THE MATHEMATICAL ASSOCIATION OF VICTORIA

THE COMMON DENOMINATOR 3/25

EXPLORING PROMPTING TECHNIQUES

INSIDE

Dr Scott Cameron and Dr Carmel Mesiti, The University of Melbourne

QUALITY FIRST: EXPLORING PROMPTING TECHNIQUES TO ENHANCE THE QUALITY OF GENAI-CREATED TEACHING MATERIALS

The increased availability of generative artificial intelligence tools (GenAI) tools, such as OpenAI's ChatGPT, Google's Gemini and Anthropic's Claude, has been met with excitement about their potential to alleviate teacher workload issues by enabling teachers to offload time-consuming tasks to GenAI. Priority areas include using GenAI to assist with the development of lesson plans and other teaching materials, assessment, and administrative tasks (Commonwealth of Australia, 2024).

However, delegating planning to GenAI risks overlooking the critical importance of a teacher's professional experience and knowledge in developing high-quality resources.

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THE COMMON DENOMINATOR
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FROM THE PRESIDENT

Kerryn Sandford

As Term 3 unfolds, I'm reminded again of the strength and dedication of our mathematics education community.

At our recent AGM, we appointed four new board directors, three of whom are returning for additional terms of service. We welcome Dr Sharyn Livy as a new board member and myself, Dr David Leigh Lancaster and Dr Aylie Davidson each returning for another term. I'd like to formally thank our outgoing board member, Louise Gray for her service and leadership during her time on the board, her contribution to MAV has been significant and is much appreciated. Thankfully, we do not lose Louise entirely from our organisation as she will continue to support MAV as the editor in chief of *The Common Denominator* magazine.

This edition of *The Common Denominator* reflects the diversity and depth of practice that makes our community so vibrant. Kristen Tripet's article on mathematical inquiry invites us to consider what it really means for students to 'see, think and work like mathematicians.' Tim Wilson's unpacking of the Mathematics Position Statement brings clarity to the role of explicit teaching and mastery within the VTLM 2.0 framework.

It's inspiring to see how a wide range of pedagogical approaches are explored in these pages, from the playful real-world integration of sport in the GOAL! program to the thoughtful application of generative AI in teaching resource design. This diversity is not a contradiction, but a strength. Great teaching is responsive, deliberate, and grounded in professional judgement.

At MAV, we continue to support professional agency through events, publications, and community connection. I encourage you to register for our upcoming annual conference, MAV25: *Thriving in Mathematics*, where many of the ideas explored in this edition of the magazine will be brought to life through keynote presentations, hands-on workshops, and collaborative dialogue. It promises to be a powerful space for connection, reflection, and inspiration.

Finally, I invite you to consider how your voice might contribute to this growing conversation whether through sharing classroom experiences in our magazine or journals, posting in our online community, or presenting at an MAV event. Our collective strength lies in the insights and experiences we share.

MAV25: BOOK NOW

MAV's 62nd Annual Conference, will be held at La Trobe University, Bundoora on Thursday 4 and Friday 5 December 2025.

MAV25, *Thriving in Mathematics* will bring together educators, leaders, researchers, and key stakeholders to explore innovative strategies that support teachers and students throughout their mathematics learning journey. The conference will address current challenges in mathematics education, showcase best practices, and foster discussions on the future of mathematics learning. It's a unique opportunity to gain fresh insights, connect with peers, and be inspired to thrive in the classroom and beyond.

WHY ATTEND MAV25?

- Inspire your practice: Take away practical ideas to improve teaching and student engagement.
- Connect with experts: Hear from leading voices in mathematics education.
- Stay current: Learn about the latest research, tools, and curriculum trends
- Network and Collaborate: Share experiences with peers.
- Shape the future: Be part of a vibrant, forward-thinking education community.

Register at www.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
Springboard series: 6 free webinars for MAV members ($30 each for non-members)			
Using problem strings in a primary classroom	6/8/25 (Virtual)	4–6	Renee Ladner
Mathematics network opportunity: primary	14/8/25 (Virtual)	F–6	Renee Ladner
Checks for understanding	18/8/25 (Virtual)	F–6	Jessica Kurzman
Mathematics network opportunity: secondary	20/8/25 (Virtual)	7–12	Jess Mount
Productive vs non-productive struggle	21/8/25 (Virtual)	F–12	Tom Mahoney and James Dixon
Strengthening numeracy and mathematics	2/9/25 (Virtual)	F–10	Leonie Anstey
MAV annual conference: Thriving in mathematics	4/12/25 5/12/25	All	Various

VCE SUPPORT STRATEGIES

Danijela Draskovic, Education manager, MAV

The journey through VCE mathematics is both about achieving the best possible ATAR, and also building confidence in mathematics and numeracy for students' life goals. It includes the development of analytical thinking to make complex decisions and opens doors to a range of career pathways. As teachers, we play a vital role in helping students build effective learning habits that make the most of their final years of secondary schooling. Here are eight practical strategies to support students as they prepare for their VCE mathematics assessments.

1. VISUAL TOPIC SUMMARIES

Students often underestimate the power of summarising content. Encourage them to create topic summaries progressively, during, and at the end of, each topic – rather than cramming at the end of the year. Effective summaries are visual and include definitions, diagrams, formulas, worked examples, key ideas, and even colour-coded structures to highlight connections. These summaries act as anchors for understanding, recall, and retrieval. Displaying summaries on walls or folders can turn revision into an everyday habit rather than a daunting task.

2. STEP-BY-STEP WORKING

One of the simplest habits that can have a significant impact is recording each step of the solution clearly, one line at a time, vertically down the page. This 'one equation per line' approach helps students see logical progression, reduce errors, and identify missteps. It's especially important in exam situations, where VCAA assessors are instructed to award method or 'working' marks for questions worth more than one mark. This means even if the final answer is incorrect, clear steps can earn the student valuable marks.

3. USE CHECKLISTS TO TARGET STUDY AND REFLECT

Checklists are more than just a way to track what's been done, they build student agency and metacognition.

Encourage your students to assess their understanding of key outcomes using a traffic light or rating system (e.g., nailed it, need more work, etc.). This self-reflection builds awareness of where to focus next, which is often the missing link between hard work and effective study. Plus, the simple act of ticking things off gives students a sense of momentum and achievement, which can be a great motivator as the year progresses.

