunities to learn about finance at school. Teenagers in our study told us that their families and communities are encouraging them to plan their financial behaviour and delay gratification by saving and investing. They wanted their schooling to provide the practical financial skills to follow through on this advice, so that they can achieve financial independence and wellbeing. See Figure 1.

Related to this, secondary school students want help making cross-curricular connections. Most of the students we surveyed agreed or strongly agreed that learning mathematics and learning about the economy can help them make informed financial choices. However, less than half agreed or strongly agreed that they could see clear connections between their learning across these disciplines. In fact, one in five could not see these connections at all. This result suggests not only that economic and financial contexts are not being used to contextualise mathematics teaching and learning, but also that mathematical knowledge and skills are not being drawn upon across the curriculum, as is the intention of the numeracy general capability.

The second insight is that teachers want to be shown how to design and implement better programs and lessons. The teachers we worked with saw benefits to working in interdisciplinary teams to develop the sorts of innovative finance-related programs and lessons that students want. They described wanting help connecting economic and mathematical content and concepts with contemporary financial contexts, along with support to tap into knowledge networks within their schools. It's important that school leaders make time for teachers with complementary knowledge (i.e., teachers of economics and mathematics) to form relationships and join forces to strengthen existing programs and lessons, and even design new offerings.

THE CURRICULUM IS A BLUEPRINT, NOT A CHECKLIST

While it can be tempting to teach and tick content descriptions, ACARA's implementation advice implies a valuing of teacher autonomy, agency, and collegiality, as well as respect for diverse learners and tailored approaches. ACARA specifies that:

> The Australian Curriculum can be used flexibly by schools according to jurisdictional and system policies and schedules, to develop programs that meet the educational needs and interests of their students as well as ensuring that schools extend and challenge students. Schools implement the Australian Curriculum in ways that value teachers' professional knowledge, reflect local contexts and take into account individual students' family, cultural and community backgrounds.
> - (ACARA, 2022a)

THE DISCIPLINE OF MATHEMATICS, AND MATHEMATICS TEACHERS AND TEACHING, MATTER

Because mathematics is core learning, mathematics teachers can reach and teach more students. And students' financial activities and interests offer rich contexts for mathematisation.

The new mathematics curriculum emphasises 'the importance of students learning how to apply mathematics to authentic real-world contexts' (see ACARA, 2022b) and makes explicit reference to teaching and learning about money and financial contexts within Achievement Standards from Years 2-10. The curriculum also specifies that students will learn to use mathematical modelling to solve practical and applied problems, including in financial contexts.

The numeracy general capability continues to encourage teachers to identify the numeracy demands that exist across the curriculum and give students opportunities to transfer and use their mathematical knowledge and skills across the curriculum and in the real world. For example, the curriculum specifies that 'Humanities and Social Sciences and Mathematics share a focus on consumer and financial literacy, including understanding the principles of financial management to make informed consumer, financial and business decisions.' (ACARA, 2022c).

EXCITING DEVELOPMENTS SUPPORT TEACHERS AND STUDENTS IN VICTORIA

In Victoria, the above insights have informed VCAA's efforts to strengthen secondary school students' access to financial education via the new Victorian Curriculum, VCE Foundation Mathematics, and the Numeracy Vocational Major. For the past two years, MAV's Maths Talent Quest has included a financial literacy challenge sponsored by DET Victoria. These are exciting developments.

However, as the financial landscape is dynamically changing and increasingly risky, educational research, teaching resources, and teacher professional learning must also be current and ongoing. Financial education is a project across the curriculum and the lifespan.

REFLECT AND DISCUSS WITH COLLEAGUES

Below are five examples of useful mathematical tasks with a modern twist. Does your school provide access to this learning? Is there the opportunity to strengthen what is offered across year levels and learning areas?

1. Making sense of the language, calculations and graphs on a range of financial statements. Examples include payslips, invoices, bills, and tax and super notices.

2. Comparing and choosing between products and services. Examples include energy providers, bank and non-bank alternatives, entertainment subscriptions, and Internet and mobile service providers.

3. Investigating the effectiveness of financial regulation and protection. Students might draw on mathematics to define risks associated with 'get rich quick' schemes, data breaches, scams, and cases of fraud and corruption.

4. Examining market reports, and comparing and choosing between different investment options. Examples include superannuation, property, shares and cryptocurrencies.

5. Evaluating political, media and social media stories about economics and finance. Examples include reports about election promises and budgets, as well as posts by Insta and TikTok finfluencers.

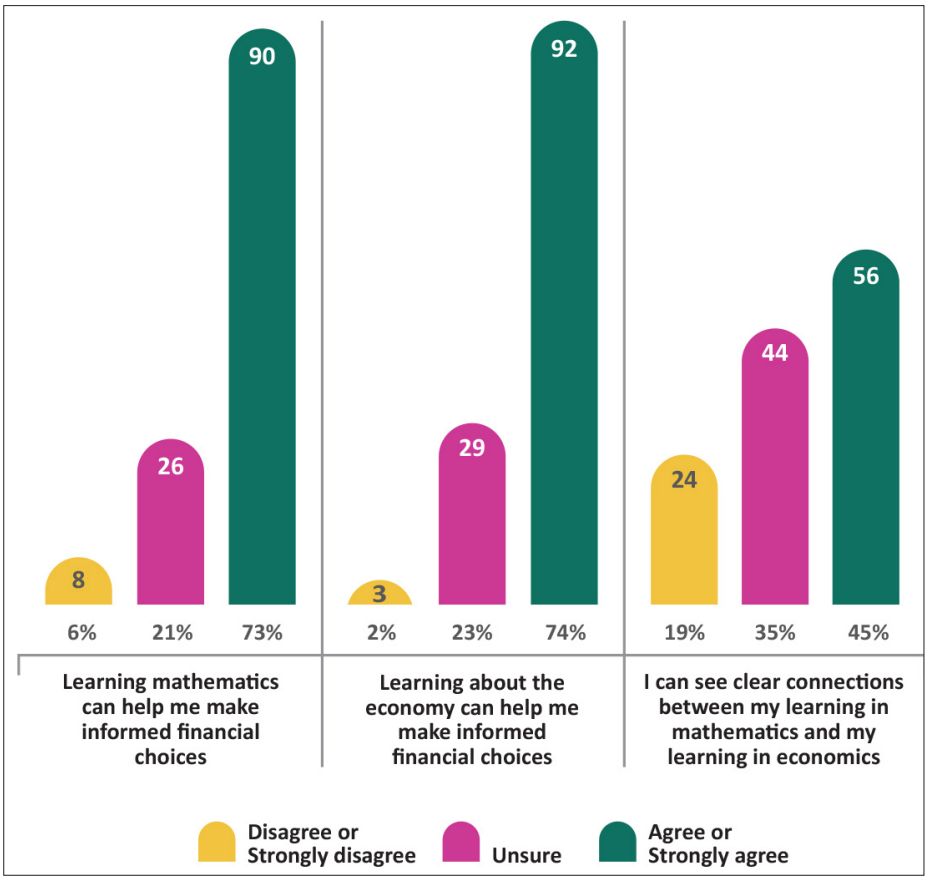

Figure 1. Students' learning about finance at school (n = 124).

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Carly is giving a keynote address at at the 2023 MAV conference. Carly will explore recent F–12 curriculum developments, what these changes promise students, and what you can do to better connect young people's real and mathematical worlds. This session will appeal to school leaders and Foundation - Year 12 teachers.

To register, visit www.mav.vic.edu.au/Conference/Annual-Conference.

CULTURALLY RESPONSIVE MATHS

Dr Caty Morris – Aboriginal and Torres Strait Islander Mathematics Alliance (ATSIMA)

Figure 1.

CULTURALLY RESPONSIVE MATHEMATICS EDUCATION: TEACHING MATHS THROUGH ABORIGINAL AND TORRES STRAIT ISLANDER HISTORIES AND CULTURES

In my recent role as ACARA's Curriculum Specialist, Aboriginal and Torres Strait Islander Education, I had the great privilege of working with Professor Chris Matthews from the Aboriginal and Torres Strait Islander Mathematics Alliance (ATSIMA).