4. MAXIMISE FAMILIARITY WITH VCAA RESOURCES

The VCAA website is a treasure trove that many students overlook. Teachers use examiners reports as a core resource, but how many of our students have even heard of them? These reports provide invaluable insight into how questions were handled by students across the state, what common errors were made, and what assessors are awarding marks for. Encourage your students to read the comments alongside their practice exams – it's like having an examiner over their shoulder sharing valuable tips. Combine that with regular use of the official formula sheet and past exams for timed practice, and they'll start to feel far more exam-ready.

5. LEVERAGE STRUCTURED REVISION PROGRAMS

Hearing content explained in new ways can spark fresh understanding. MAV's VCE Revision Program offers interactive, self-paced online modules for VCE mathematics.

Our enhanced VCE Revision Program has been developed and presented by experienced VCAA exam assessors. Each course includes detailed videos, guided examples, quizzes, CAS advice videos, and a downloadable notes book. Students gain valuable insights into examiner expectations, all while revising at their own pace. The content is categorised by topic, so students watch small sections at a time, and revisit material as often as they like.

6. RUN AUTHENTIC TRIAL EXAMS AND PRACTISE UNDER EXAM CONDITIONS

It's one thing to know content, it's another to manage time, pressure, and endurance across exams. Encourage students to simulate exam conditions regularly: timed (including reading time), with or without technology, with a proper break between Exam 1 and 2 practice sessions.

This builds exam stamina and helps students fine-tune their pacing. Teachers can structure these sessions in class or encourage students to do them at home on weekends.

One of the best ways to simulate exam conditions is through trial exams students haven't seen before. MAV's VCE Trial Exams are designed by expert teachers and align closely with the current Study Design. As they are available for school purchase only, you can be confident students won't have pre-access. Running them under full exam conditions helps students practise not just the maths, but also the mental stamina needed on exam day. Explore the range: www.mav.vic.edu.au/MAV-Shop.

7. USE PEER COLLABORATION STRATEGICALLY

Group study can be a powerful revision tool when used purposefully. Encouraging students to explain concepts to one another, compare approaches to problem solving, or co-create summary sheets helps deepen understanding. Just remind students to ensure the sessions are structured and stay focused, rather than becoming passive or overly social.

8. ENCOURAGE STUDENTS TO PRIORITISE REST AND SLEEP

It can be tempting for students to push through late-night study sessions, especially as exams approach. But the science is clear: sleep is essential for memory consolidation, cognitive function, and emotional regulation. A well-rested brain is better at problem-solving, applying learned concepts, and handling pressure. Remind students that sacrificing sleep for study often leads to diminishing returns.

Supporting students through VCE mathematics is about more than content knowledge, it's about helping them feel prepared, calm, and capable. With the right tools, guidance, and opportunities, we can help them thrive.

MAV's VCE Revision Program is open for bookings. Students can book directly or via their school.
Visit mav.vic.edu.au/Student-activities/VCE-revision-program.

EXPLORING PROMPTING TECHNIQUES

Dr Scott Cameron and Dr Carmel Mesiti, The University of Melbourne

CONT. FROM PAGE 1.

Without careful oversight, there is a risk that reliance on GenAI could diminish the quality of learning experiences provided to our students. This paper explores two prompting techniques and offers practical strategies to optimise the quality of GenAI-generated teaching materials.

Anyone who has experimented with GenAI is likely aware of the varying quality of their outputs. Prompt engineering (i.e., the careful and strategic crafting of GenAI prompts) has been widely acknowledged as a mechanism for enhancing the quality of GenAI outputs. Prompt engineering is akin to the strategies we may use with search engines. We know that searching for 'linear equations resources' would yield an overwhelming number of results, so the search may be refined by including terms such as 'Victorian Curriculum,' 'real world contexts,' or 'Year 8'. Additionally, quotation marks and Boolean logic can further narrow the search. Similarly, prompt engineering provides the tools to enhance the quality and relevance of GenAI outputs. Many of the uses demonstrated in this paper are inspired by Furze (2004).

ZERO-SHOT PROMPTING

Zero-shot prompts instruct a GenAI tool to complete a task without providing an exemplar to help guide the tool in the development of the output (see Figure 1). This prompting technique is especially useful when starting from scratch or when exploring the tool's capabilities for the first time.

While zero-shot prompting is straightforward, the resulting output may be imperfect due to vagueness of instruction (i.e., absence of year level), or misalignment of preferences (i.e., the response does not match the user's intended pedagogies). To address these limitations and enhance the quality of GenAI outputs, users can apply the following strategies:

1. Assign the GenAI a role

Role prompting involves the user explicitly assigning a role to a GenAI tool. For example, when creating a lesson plan, the user may instruct the tool to act as a mathematics teacher (see Figure 2). Providing GenAI tools with a role enhances the relevance and quality, relevance and

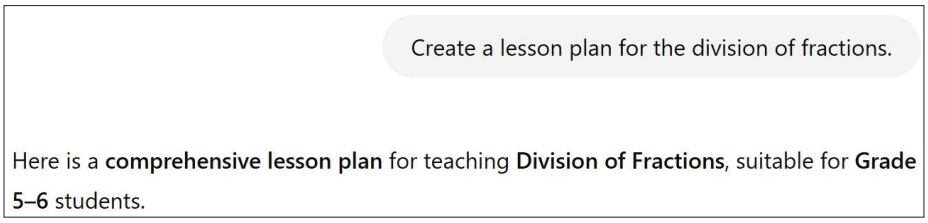

Figure 1. A zero-shot prompt for the creation of a lesson plan on the division of fractions.

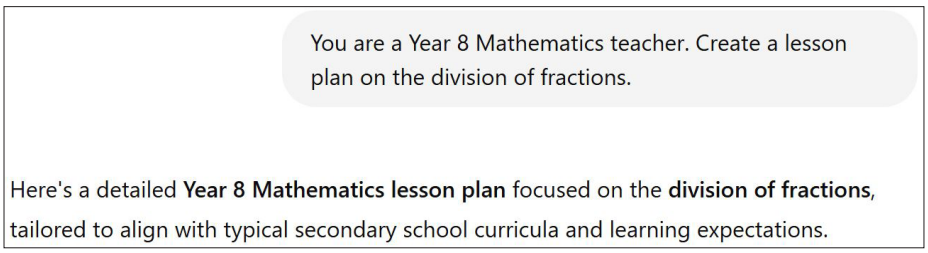

Figure 2. A zero-shot prompt instructing the GenAI tool to act as a Year 8 mathematics teacher.

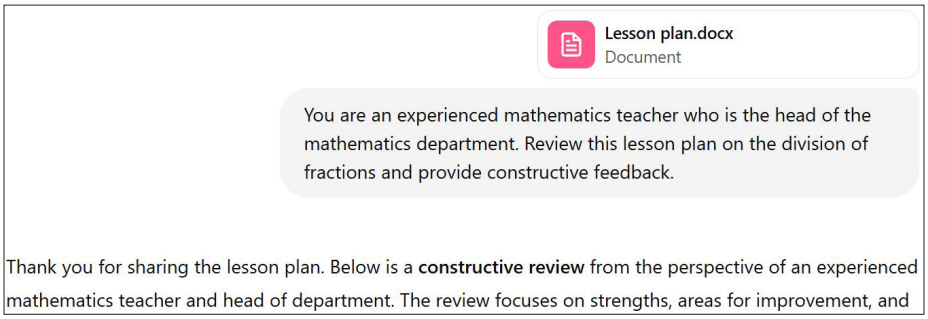

Figure 3. A zero-shot prompt that instructs the GenAI tool to act as a head of mathematics department to review a lesson plan.

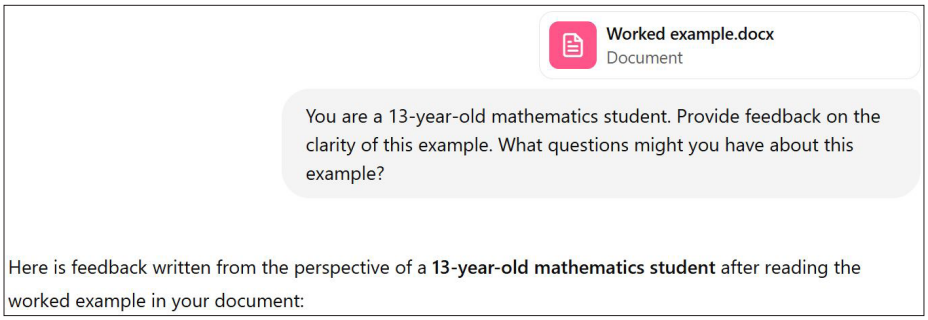

Figure 4. A zero-shot prompt that instructs the GenAI tool to act as a student to provide feedback on a worked example.

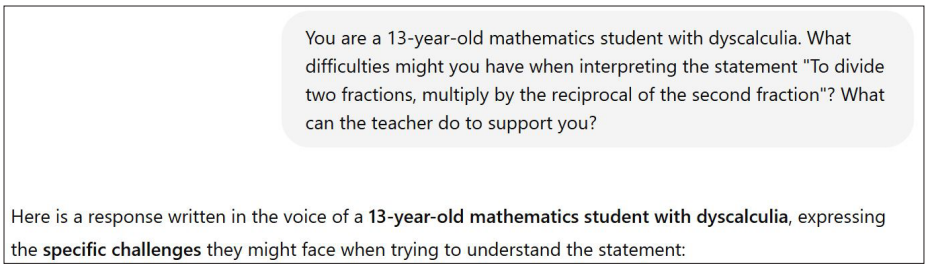

Figure 5. A zero-shot prompt which instructs the GenAI tool to act as a student with dyscalculia.

EXPLORING PROMPTING TECHNIQUES

Dr Scott Cameron and Dr Carmel Mesiti, The University of Melbourne

focus of lesson plans (Spasić & Janković, 2023).

Assigning roles also allows users to engage in roleplay; this may be helpful to 'test' how examples, explanations and materials might be received before using them in class (see Figure 3 on page 5), to seek feedback on teaching materials from a knowledgeable reviewer (see Figure 4), to anticipate the misconceptions associated with a particular topic, or to anticipate difficulties that may be encountered by a student with a particular learning need (see Figure 5).

ChatGPT's memory feature allows it to retain information, including roles, from previous conversations; this information will inform and influence future interactions. You can check what ChatGPT remembers by asking, 'What is in your memory?' Additionally, you can instruct ChatGPT to clear its memory. In contrast, Claude and Gemini do not have a memory feature so the role will need to be specified in each new conversation.

2. Include seed words

Seed words/phrases provide relevant contextual information to guide the GenAI tool towards producing desired outputs.

These seed words might include the age or developmental stage of students (as references to year level may not align with your context), content descriptors, a context in which problems should be based, or instructional models to use (Figure 6 and Figure 7). The inclusion of seed words tends to result in outputs that are better suited to the environment or purpose for which they are intended (Spasić & Janković, 2023).

However, our soon-to-be-published research reveals a limitation to this approach. While GenAI outputs appear to reflect the seed words, the output is not always consistent with the expectations associated with the inputs. We tested the same prompt using different instructional models (5E; Launch, Explore, Summarise; Explicit Teaching) as seed words.

We found that, despite using words consistent with the instructional models, there was little difference in the structure and activities of the generated lesson plans.

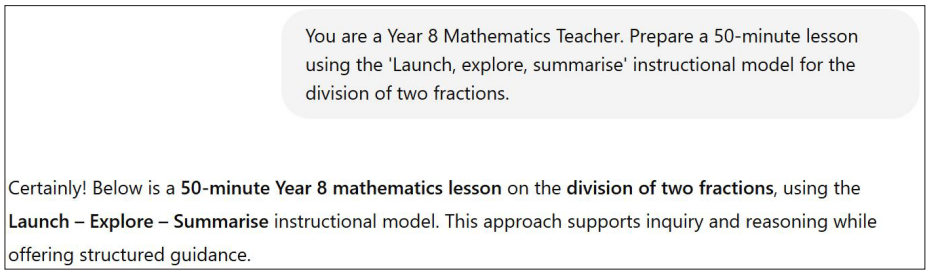

Figure 6. A zero-shot prompt which assigns a role and includes seed phrases (i.e., lesson length and instructional model).

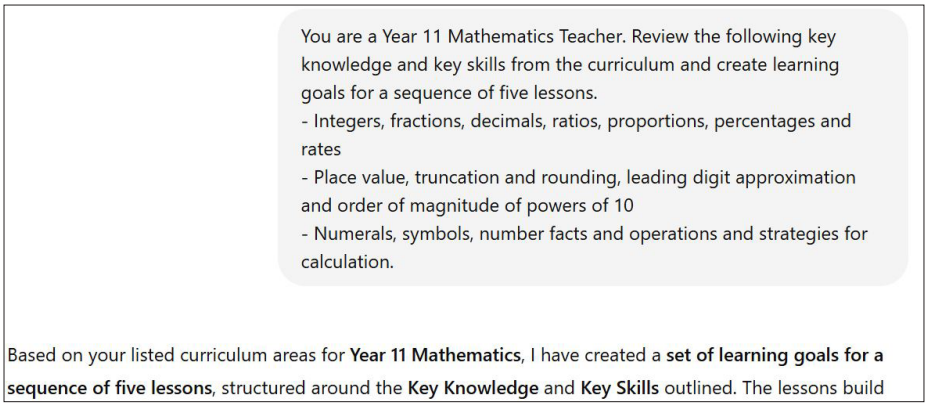

Figure 7. A zero-shot prompt which assigns a role and includes seed phrases (i.e., key knowledge and key skills, number of lessons).