Together, we developed over 100 content elaborations in the Aboriginal and Torres Strait Islander Histories and Cultures cross-curriculum priority (CCP) for the latest version of the Australian Curriculum: Mathematics. This endeavour involved a lot of research, discussion and deliberating about locating appropriately and respectfully First Nations' content in the maths curriculum. We wanted to honour ways of being, knowing, thinking, and doing in culturally responsive ways, knowing that we were tasked with locating all of this within a Western framework.

Whilst we lost some content elaborations because of the parameters in Western understandings of mathematics, we were able to weave some narratives through the F–10 years levels and through the six strands of the Australian Curriculum: Mathematics.

These narratives are based on the nine rich contexts that we connected the elaborations back to through the three key concepts of the CCP:

- Country/Place
- Culture and
- People

This can be seen in Figure 1. The nine rich contexts are inextricably connected, for example, knowledge systems exists in all nine contexts. The 91 elaborations that made the final publication of version 9 of Australian Curriculum: Mathematics are only the tip of the iceberg in what is possible; we know that there are so many more maths situations, maths stories and maths contexts that could (and should) be included.

Since leaving ACARA, I have been working with ATSIMA on several projects including the development and delivery of professional learning programs for schools and education systems, and the development of culturally responsive mathematics resources for the classroom.

We incorporated Professor Matthews' Goompi Model into these programs and resources and embedded the new content elaborations we developed. The Goompi Model was created on Quandamooka Country in Queensland and describes a process of teaching as outlined in Figure 2.

The results from this approach to teaching and learning so far reveal a significant increase in student and teacher engagement by connecting culture with mathematics.

Critically, a collaboration between First Nations educators and teachers and the localisation of cultural content are features of the Goompi Model. I have seen some amazing things in our schools, such as the teaching of place value through local contexts and cultural content that have

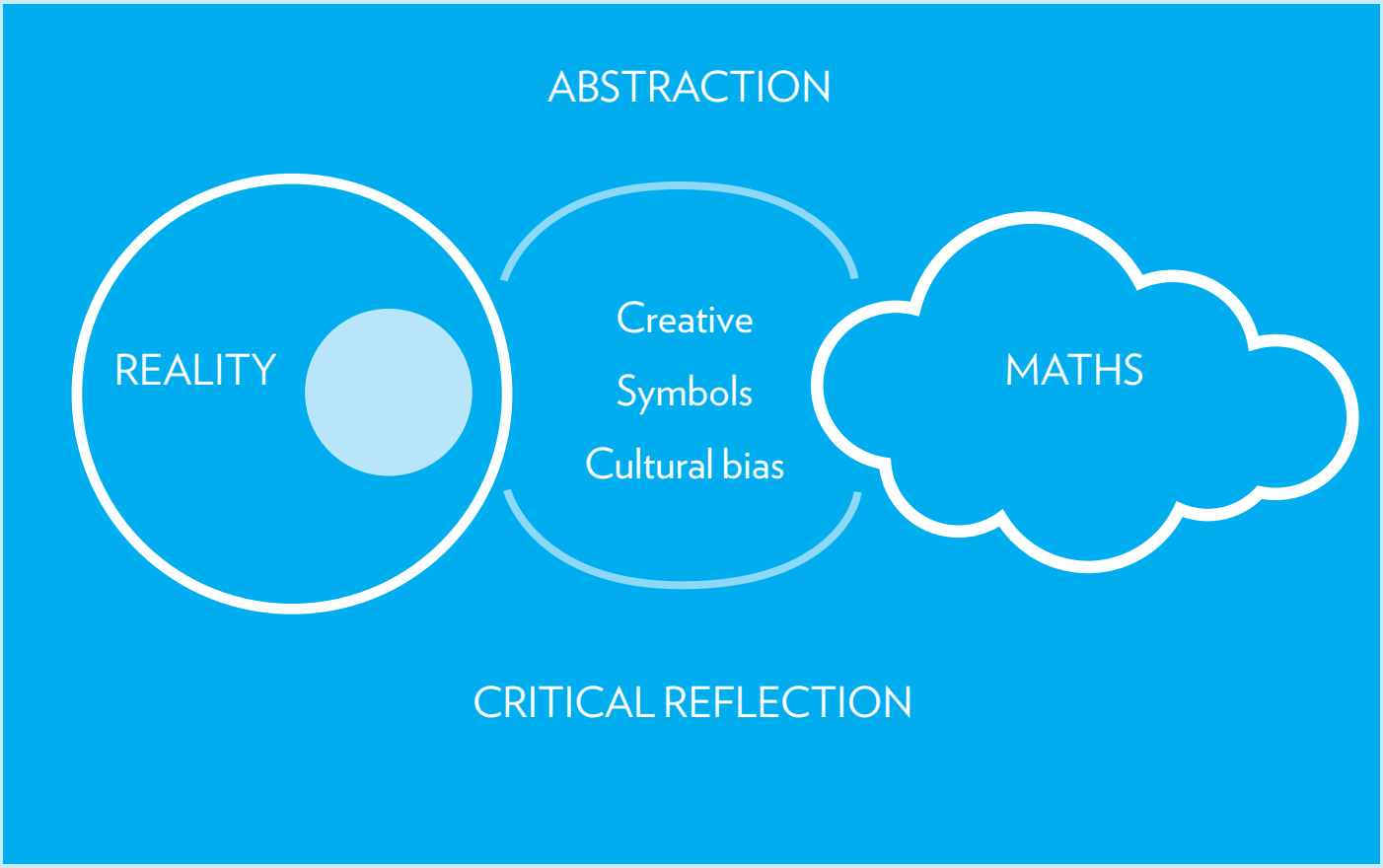

Figure 2.

allowed teachers to teach maths creatively by starting with students' realities, the importance placed on students' own symbolic expressions of mathematics and connecting this with the mathematics required in the curriculum.

During 2022, I had the privilege of working with two schools in Melbourne to develop classroom resources. An example of this work comes from Jess and Shane from Heathmont College who produced a Year 7 statistics unit of learning that focused on the Wurundjeri Season. The learning intentions include:

- to understand the seasons used by the First Nations Peoples of the Kulin Nation;
- to understand that change of season is based on environmental changes, not time of the month; and
- to be able to statistically analyse birth months and Kulin Nation seasons.

Curriculum content covered includes the Organising Idea A_TSICP1 from the Aboriginal and Torres Strait Islander Histories and Cultures cross-curriculum priority: First Nations communities of Australia maintain a deep connection to, and responsibility for, Country/Place and have holistic values and belief systems that are connected to the land, sea, sky and waterways. Content from the mathematics curriculum includes calculating mean, median, mode and range for sets of data, and interpreting these statistics in the context of data.

Nicholle and Ross from Brookside College developed units of learning for Years 1 and 3 that include teaching fractions through a range of contexts including First Nations use of local native plants, and quill necklaces. Students explore these cultural contexts and learn different mathematical concepts through them.

ATSIMA's focus continues to remain on developing and delivering customised professional learning programs with, and for, schools and education systems and integrating culturally responsive maths resources into these programs.

We are in the process of designing a 36-hour course for educators plus a 12 hour train-the-trainer course.

Our unique conferences are held biennially with the next one on Yolngu Country at Yirrkala in Northeast Arnhem Land from 9-11 October 2023. To access our resources, join ATSIMA, www.atsima.com.

To learn more about Indigenous education in mathematics, register to attend Dr Chris Matthews' keynote at the 2023 MAV conference. To register, visit www.mav.vic.edu.au/Conference/Annual-Conference.

EARLY MATHS EXPERIENCES

Di Liddell - Primary education consultant, MAV

THE SIGNIFICANCE OF EARLY MATHS EXPERIENCES IN PRIMARY EDUCATION

Early childhood education plays a pivotal role in shaping a child's academic journey, and among the subjects taught during these formative years, mathematics holds special significance. Research consistently demonstrates the profound impact that early mathematics experiences have on long-term academic success. This article explores the connection between early mathematics experiences and academic achievement, emphasising the importance of creating a supportive and stimulating mathematics environment for young learners.

Early mathematics experiences act as building blocks for future learning, enabling children to develop essential cognitive and problem-solving skills. Through mathematics activities, children enhance their critical thinking, logical reasoning, and spatial awareness abilities and studies have shown that early maths skills predict later mathematical achievement (Duncan et al., 2007; Jordan et al., 2009).

MATHS IS A PATHWAY TO LONG-TERM SUCCESS

Research conducted by Duncan et al. (2007) highlights a positive correlation between early maths proficiency and overall academic achievement. Strong mathematics skills in the first years of formal schooling are associated with higher performance in various subjects in later grades, including reading and science. This suggests that early mathematics experiences not only impact mathematical abilities but also contribute to a broader academic foundation.

Additionally, a longitudinal study by Jordan et al. (2009) followed children from Foundation through to Year 5 and found that early mathematics skills were strong predictors of later mathematics achievement. Children with a solid foundation in early maths concepts and number sense displayed higher mathematics skills throughout their academic journey. This underscores the significance of investing in early mathematics education to set children on a path to long-term success.

THE RIGHT ENVIRONMENT

Creating a supportive and stimulating mathematic environment is crucial for fostering a child's mathematical development. By providing a supportive environment, children feel encouraged to explore and engage with mathematical concepts, developing a positive attitude towards mathematics that enhances their motivation and enthusiasm for learning.

A stimulating mathematics environment offers opportunities for hands-on activities, problem-solving tasks, and collaborative learning experiences, enabling children to apply their mathematical knowledge in practical and meaningful ways. Moreover, it helps build critical thinking, logical reasoning, and analytical skills that are essential for success in academic and professional endeavors. Ultimately, a supportive and stimulating maths environment lays the foundation for a child's lifelong mathematical learning and equips them with valuable skills for their future endeavors.

CREATING THE CONDITIONS

To create such an environment, primary educators should consider several key factors.

1. Incorporating play-based learning through games, puzzles, picture story books and manipulatives that engage children's natural curiosity and encourage active exploration, improving comprehension and retention (Gelman & Brenneman, 2004).

2. Integrating maths into real-life situations helps children understand the relevance and practicality of mathematical concepts, such as counting and measurement during cooking or building exercises (Clements & Sarama, 2007).

3. Skilled educators play a vital role in providing guidance and support, offering developmentally appropriate challenges and scaffolding learning experiences to suit individual needs, while employing effective instructional strategies like modeling and questioning to promote mathematical thinking and problem-solving skills (NCTM, 2020).

Finally, parental involvement is crucial in reinforcing maths skills outside the classroom. Collaborating with parents and caregivers, sharing resources, suggesting maths-related activities, and encouraging mathematical conversations at home can help children consolidate their learning and improve academic achievement, including maths performance (Epstein, 2010).

Early mathematics experiences serve as a springboard for long-term academic success. By creating a supportive and stimulating math environment, primary educators can empower young learners to develop essential mathematical skills and lay the foundation for future mathematical proficiency. By prioritising early mathematics education and implementing research-supported strategies, we can pave the way for a generation of confident and successful mathematicians.

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A PEEK INSIDE MATHS CAMP

Connor Tarrant – student at St Mary of the Angels, Nathalia

MAV hosts an annual maths camp for regional Year 10 students. The aim of the program is to provide a chance for students to gather, with like-minded peers and work in small groups to explore hands-on, industry problems. Students work in a team to complete a real-world mathematics project. Student Connor Tarrant from St Mary of the Angels shares his experience:

The MAV 2023 Mathematics camp provided me with a vessel to explore, understand and overcome my social insecurities, while simultaneously stimulating my brain with problems and conundrums. The week began at the Victorian Space Science and Education Centre, where we conducted biological experiments with astronaut samples and DNA, kickstarting our week of learning and curiosity. In the evening, we participated in an escape room, showcasing our problem-solving skills reflected in a group environment.

Wednesday began with a forum at the Reserve Bank Melbourne office, where Junior Economists Madison Terrell and Chris Schwartz introduced us to the intricacies of the economy and the RBA's crucial role in regulating supply and demand.

Next was Ford, where we gained insights into virtual-reality prototyping and pre-production processes, and how they use these technologies to save the company hundreds of thousands of dollars.

The week concluded with Python coding at Texas Instruments (see image) and a captivating tour of the RMIT city campus, where Dr Simon Johnstone-Robertson showed us the many facilities at RMIT, as well as the on-campus lifestyle that RMIT has to offer. On Friday, the groups came together and presented our projects to fellow students, parents and the RMIT Mathematics faculty.

Being grouped from day one based on our interests helped me to start conversations and create friendships with other people who shared my passions. The program was run swiftly and smoothly. From the get-go, the fear of being outside of my comfort zone clouded and plagued my mind, as it was the longest I had been away from home in quite some time. Nevertheless, I was able to look past this and direct my attention to the academic opportunities at my disposal.

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 stars can you see in this picture? How did you know? If I took one of the stars off the board, how many stars would I have left?
- How many ghosts are in this picture? What is one more than this number?
- Are there more stars or more ghosts? How many more?
- Can you use your finger to make a line from the face to the stars in the middle? Count the dots as you trace over them. How many different ways can you find to get from the face to the stars?
- What shapes can you see in this picture? What other shapes do you know? Can you describe what the shapes look like?
- How many dots do you think are on this page? Why do you think there are that many dots?
- If someone couldn't see this board, how could you describe the group of five stars in the middle of the picture so they could make the same pattern with some counters?
- The stars in the middle of the board look like the dot pattern for number five on a dice. What do the other dots on a dice look like? Can you draw those dot patterns and the numbers that match?
- What words could you use to describe where each of the stars are on this game board?