3. Clarity of instruction

Providing clear and concise instructions is key for achieving high-quality outputs from GenAI tools. Vague prompts result in vague responses, while lengthy and complex prompts can 'confuse' the GenAI tool. In our experience, this results in the GenAI tool focusing on some aspects of the prompt while neglecting others. We find it helpful to think of GenAI as an efficient and reliable assistant that lacks common sense and an ability to 'read between the lines' of any instructions they are given. For example, when asking GenAI to create a revision worksheet, it is more effective to provide specific details (e.g., include 10 problems of different complexity) rather than vague criteria (e.g., the worksheet should take 50 minutes to complete). Given the potential for GenAI tools to hallucinate or create mathematically incorrect problems, we encourage teachers to review and complete all problems created by GenAI.

Breaking down the larger task into smaller tasks is another useful strategy. Rather than asking GenAI to 'create a lesson on dividing two fractions', you might first instruct it to generate learning intentions, then a hook, then worked examples, et cetera (see Figures 8a, 8b, 8c). These smaller tasks can then be combined into a single lesson plan.

META-PROMPTING

Meta-prompting involves the GenAI tool assisting you in developing the prompt itself (see Figure 9). This is useful if you're unsure about the information that a GenAI tool needs to complete a task. Although this strategy is less efficient than zero-shot prompting, this strategy reintroduces teacher expertise into the development of teaching materials as educators have greater control and agency over the output.

FINAL THOUGHTS

It is unlikely that a GenAI tool will produce an output that perfectly aligns with your desired outcome on the first attempt, so follow-up prompts are essential for refining an initial output. Clear and direct follow-up prompts are necessary to guide the GenAI tool towards better results.

Harvard University Information Technology (HUIT; n.d.) suggest that follow-up prompts should focus on correcting mistakes and providing (both positive and negative) feedback on the output.

Using earlier advice about instructions, follow-up prompts should target clear and specific aspects of the lesson. HUIT also suggest that clear instructions with 'do' and 'don't' statements are useful in ensuring that only relevant aspects are modified.

While we've not provided an exhaustive discussion of every prompting strategy here, one of the best ways to find what works is through experimentation. Playing with GenAI, while maintaining a critical view of its outputs, can reveal valuable prompting techniques. This process of exploration and refinement will help you unlock the full potential of GenAI as a teaching assistant.

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AI is a hot topic in education. At MAVCON25 we'll be talking about many issues that affect mathematics teaching and learning – including AI. Registrations for MAV's annual conference are open now, visit www.mav.vic.edu.au.

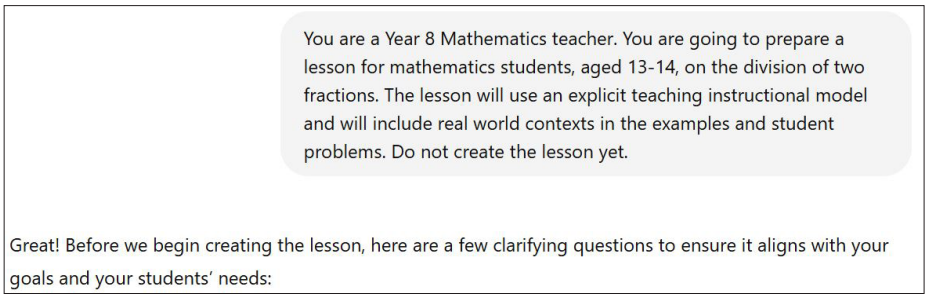

Figure 8a. A prompt to provide contexts for the tasks that are about to be requested.

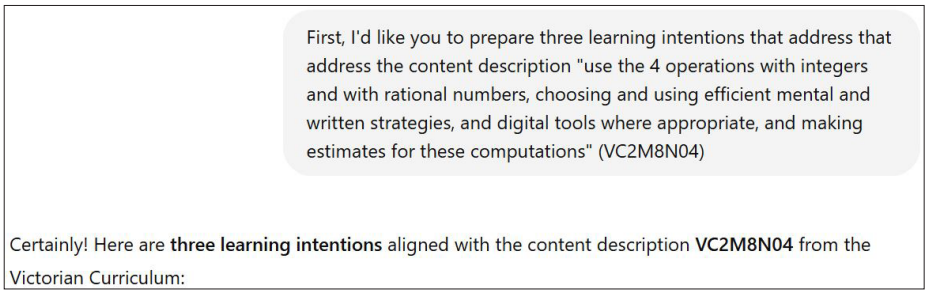

Figure 8b. A zero-shot prompt to develop a small part of a lesson plan.

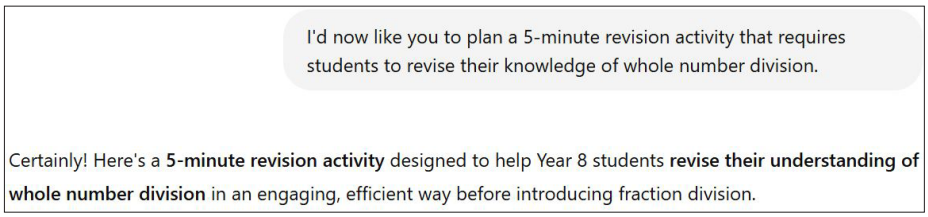

Figure 8c. A zero-shot prompt to develop a small part of a lesson plan.

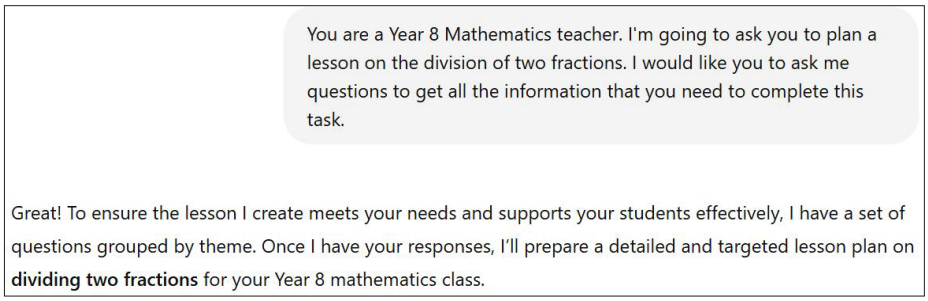

Figure 9. An example of a meta-prompt, and part of ChatGPT 4o's response.