FOUNDATION - YEAR 2

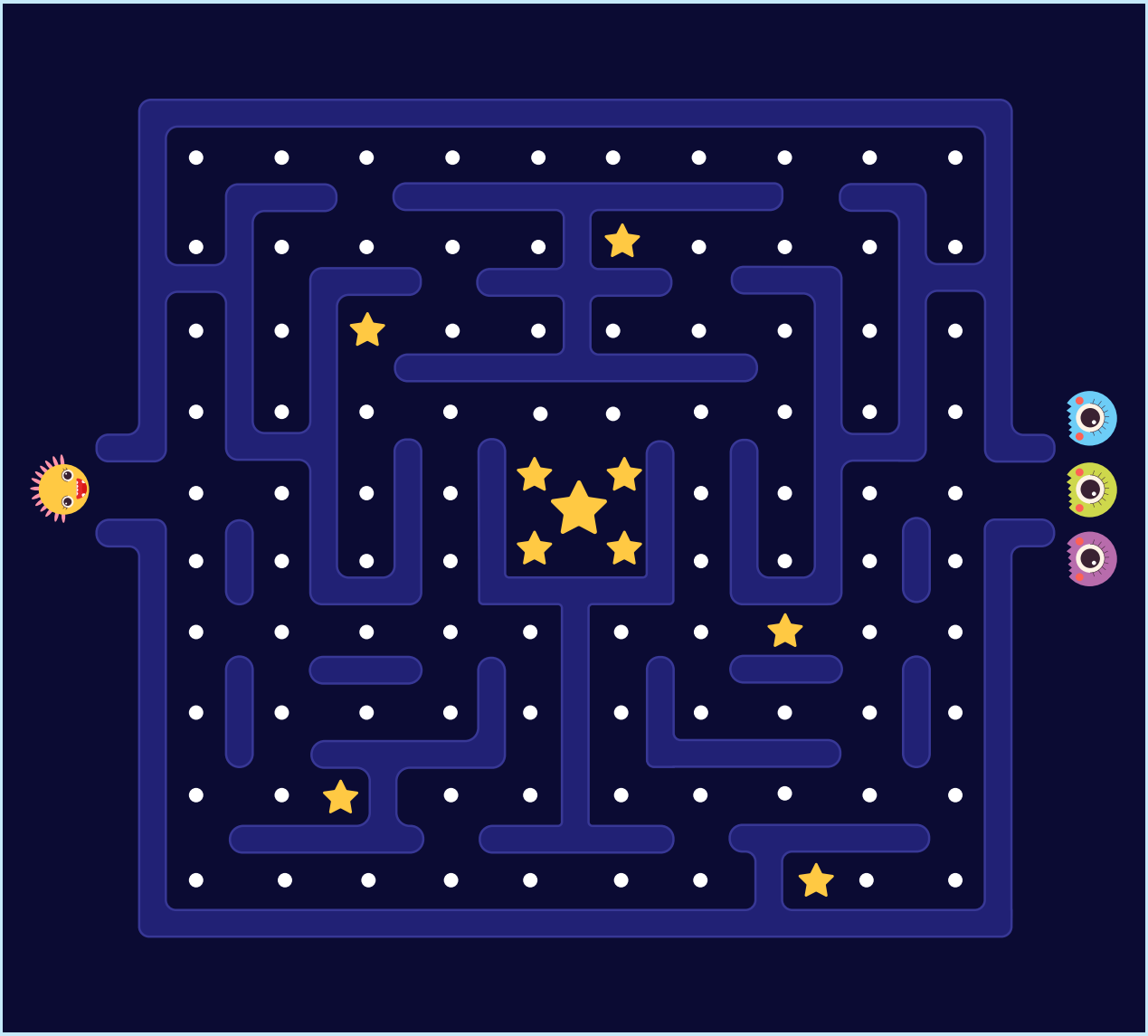
- How many dots are there in the top line of this game board? What would be an easy way to draw that number of dots so they were easier to count rather than all being on one long line?
- If it takes 10 seconds to move from one dot to the next, how many seconds would it take to move from the face to the stars in the middle of the game board? What is the least amount of time it could take?
- Without counting them one by one, work out how many dots are on this game board altogether. Can you use materials to make this number so it is easy for someone else to count quickly?
- Three people played the game. When they added their scores together, the sum of their scores was 42. What might each of their scores have been?
- Count the stars on the gameboard. How many ways can the stars be sorted into equal groups?
- Ask ten people if they have ever played a game that looks like this. Record their answers and present the information in a graph.
- Circle groups of two dots. How many equal groups are there? What other equal groups can you circle?
- If each dot represents one move, what is the least amount of moves it would take to start from the face and collect all of the stars?
- Write a list of instructions that guide someone who can't see the board to get from the ghosts to the stars in the middle of the board.

YEARS 3 - 6

- If the distance between each dot is 3cm, what is the shortest distance you need to travel to get from the face to the stars in the middle of the board?
- What fraction / decimal / percentage of the dots are on the top line?
- If a face represents $1.50, a star represents 35 cents and a ghost represents 75 cents, how much money is represented on the board? How many ways can you represent $15 using the same pictures and values?
- If you closed your eyes and threw a small counter onto this game board, what is the probability you would land on a star?
- I played this game three times, and my average score was 175. What might the individual scores of my three games have been?
- Ten people played the game, and added their scores together. Everyone scored at least 50. The sum of their scores was 957. What might each person's individual score have been? How many different possibilities can you come up with?
- Can you describe the location of each of the individual stars in relation to the stars in the centre of the gameboard? Could you use a compass to help you? Or perhaps a grid map?
- When moving through the gameboard, there are many different types of turns that could be made. What are some ways to describe the different turns?
- You play this video game for 45 minutes without taking a break. What time might you start and finish playing the game? What if you don't start on a five minute interval? How many different possibilities can you come up with?

YEAR 7 AND BEYOND

- Can you write a code to get from the face to the stars in the middle? How many different pathways can you write the code for? Give your codes to another person to test!
- What is the ratio of stars to dots?
- Divide the game board into the four quadrants of the cartesian plane. What are the coordinates for each star?
- If the dots are one metre apart, and the face travelled at three metres per second, what is the shortest amount of time it would take to get to the stars in the middle of the game board? If the ghosts travelled at two metres per second, which character would get to the stars in the middle the fastest, and by how much?
- If the distance between each dot is 15mm, what is the perimeter and area of the game board?
- If you started playing this game at 11.15pm in Melbourne, what time would it be in New York, London and Dubai?



- If you played for one hour and 17 minutes, what would be your finish time in each of these cities?
- There was a class challenge to get the highest score for this game. Ten students recorded their results in a table. The mean score was 50, the median was 51 and the range was 12-78 . What might the table of individual results have looked like?
- How many dots are on this page? What is the square root of this number? How many other numbers between 1 and 200 can you find the square root of?
- If this video game is on sale for 25% off the regular price, and the sale price is $270, what is the regular price?
- Connect dots on the gameboard to create a pair of congruent triangles. How many different pairs of congruent triangles can you create using this gameboard, that have different orientations? For each pair of triangles you create, prove they are congruent by measuring the sides and the angles.
- Can you connect some dots to show pairs of parallel lines in red? Can you connect some dots to show perpendicular lines in green? Prove that each pair you create is either parallel or perpendicular.
- In 2010 it cost $1 to play this game at the video arcade. Each year, the price has increased by 5%. How much does it cost to play the game in 2023? What will the price be in 2030?

MAV education consultants can come to you and create a professional learning plan to build the capacity of teachers at your school.

If you have an idea for a stimulus image in future editions of *Common Denominator*, we'd love to hear from you. Email office@mav.vic.edu.au with your suggestions.

ONE MINUTE WITH BROOKE HENSON

I'M…

Brooke, a data scientist within the Queensland Government. I work with internal datasets to provide evidence in strategic and transformative work, ultimately resulting in a streamlined government experience for Queenslanders.

I WANTED TO BE A HIGH-SCHOOL MATHS TEACHER BUT THAT DIDN'T QUITE GO TO PLAN….

I enrolled in a Bachelor of Science and Bachelor of Education, with plans to major in Biology and Mathematics. After first year, I realised that education wasn't where I wanted to end up (I still love teaching, so much so that now I teach dance). I swapped to single degree (Bachelor of Science) and pursued two majors – Biomedical Science and Computational Science.

I DIDN'T EXPECT TO FALL IN LOVE WITH CODING…

In my second year of university, I studied Bioinformatics. As a biology and maths girl I thought it looked super interesting, so I enrolled. It required heavy coding skills – something I had never done before. I was scared but excited for the challenge.

COMPUTATIONAL SCIENCE IS …

If computer science is about the science of computers, then computational science is about the use of computers to solve problems. I think of it this way – computational science is where we use the principles, theories, algorithms, and programs developed by computer scientists, to understand and solve problems.

DIGITAL TRANSFORMATION CREATES EFFICIENCIES…

There are three broad categories of work in the digital space: run - the work that keeps the lights on; grow - the work scales up something that exists, and transform - the work changes the way things are done. Transform is where the big changes can happen, and these changes work to create efficiencies in the whole government space.

I LOVE SOLVING PUZZLES LIFE…

My mum often says I was the quiet kid in kindergarten that liked to stay inside and

do the puzzles. My work is like solving a big puzzle. I start with the pieces (data) and assemble it so it paints a clear picture.

I VISUALISE RICH DATA TO HELP INFORM DECISION-MAKERS…

The data we collect is rich but complicated, so, it's sometimes tricky to find the value within it. Humans are good at scanning data in a table, but not so good at interpreting and understanding what the data means. Visualisations change this. We can see the variations of shapes and sizes and colours and it creates an incredibly rich but easy to digest picture which can be used to inform decisions.

I LOVE TO DANCE…

Maths plays a massive role in dancing. In Highland dancing, the basic positions of my feet are at particular angles, the places we stand in choreography need to be symmetrical, our turns need to be precise rotations (3/4 of a turn, 5/8 of a turn), we repeat steps a set number of times.

MATHS AND MUSIC…

Music and maths are intricately intertwined. We need to be able to count beats, know the time signatures, understand where we are in the music. Pythagoras believed music to be the expression of number in sound, and I truly believe music is maths with a melody.

I USE MATHS AT WORK DAILY…

Often without realising it! Time management, managing costs of training – even making my lunch requires maths. Data science requires a lot of maths, from statistical methods to more advanced machine learning.

STICK WITH MATHS…

It's so important to continue learning maths up until Year 12. You don't have to do the hardest maths subject, but the amount of life skills that require maths means its definately worth sticking with maths. Life after school is not all about quadratic equations, but finances, cooking, sports, games – it's all maths.

MY CRT TOOLBOX: GOAL!

Thomas O'Halloran – Casual relief teacher

In the early days of my year-long adventure as a casual relief teacher, I felt uneasy each morning. It was the uncertainty, the walk into the unknown, the unpredictability.

So, I started to compile a collection of gold nuggets, fun and easy-to-implement lessons, in case of emergencies. One gem that caught my attention while I was scrambling last minute to find something for a Year 4 maths replacement class was GOAL! Designed to combine the excitement of sports with the principles of STEM, GOAL! lessons offer a unique, contextualised and engaging learning experience for primary students.

Traditionally, sports and STEM have been seen as separate domains of learning and teaching. However, the soccer GOAL! lessons break down these barriers, creating a meaningful connection between the two.

By incorporating sports-related themes such as goalie reactions, obstacle courses and player recruitment with STEM challenges, students are intrinsically drawn to the learning activities.

They experience the relevance and applicability of STEM concepts in a real-world sporting context. I have seen this integration spark curiosity, enhance motivation, and provide students with a fresh perspective on the practical applications of scientific, design and mathematical principles.

GOAL! emphasises hands-on, experiential learning. Whether it's designing an experiment to test reaction speeds or interpreting player statistics to select the ultimate soccer team, students apply critical thinking, creativity, and problem-solving skills in every lesson. This approach nurtures their ability to think analytically and innovatively, preparing students for future challenges. What's more, these lessons allow CRT's to set up an engaging and collaborative learning environment in classrooms where I am typically seen as an alien from another planet.

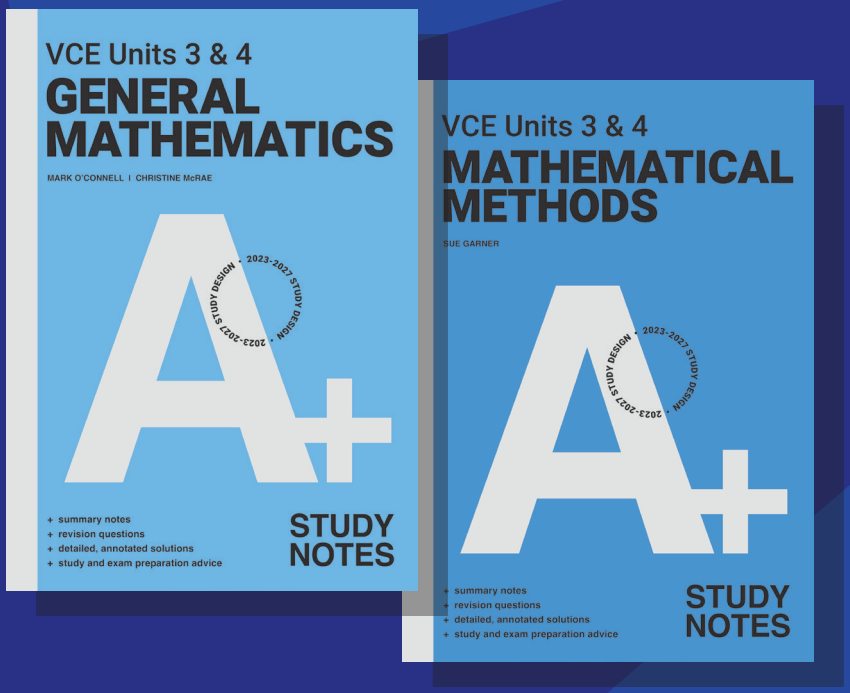
The GOAL! program co-designed by The Huddle and the Mathematical Association of Victoria offers a refreshing and effective approach to STEM education.

As a CRT, often without a moment to spare, I have witnessed firsthand the ease of implementation and the high engagement. If you're teaching Years 3 to 6 and looking for innovative STEM lessons, go check out GOAL!

Check out the free soccer and basketball themed STEM lessons at www.thehuddle.org.au/goal. Each lesson follows the 5E instructional model.

Schools can also visit The Huddle in North Melbourne and be immersed in a sports-themed STEM excursion.

Students will explore mathematical concepts, artificial and emotional intelligence through the lens of sport - all aligned with the Victorian Curriculum. Students work collaboratively to achieve STEM challenges like building a pendulum. This excursion is free and is aimed at students in Years 5 and 6, to book, visit, www.nmfc.com.au/huddle/programs/game-day.



Key Features

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General Maths

Maths Methods

Nelson

GENERAL MATHEMATICS: MATRICES

Fiona La Trobe – Assessor General Mathematics, VCAA

As part of the changes to the VCAA Study Design transitioning to General Mathematics, some changes have been made to the teaching and learning of matrices.

Elementary matrix operations remain unchanged and should be taught using both by-hand skills and the use of a CAS calculator. It is also important that these skills are given an applications perspective.

It is tempting for students to concentrate solely on the use of calculators for matrix operations, given that this is a technology active subject, but past examinations have shown that students must also understand how these processes work, if they are to achieve the best results.

Questions in examinations often ask students to explain the information provided by an element in a product matrix or to perform one or more matrix operations that would achieve a particular result and, without the underlying understanding of process, many students cannot provide a suitable response.

An example from the 2022 VCAA Further Mathematics Exam 1 would be Question 8:

> Two types of computers – laptops (*L*) and desktops (*D*) – can be serviced by Henry (*H*), Irvine (I) or Jean (*J*). Matrix *N* shows the time, in minutes, it takes each person to service a laptop and a desktop.
>
> $$N = \begin{array}{c} \\ H \\ I \\ J \end{array}\begin{array}{c} \begin{array}{cc} L & D \end{array} \\ \begin{bmatrix} 18 & 8 \\ 10 & 17 \\ 12 & 9 \end{bmatrix} \end{array}$$
>
> Matrix Q shows the number of laptops and desktops in four different departments: marketing (*M*), advertising (*A*), publishing (*P*) and editing (*E*).
>
> $$Q = \begin{array}{c} \\ M \\ A \\ P \\ E \end{array}\begin{array}{c} \begin{array}{cc} L & D \end{array} \\ \begin{bmatrix} 6 & 8 \\ 4 & 7 \\ 5 & 5 \\ 10 & 12 \end{bmatrix} \end{array}$$
>
> A calculation that determines the total time that it would take each of Henry, Irvine or Jean, working alone, to service all the laptops and desktops in all four departments is:

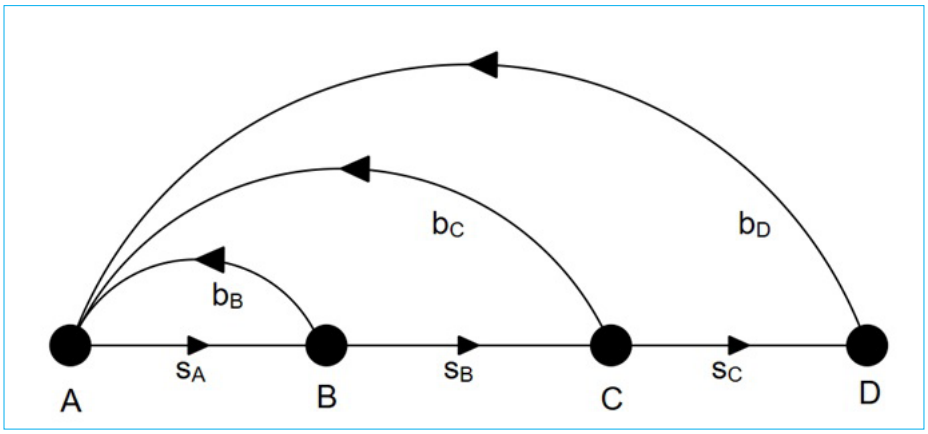


Figure 1.