MATHEMATICAL INQUIRY - WHAT IS IT?

Dr Kristen Tripet, Australian Academy of Science Education, reSolve Mathematics

Francis Su is a renowned mathematician and the author of one of my favourite books, *Mathematics for Human Flourishing*. Reflecting on the process of doing mathematics, Su writes:

> 'Exploration and understanding are at the heart of what it is to do mathematics' (Su 2020, p.23).

Mathematical exploration, or mathematical inquiry, is central to what it means to do mathematics.

Su (2020) describes mathematical inquiry as a process involving two phases.

Exploration phase: examining patterns and using inductive reasoning to form general claims (conjectures) based on specific examples.

Justification phase: deductive reasoning is used to logically explain and support conjectures using mathematical language.

MATHEMATICAL INQUIRY IS A STUDENT ACTION

Students should experience mathematics in the same way. Students should be engaged in mathematical inquiry as they explore patterns, make and test conjectures, form generalisations, and predict results (Mason et al., 2010).

The teacher must play a crucial role by deliberately using multiple pedagogical practices to skilfully guide students' inquiry. These pedagogical practices vary – they will be dependent on the mathematical goal for the lesson, the content being explored, the teacher, the students, and even the time of day that maths is being taught! These pedagogical practices will draw from those aligned with inquiry and explicit teaching pedagogies.

INQUIRYING INTO WHAT?

So, we want students engaged in genuine mathematical inquiry. But what are students inquiring into? And what is the purpose of this inquiry? Again, Su's (2020) quote cited earlier is useful: 'Exploration and understanding (emphasis added) are at the heart of what it is to do mathematics.' (p.23).

Students need to be exploring and making sense of the mathematical patterns and structures that underpin concepts and procedures of school mathematics (Chapman, 2024). They need opportunity to notice and make sense of the structure of, and structural relationship among, mathematical ideas (Schoenfeld, 1992).

POWERFUL MATHEMATICAL IDEAS

Students must be involved in grappling with important, foundational concepts – what we refer to at reSolve as powerful mathematical ideas. These are fundamental ideas that connect mathematics and support the development of deep, transferable understanding. They appear in the early years of schooling and grow in complexity and sophistication throughout the curriculum. By exploring these ideas, students build a coherent and interconnected understanding of mathematics.

Mathematics teaching in schools can be dominated by teaching the skills of mathematics. Skills in mathematics are vital — they are part of the necessary tools we need to do mathematics, and students must be fluent with these skills. But skills alone are not enough. Students need to understand the concepts behind skills and procedures to make these skills transferable (Wiggins & McTighe, 2005).

At reSolve, we have begun the work of identifying powerful mathematical ideas for different mathematics concepts. Visit www.reSolve.edu.au to learn more.

STUDENTS AS MATHEMATICAL INQUIRERS

Our goal should be for students to engage in genuine mathematical inquiry to learn what it means to see, think, and work like mathematicians. While students are not yet mathematicians, they are developing the habits and practices that mathematicians use when exploring unfamiliar ideas and solving problems with no immediate solution. So, we want students engaged in genuine mathematical inquiry into powerful mathematical ideas as they learn what it means to see, think and work like a mathematician.

WHAT THIS LOOKS LIKE IN PRACTICE

Lesson 10 to 1 is a reSolve task in our odds and evens sequence for Year 4.

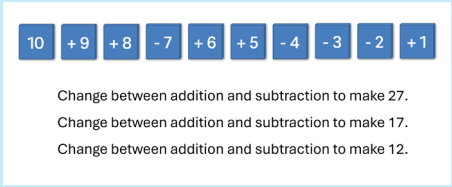

Figure 1. 10 to 1 task from reSolve.

Students use the numbers 10 through 1, applying addition and subtraction, to reach the targets of 27, 15, and 12. We typically use small square tiles for this task: one marked with the number 10, and nine others labelled from 9 down to 1. The tiles for the numbers 9 to 1 are double-sided: one side showing an addition sign and the other a subtraction sign before the number (Figure 1). This design enables students to easily switch between addition and subtraction as they experiment with combinations.

While many students quickly find ways to make 27 and 15, they soon discover that making 12 is impossible. This shift – from seeking answers to investigating why an answer doesn't exist – transforms the task from an arithmetic challenge into a rich mathematical inquiry. Why can I make 27 and 15, but not 12? What makes 12 different? This line of questioning moves students into deeper reasoning about number properties. They use specialised examples (Mason et al., 2010) to explore what quantities can be found. For instance, what happens when 5 is subtracted instead of added? Or if 7 is added rather than subtracted? What is the total when all tiles are added? (Figure 2).

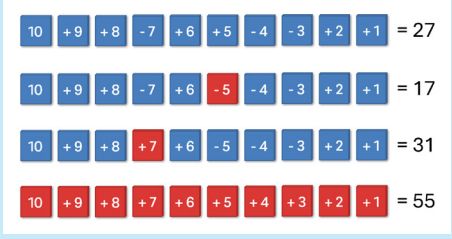

Figure 2. Exploring specialised examples in reSolve 10 to 1 task.

Through these investigations, students notice a pattern: all resulting totals are odd. This leads them to form a conjecture: Can only odd totals be made with these numbers?

By systematically trying different combinations, students confirm that using the numbers from 10 to 1 always results in odd totals. In contrast, when using only the numbers from 8 to 1, they find that only even totals are possible. This leads to a new and deeper inquiry: What is it about the set of numbers from 10 to 1 that results in only odd totals?

The key difference lies in the count of odd numbers in each set. The set 10 to 1 contains an odd number of odd numbers, whereas the set 8 to 1 contains an even number. This leads to an important mathematical idea: an odd number of odds will always produce an odd total when using only addition and subtraction. But why is this the case?

To make sense of this, students explore the structure of odd and even numbers. An odd number divided by two leaves a remainder of one. When you add an even number of odd numbers, their 'extra ones' pair up to form even totals. But when the count of odd numbers is itself odd, one 'extra one' remains unpaired, resulting in an odd sum (Figure 3).