A. $[1 \quad 1 \quad 1 \quad 1] \times (Q \times N^T)$

B. $(Q \times N^T) \times \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$

C. $(N \times Q^T) \times Q$

D. $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \times N \times Q^T$

E. $[1 \quad 1 \quad 1 \quad 1] \times Q \times N^T \times \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$

In order for students to correctly select answer A, they had to understand the concept of a transpose, the use of a summing matrix, the effect of order of matrices on multiplication and basic matrix multiplication as a row by column process The solving of simultaneous equations using matrices is no longer in the new Study Design, but Leslie matrices have been added as a new application.

Leslie matrices add another way to consider changes in population rather than just considering the use of a transition matrix It is important that students understand that Leslie matrices, unlike transition matrix models, only consider the females of a population. Leslie matrices also consider the entire life cycle of an animal separated into two or more clear stages, each of equal length. A Leslie matrix for an animal with four clear and equal life stages has the form:

$$L = \begin{array}{c} \\ A \\ B \\ C \\ D \end{array}\begin{array}{c} \begin{array}{cccc} A & B & C & D \end{array} \\ \begin{bmatrix} b_A & b_B & b_C & b_D \\ s_A & 0 & 0 & 0 \\ 0 & s_B & 0 & 0 \\ 0 & 0 & s_C & 0 \end{bmatrix} \end{array}$$

this period / *next period*

Where b_A, b_B, b_C and b_D are the average number of female births per animal at each of stages *A*, *B*, *C* and *D* respectively and s_A, s_B and s_C are the proportion of females at each of stages *A*, *B* and *C* respectively, that are expected to survive to the next stage. As stage *D* is the last life stage, there are no animals in *D* expected to survive and as *A* is the earliest life stage, b_A will often be zero.

Being able to articulate the meaning of an individual element in a Leslie matrix is an essential skill, as is converting the information in the Leslie matrix to a life cycle diagram or vice versa. The life cycle diagram for the Leslie matrix above is shown below. Note that only 'zeros' in the Leslie matrix representing survival or birth rates are in the life cycle diagram (Figure 1).

The General Mathematics sample exam questions on Leslie matrices did not include the information around the Leslie matrix as shown, but students should be aware that this information is always implied, even when not present.

Because Leslie matrices consider the full life span of a range of animals, divided into equal parts, the transition periods under consideration could range from a few days to decades.

Students should also be aware that the average number of female births per animal at each life stage can vary widely from zero upwards to potentially many thousands in the case of some insects. The survival proportions will always be between zero and one as the number of survivors will range from 0% to 100%.

Like transition matrices, Leslie matrix calculations can be completed using powers of the Leslie matrix or using recurrence relations of the form:

S_0 = initialstatematrix, $S_{n+1} = L \times S_n$

Using recurrence will allow students to explore step by step movements in the population being considered and potentially even track the numbers at each stage graphically in an extended explorative question such as those required in SACs.

Unlike transition matrix models that would normally explore movement down through the life cycle state matrix, Leslie matrices track the numbers at each life stage with births adding new members to the first stage of the population. Leslie matrix populations do not come to an equilibrium state, but instead increase or decrease or cycle every n periods for n life stages in the long run.

Leslie matrices that show a population cycling every n periods will have the property $L^n = I$ where I is the identity matrix. Leslie matrices modelling a population that increases in the long run, may not consistently increase until after a particular number of transitions, at which point the population becomes self-sustaining and consistent increases occur across all life stages in the population.

Once the population has reached this point, a consistent percentage increase will be seen at all life stages. The value of the percentage increase can be calculated using any of the life stages by finding the percentage increase from one state matrix to the next for corresponding elements. The same patterns can be seen in populations that decrease over time.

The inclusion of Leslie matrices in the Study Design provides an opportunity for students to explore changes in populations, with possible School Assessed Coursework tasks including comparisons between models provided by transition matrices, transition matrices that include culling or restocking and the models provided by Leslie matrices.

MAV provides comprehensive VCE professional learning opportunities, featuring Meet the Assessors sessions and SAC workshops. These events are scheduled for Term 1 2024. You will have the flexibility to choose between attending a virtual session or opting for a full day mini-conference which is tailored for teachers seeking an immersive VCE professional learning experience and a chance to network.

The mini-conference encompasses both Meet the Assessors and SAC workshop content, thoughtfully organised into subject-specific streams for each VCE mathematics study.

As you prepare for the start of the 2024 school year, set a reminder in your calendar for the first day of school to visit MAV's website and book your spot at these VCE professional learning events.

TIME LAPSE

Andrew Stewart

The Age population profile of the Melbourne LGA (as shown in *Common Denominator* 4/22, p. 18) had a distinct peak at around 25 years of age. Was this always the case, or has this changed over time?

I originally intended to use data from the Melbourne LGA Community Profile spreadsheets for each of the separate Census collections that are available – 2021, 2016, 2011, 2006, 2001 and 1996. Seven spreadsheets had to be downloaded, as in 1996 Melbourne was split into two areas. The data would give us six lines on the graph.

The Time Series Profile (TSP) spreadsheets which appear on the same download page as the Community Profile Spreadsheets, contain limited data sets for the current and the previous two Census collections. The TSPs were not available for the 1996 Census, but the 2001 TSP gave access to data from 1991! So, only three spreadsheets were downloaded – 2021 (containing the data from 2021, 2016 and 2011), 2006 (containing the data from 2006, 2001 and 1996 (in one list!)) and 2001 (containing the data from 2001, 1996 and 1991). This data will give seven lines on the graph. Fortunately, the Age by Sex data for the range required (0 – 29 years) can be found on just one sheet

A new spreadsheet was set up, see Table 1. Note the apostrophe just before each date. This will ensure that the graph will plot correctly.

In the 2021 TSP, select sheet T03a. Cells A12 to A46 contain the age labels for the ages required (0 – 29). For total male plus female numbers at each age up to 29 years, cells D12 to D46 contain the 2011 data, cells H12 to H46 contain the 2016 data, and cells L12 to L46 contain the 2021 data. copy and paste the labels and data from the TSP into the appropriate columns in the new spreadsheet starting at row 11.

In the 2006 TSP, select sheet T 03a. For total male plus female numbers at each age up to 29 years, cells D11 to D45 contain the 1996 data, cells H11 to H45 contain the 2001 data, and cells L11 to L45 contain the 2006 data. Copy and paste the data from the TSP into the appropriate columns in the new spreadsheet starting at row 11.

	A	B	C	D	E	F	G	H
9								
10	Age (y)	'1991	'1996	'2001	'2006	'2011	'2016	'2021
11								

Table 1.

	A	B	C	D	E	F	G	H
9								
10	Age (y)	1991	1996	2001	2006	2011	2016	2021
11	0	854	571	679	774	855	1,147	1,073
12	1	355	300	393	466	653	978	968
13	2	372	300	391	385	635	867	841
14	3	326	290	338	357	532	761	740
15	4	288	263	289	289	487	634	731
16	*0-4 yr*	*2,195*	*1,724*	*2,090*	*2,271*	*3,170*	*4,386*	*4,354*
17	5	315	236	301	330	422	560	715

Table 2.

In the 2001 TSP, select sheet T 02a. Cells D10 to D44 contain age data up to 29 years for 1991. Copy and paste this data into the appropriate column starting at row 11. The spreadsheet now contains data up to age 29 for all seven Census collections.

The first seven rows of the spreadsheet are shown in Table 2.

The graph will use the year-age data, not the sums, so the sum values will have to be removed. The easiest way is to click on the row number at the side of the spreadsheet so that the entire row is highlighted. On the edit menu, select delete to remove that row and all the other rows will move up one. There are five sum values to be removed, starting with 0–4 and finishing with 20–24.

The last data value (for age 29) will now be in row 40. Click in cell B43 and type in =SUM(B11:B40) and press enter to obtain the total population of 0 – 29 year-olds for 1996. Use FillRight to obtain the sums in columns C to G. These values will be required to calculate the percentages of each age group.

Select cells A10 to G10. Copy and then paste in cell A50 to act as headers for the percentage values. Select cells A11 to A40, copy, then paste in cell A51 to copy the age values down the column.

In cell B51, type =(B11/$B$43*100) and press enter. Click in B51, and in the format menu select Cells/Number and set to one decimal place. FillRight from B51 to G51.

In cell C51, edit the formula to =(C11/$C$43*100) and press enter. Amend the formulae in cells D51 to G51 as appropriate. Now select cells B51 to G51, and use FillDown to row 80 to calculate all the percentages for all the Census years.

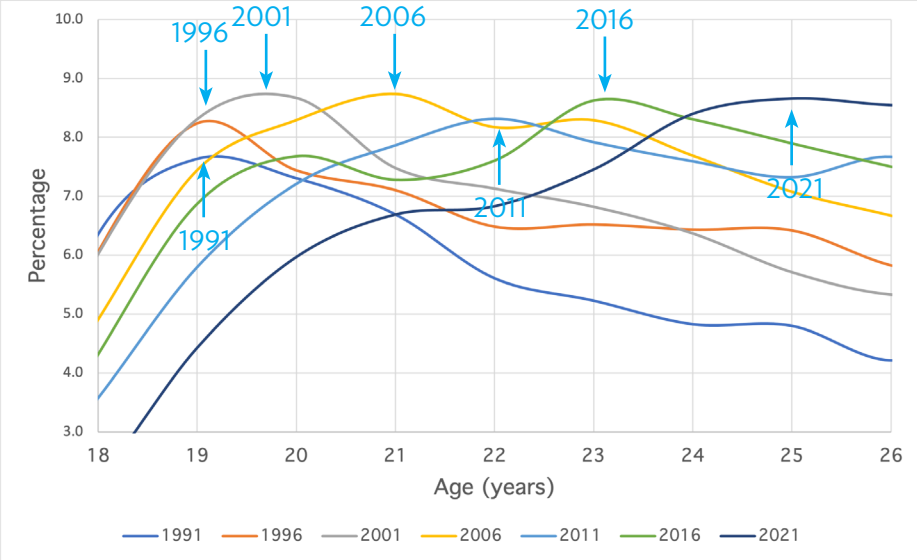
To graph this data, click and drag to highlight from cell A50 to G80. On the insert menu, select Chart/X-Y scatter. The peak age group for Melbourne LGA ranges from late teens to mid-twenties. The axes have been reformatted – the horizontal axis to 18 – 28 age groups and the vertical to 3.0 to 7.0 percentage – to obtain graph 1 (right). The peak age for each Census collection has been marked. The data shows that the peak age group has been getting steadily older with each Census, from 19 years in both 1991 and 1996, to 25 years in 2021.

This kind of analysis could be extended to compare the distribution of each gender at each age in each of the available Census collections. This analysis is shown in graphs 2 and 3 (right). Graph 2 shows female age distribution which mirrors the overall age distribution in the location of peaks.

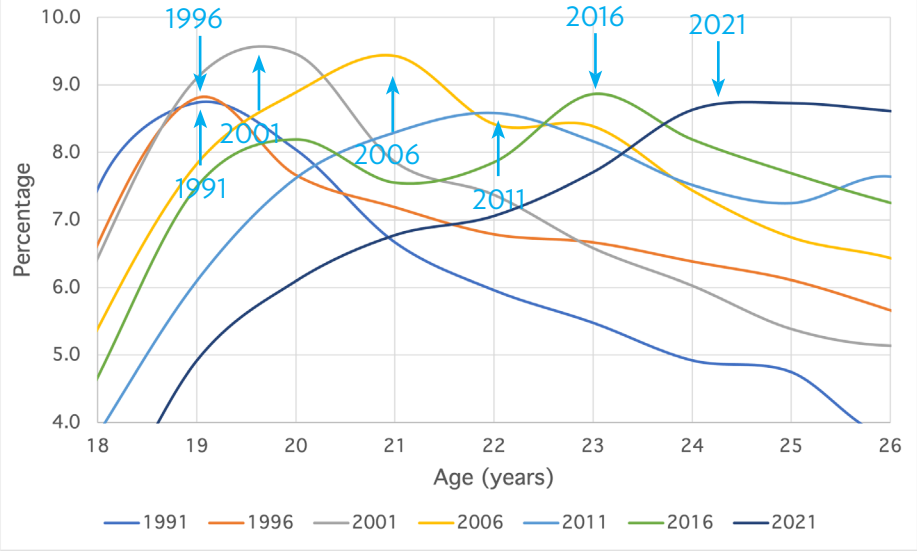
Graph 3 shows male age distribution where the peak for 1991 is 21 years, then drops to 19 years for 1996 and then increases again to 25 years in 2021, with a two year jump from 2001 to 2006.

There are a number of other data sets available in the TSP spreadsheets that could be useful to analyse for changes over this time period. Alternatively, perform a similar age analysis for your local government area.

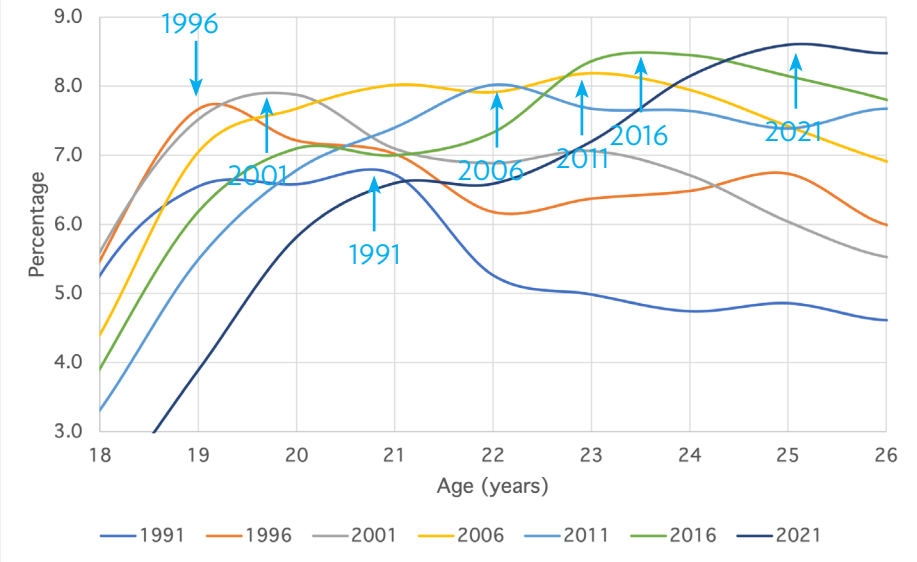
Happy researching!



Graph 1.



Graph 2.



Graph 3.

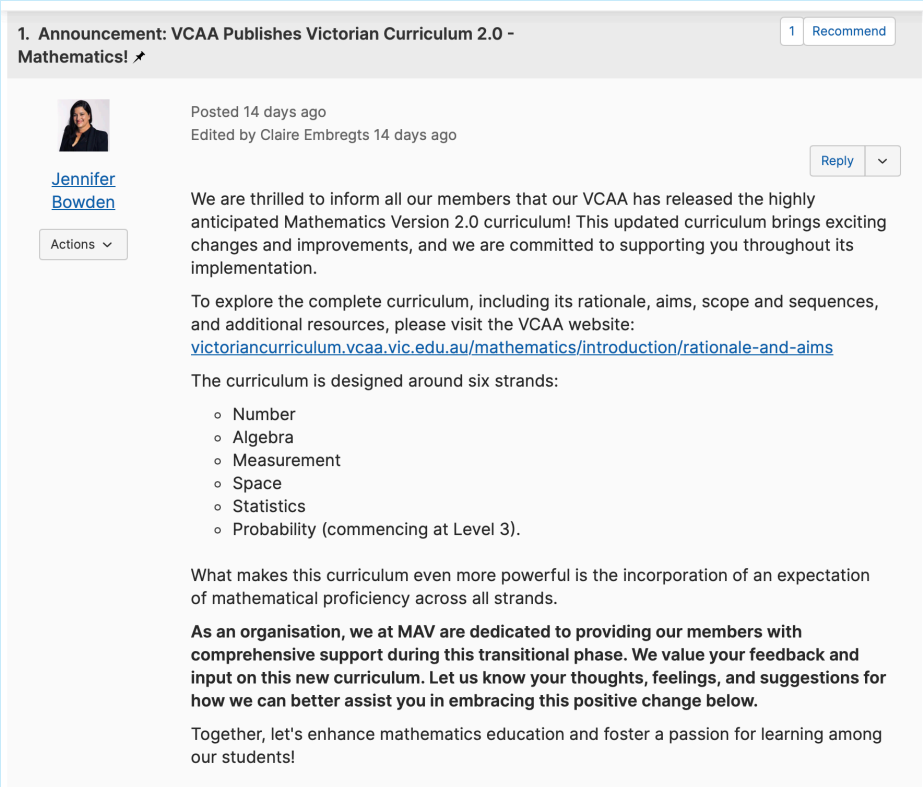
CREATING COMMUNITY

Claire Embregts – Community strategy manager, MAV

My work at MAV is centred around our online community offering. We know that mathematics educators in Victoria are keen to create connections with others who have ideas, stories of success (and failure!) and want to network with other maths educators in different schools and settings.