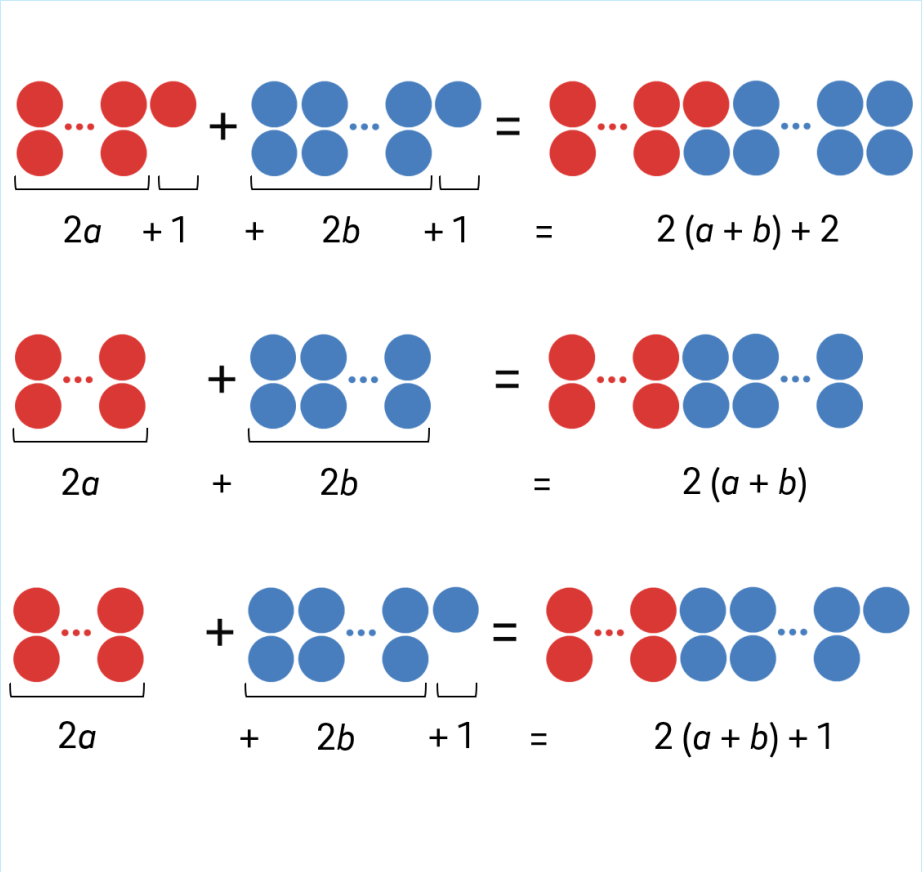

Figure 3. The effects of adding odd and even numbers.

OUR FIVE INQUIRY PRACTICES

At reSolve, we have identified a set of five practices that are central to mathematical inquiry, the practices used to develop mathematical understanding.

- **Exploring:** Exploring specific examples of mathematical ideas to see what is noticed.
- **Conjecturing:** Asking questions and making conjectures about what is noticed, and then testing these conjectures
- **Generalising:** Forming generalisations based on the mathematical patterns and relationships that have been noticed.
- **Justifying:** Justifying conjectures and generalisations that are made using convincing arguments and proofs.
- **Representing:** Representing mathematical thinking and concepts in multiple forms.

We have woven these inquiry practices into our reSolve sequences. Each sequence engages students in mathematical inquiry with the goal of developing a deep understanding of a powerful mathematical ideas. Teachers are supported with guidance on how they can effectively guide students through the mathematical inquiry process to achieve the lesson's mathematical goal.

At reSolve, our vision for school mathematics is that students are engaging in genuine mathematical inquiry into powerful mathematical ideas as they learn to see, think, and work like mathematicians. Let's make it a shared vision!

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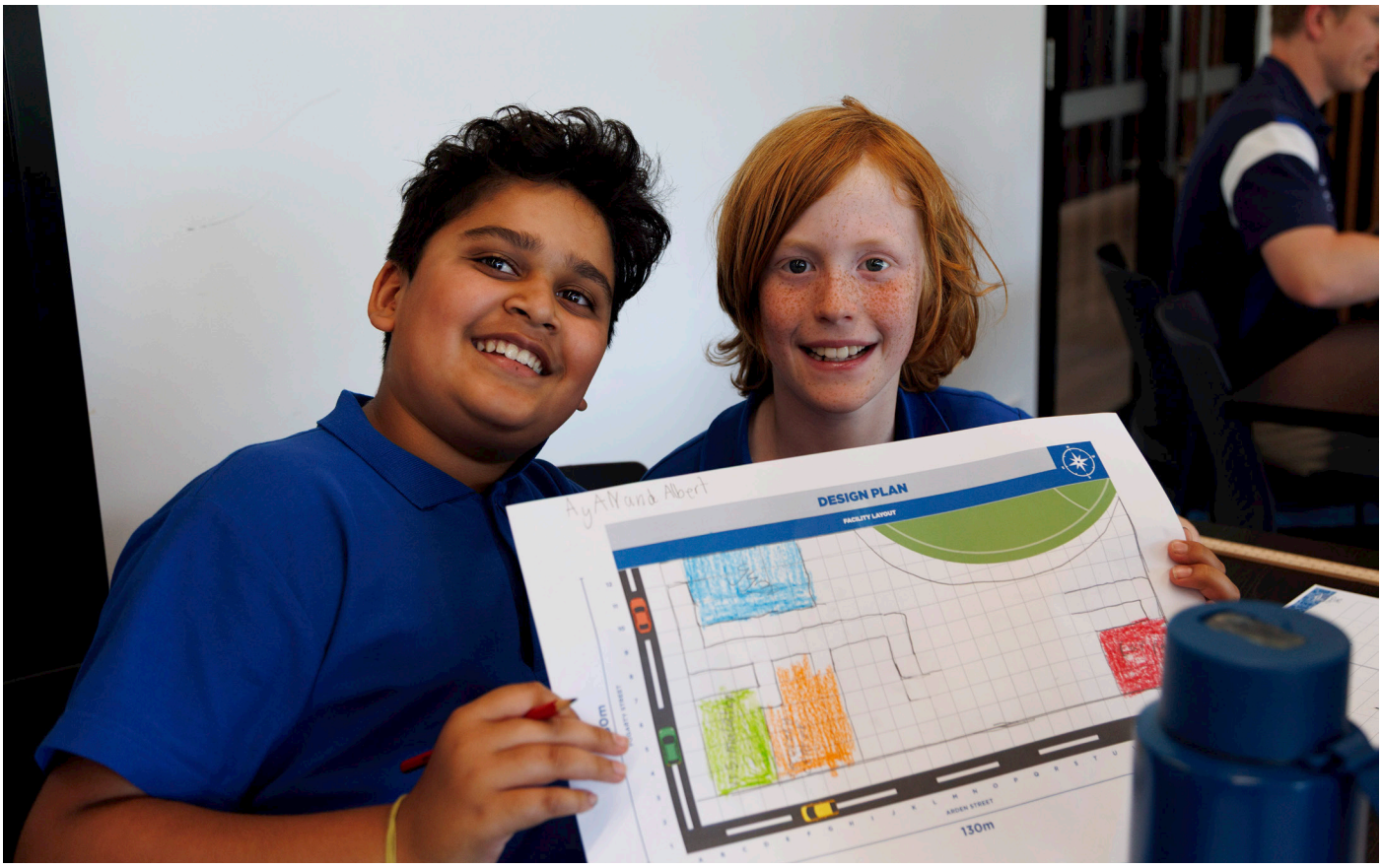
Kristen Tripet is a keynote speaker at MAV's annual conference, the leading mathematics education event in Victoria. Registrations are essential, book your place now at www.mav.vic.edu.au.

HOW CAN MATHS BE THIS FUN?!

Em O'Halloran, The Huddle and Ellie Barzouca-Evans, Ascot Vale West Primary School



A SPORTS INSPIRED APPROACH TO MAKING MATHS COME ALIVE IN THE CLASSROOM

Student reactions after experiencing GOAL! Kangaroos lessons continue to surprise - we keep hearing kids exclaim that they didn't know maths could be this fun. GOAL! lessons fuse sport and play which brings STEM to life in unexpected ways.

Each lesson is introduced by North Melbourne Football Club players, including AFLW premiership players Emma Kearney and Ash Riddell, along with AFL players Nick Larkey and Eddie Ford. Students engage in real-world problem-solving: analysing stats, designing kicking machines and investigating optimal kicking angles.

GOAL! IN THE CLASSROOM

At Ascot Vale West Primary School, Assistant Principal and Numeracy Leader Ellie has seen the positive impact of GOAL! Kangaroos on student engagement and learning. Aligned with the Victorian Curriculum - Mathematics 2.0, 'The lessons encourage students to apply skills, deepen their understanding, and connect maths to the real world,' Ellie explains.

'GOAL! lessons allow students to see how mathematical concepts work outside the classroom,' she continues. 'They use maths to solve real-life problems, such as redesigning football facilities, making learning tangible and purposeful.'

'It's essential that we continue to offer opportunities for our students to become problem solvers in a supportive environment, where they can test their ideas and bounce back from challenges. GOAL! lessons set up the conditions for students to do just that.'

'The lessons are highly adaptable,' says Ellie. 'They're great for hooking students, applying and mastering skills, or assessing student understanding.'

Not only do the lessons give students a fresh perspective on maths, but they also offer valuable resources for teachers. 'The lessons have become a useful tool for us in subsequent classes,' Ellie adds.

'Teachers can use the experiences students gain from GOAL! to explain new learning and make abstract ideas easier to understand.'

WHY GOAL! WORKS

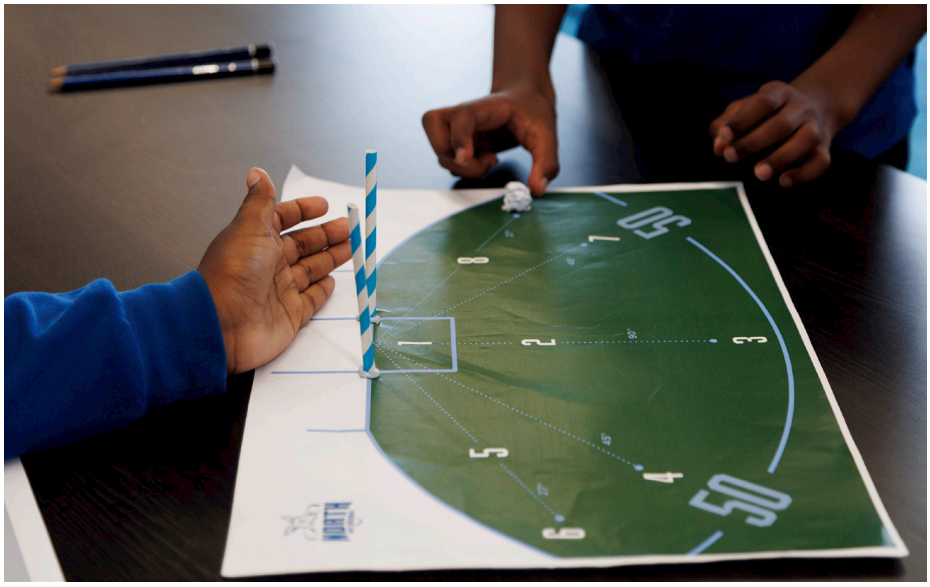
GOAL! aligns with the Victorian Teaching and Learning Model 2.0 by providing engaging, hands-on learning that builds mastery through application. The program offers multiple benefits for both students and teachers:

- **Real-world context:** Students see maths in action through practical examples such as estimating the number of seats at Marvel Stadium and calculating goal accuracy.
- **Easy experimentation:** Supported application for students to test ideas, refine strategies, and gain confidence through trial and error.
- **Career pathways:** Activities introduce students to novel STEM careers, such as data analysis in sports.

- **Time saving:** 'Developing engaging and rich tasks can be time-consuming' Ellie notes. 'GOAL! lesson plans are clear and easy to follow for teachers of all experience levels.'

MAKING MATHS MEANINGFUL THROUGH SPORT

Sport and play involve maths by nature; they provide the perfect context for bringing numbers to life for students. GOAL! makes it easy to integrate playful learning into any classroom while keeping maths at the forefront. When students exclaim, 'I didn't know maths could be this fun,' after role-playing as sports analysts and sharing their data insights, it shows how sport's appeal and real-world challenges make maths not only playful but also relevant and attractive for students.



' I liked working with my friends on the role play – pretending to be a sport analyst using the stats to justify my argument.'

' I'm never kicking from the left pocket again; the probability of scoring is too low.'

Why not give GOAL! a try in your classroom? Visit www.thehuddle.org.au/goal to download all six lessons for free.

MATHEMATICS POSITION STATEMENT

Tim Wilson, Executive director, Curriculum and Teaching Practice Division, Department of Education (Victoria)

VICTORIA'S VISION FOR MATHEMATICS TEACHING: UNPACKING THE MATHEMATICS POSITION STATEMENT

Mathematics education in Victoria is at a critical and exciting juncture. Drawing on growing evidence from education, cognitive science, psychology, and implementation science, Victoria is leading the way, seeking to drive improvement in outcomes for all Victorian students. The newly released Mathematics Position Statement reflects Victoria's commitment to high-quality, evidence-based mathematics teaching and learning.