Venessa Paech has been working with MAV on our online community. Venessa is Australia's leading expert in online communities and community management. She has over 25 years of experience building, managing, and leading online communities, at companies including Lonely Planet, REA Group, Envato, and Australia Post.

Venessa is Co-Founder and Director of Australian Community Managers (ACM), the national centre of excellence for online community management training and resources. She founded Swarm, the longest-running community management conference in the world, and in 2023 launched All Things in Moderation, the world's first dedicated conference for humans who moderate. Venessa teaches online community management for post-graduates, and community as a leadership model for executives, both exclusively at the University of Sydney. Venessa is a published academic, and a PhD Candidate researching AI and online communities. I spoke to Venessa about the importance of online communities:



The MAV online community hears news first. It's a great way to share news and updates - and the perfect forum for discussion and ideas.

WHY ARE ONLINE COMMUNITIES IMPORTANT?

Community is an innate human need, and member organisations like MAV have community at their natural centre.

Online communities have been offering powerful benefits for participants and hosts for well over 30 years now, and as we transition to a future of distributed working models and environments, they're more important than ever.

An online community offers an invaluable home base for learning and work-out-loud, giving and receiving peer support, finding and sharing deeply relevant resources, and more. Importantly, busy education practitioners can't always attend live events or gather at the same time. An asynchronous shared space lets people dip in and participate when and wherever suits them best. It's a support network you can carry with you and access when you need it.

HOW IS A SENSE OF BELONGING FORMED?

Member needs always come first. What are those burning needs (both informational and social) that the model of community is uniquely positioned to deliver? The content, conversation, events, and experiences that make up the community must be anchored on these. If needs are being consistently met, and the community is a place members reliably feel welcome, heard, and empowered, meaningful participation and belonging organically follow.

WHAT'S THE RIGHT BALANCE BETWEEN FOSTERING COMMUNITY AND RESPECTING PRIVACY AND BOUNDARIES?

Successful and sustainable communities need trusted, thoughtful governance and moderation - especially online where boundaries can seem fuzzier.

Community management practice works to create psychological, emotional, and cultural safety, so members can disclose what they feel most comfortable with, in order to participate most fully.

Governance processes ensure that risky disclosures are monitored. Everyone engages uniquely, so you need an approach that protects through community-level boundaries but also allows for contextual boundary maintenance for individuals or smaller groups.

Promoting education and empathy, while offering members ways to establish personalised boundaries, helps balance the disclosure we need to build community with individual and collective safety.

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.

Together, let's forge a collaborative learning environment and shape the future of maths education in Victoria.

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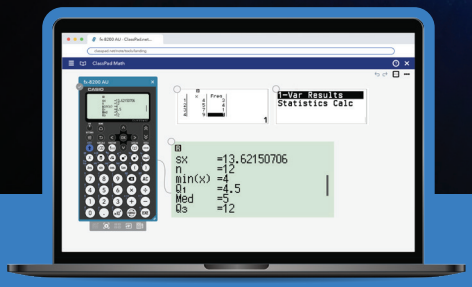

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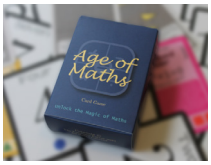
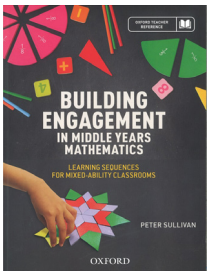


AGE OF MATHS CARD GAME

3+

Embark on a journey into the captivating world of mathematics through an engaging card game that celebrates brilliant mathematicians and fascinating mathematical concepts. Battle one or two other players in knocking out mathematicians one by one. The last one left is the winner. Knock out mathematicians by drawing digit cards and using mathematical operations that calculate to your opponent's target number. This is a game of strategy and numbers. This game is suitable for children in Year 3 and up, fluency in times tables is very helpful!

$24.40 (MEMBER)
$29.30 (NON MEMBER)

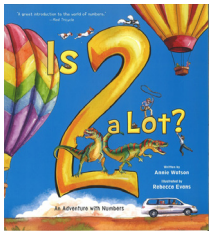


BUILDING ENGAGEMENT IN MIDDLE YEARS MATHEMATICS

4-10

This book provides teachers with a range of original learning sequences focused on the mainstream content of the Australian Curriculum. Each sequence has been developed in line with the most recent research into mathematical learning and is designed to have a low floor and high ceiling, with multiple entry points for students of varying abilities. The first task in each sequence activates existing knowledge and creates awareness of the need for new learning, while subsequent tasks consolidate and extend this learning, helping students see the 'bigger picture'.

$81.10 (MEMBER)
$97.30 (NON MEMBER)



IS 2 A LOT?

F-2

Joey's questions and his mom's artful answers transform an ordinary car ride into a magical odyssey through the land of numbers. *Is Two a Lot?* is a wonderfully charming and authentic exchange between mother and child.

$14.80 (MEMBER)
$18.50 (NON MEMBER)

T2L TV - SUBSCRIPTION

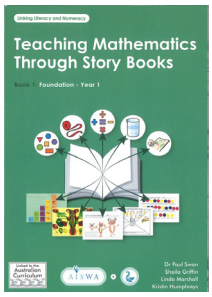
F-6

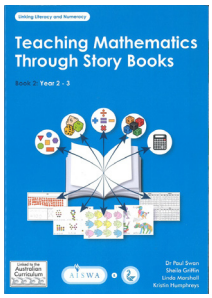
T2L TV is a comprehensive solution to your schools PD needs. This 12 months subscription provides access for up to 20 teachers (school size of 250-499 students).

T2L TV has teamed with some of the best names in education to build a streaming platform for easy access to high quality professional development. Our platform contains a mix of webinars and extremely popular short videos to support teachers improve their daily teaching practice. All webinars and videos are recorded and can be watched on-demand at a time that suits you. Each term we release a new schedule of 15+ webinars to add to the already comprehensive webinar library.

To learn more about T2L TV, visit https://t2ltv.vhx.tv/featured/videos/t2l-tv-add-take3-1

$1680 (MEMBER)
$2100 (NON MEMBER)





TEACHING MATHEMATICS THROUGH STORY BOOKS

F-3

Children's story books are a fantastic tool in every early childhood teacher's toolbox. This book takes the most popular story books and provides a number of mathematical activities for students to do based off the story book; for example investigating patterns in Lynley Dodd's *Hairy Maclary from Donaldson's Dairy* or investigating the months of the year in Penny Matthews' *A Year on Our Farm*. The book includes copiable resources to make using the activities a breeze. Each story book is given multiple mathematical activity options.

Includes 6 extra pages of assessment opportunities

F – YEAR 1: $22.10 (MEMBER)
$27.60 (NON MEMBER)

YEAR 2 – 3: $26.65 (MEMBER)
$33.30 (NON MEMBER)

THE MATHEMATICAL ASSOCIATION OF VICTORIA

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