WHAT IS THE MATHEMATICS POSITION STATEMENT?

In line with *The Education State – Excellence in Every Classroom*, the Department of Education has released a new Mathematics Position Statement. Announced by the Honourable Ben Carroll, Minister for Education and Deputy Premier, the statement sets out a clear vision for mathematics teaching in Victoria.

At its core, the Mathematics Position Statement affirms that numeracy is a fundamental life skill, central to full participatory citizenship and access to future career pathways. It also acknowledges that, despite strong outcomes in Victoria, there remains a need to lift attainment for all students — including disadvantaged students, girls, First Nations students, diverse learners and those with disabilities.

The Mathematics Position Statement outlines how the Department of Education, in partnership with government schools, will:

- Implement the Victorian Teaching and Learning Model 2.0 (VTLM 2.0)
- Ensure time for students to develop mastery
- Develop and use common high-quality classroom resources
- Address mathematics anxiety
- Support teachers to enhance their professional capabilities and confidence.

This article intends to help answer some questions that teachers and leaders may have about the Mathematics Position Statement. Before continuing, I encourage you to read the Statement which is accessible at https://arc.educationapps.vic.gov.au/learning/sites/mathematics-site/2486/Mathematics-position-statement.

The article focuses on the first two strategies: Implementing the VTLM 2.0 and developing mastery. Future articles will address the remaining strategies.

WHAT DOES IT MEAN TO IMPLEMENT THE VTLM 2.0 IN MATHEMATICS?

The Position Statement builds on Victoria's commitment to high-quality practice and highlights the importance of implementing the VTLM 2.0 in mathematics classrooms. The VTLM 2.0 is a comprehensive teaching and learning model emphasising evidence-based, explicit and systematic instruction that aligns with research on how students learn best. (Victorian Department of Education 2025).

The VTLM 2.0 outlines what schools, groups of teachers, and individual teachers should attend to before, during and after instruction. As noted by David Howes in his *Common Denominator* article, many Victorian teachers are already embedding key practices outlined in the VTLM 2.0 in their schools (Howes, 2024). There are others that may find it a shift from their current practice.

Importantly, the VTLM 2.0 supports teachers to make informed, responsive and intentional decisions for planning, assessing and teaching. It provides a lens to prioritise instructional approaches that best align with how students learn. In other words, when these approaches are most effective and why they support learning.

WHAT IS EXPLICIT TEACHING?

The Mathematics Position Statement identifies Explicit Teaching as a foundational evidence-based teaching approach designed to help manage the cognitive load of students as they learn new content.

Explicit Teaching is structured and interactive. It is a high participation approach that is responsive to individual student needs and prior knowledge.

The department has published VTLM 2.0 Guides that unpack the key practices of of Explicit Teaching in further detail. They include:

- Activating prior knowledge and stimulating connections.
- Fully explaining what students need to learn in concise small chunks (e.g. key concepts, procedures, vocabulary and strategies).
- Demonstrating and modelling new knowledge and skills using practices such as worked examples, think aloud and non-examples.

Explicit Teaching also involves planning for and providing scaffolds for students who need additional support as they work towards common learning objectives.

Checking for understanding and frequent feedback throughout Explicit Teaching can help ensure that misconceptions are addressed early. These practices inform decision making about the amount of guidance and support students need to develop mastery of new knowledge and skills.

SUPPORTING MASTERY IN MATHEMATICS

Insights from cognitive science show that fluent recall of foundational mathematical knowledge (involving number facts, mathematical procedures and language) helps free up working memory to maximise learning (AERO, 2023). When processing too much new information at one time, working memory can become overloaded making it difficult to process and connect new mathematical knowledge and skills.

Such connections are important for developing mastery in mathematics. Developing consolidated foundational knowledge and skills enables students to move on to more complex mathematical thinking, reasoning and problem-solving. Mastery supports students to become adaptable users of mathematics.

The Mathematics Position Statement emphasises the importance of achieving mastery in key areas of mathematics and recommends students be given frequent opportunities to practise and review concepts. This includes spaced and varied practice, which helps consolidate learning as well as opportunities for challenge and application as students progress from novice to expert. The VTLM 2.0 Guides further unpack the key practices.

WHERE DO MINIMALLY GUIDED APPROACHES FIT?

While Explicit Teaching is essential for teaching new knowledge and skills, minimally guided approaches also play a role in mathematics teaching and learning. However, it is important to consider when is best to use these approaches and for what purpose (the why).

Once students have learned relevant prior knowledge and skills, they are better equipped to extending their thinking and apply this learning to more complex and varied tasks with less guidance and support by the teacher. This is where minimally guided approaches like structured inquiry align within the VTLM 2.0. Lesson structures like Launch–Explore–Summarise (LES) can be aligned to the Mastery and Application or Supported Application elements of the VTLM 2.0.

Teachers with knowledge and experience implementing LES-type lesson structures are well placed to develop lessons that extend and challenge students. However, both the VTLM 2.0 and Mathematics Position Statement do articulate that inquiry approaches are not a substitute for Explicit Teaching — these approaches need to be sequenced appropriately to effectively support the teaching and learning of mathematics.

WHAT DOES THIS MEAN FOR ME?

The Mathematics Position Statement recognises that effective mathematics teaching is grounded in practices that align with how students learn — beginning with Explicit Teaching and moving purposefully toward Mastery and Application.

By embedding the VTLM 2.0 in every mathematics classroom in government schools, and supporting teachers with the tools, time, and professional learning they need, Victoria is well placed to address longstanding gaps in achievement. This will ensure all students build deep, transferable mathematical knowledge.

Teachers play a central role in evaluating the impact of their practice and engaging in informed and robust discussions about approaches that best support student learning. I encourage you to use the Mathematics Position Statement to stimulate reflection on teaching and learning practices in your school. It is through collaboration, reflection and a rich conversation about mathematics that we help foster excellence in every classroom.

REFERENCES AND FURTHER READING

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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 colours can you see on the tiger? I can see 3. Go outside and find 3 sticks. Now find 3 of something else - perhaps stones, leaves, feathers, flowers, petals or pinecones. How many different groups of 3 can you make?
- What animals do you think are bigger than a tiger? What animals do you think are smaller than a tiger? What is the biggest animal you know? What is the smallest animal you know?
- How many tigers are in this picture? I can see 1 tiger. Go for a walk and find the number '1'. Every time you find the number 1, copy it onto a whiteboard (or piece of paper).
- The tiger caught 4 fish to eat for dinner. He had to share the fish with another tiger. How many fish would each tiger get? Draw a picture that shows how the fish are shared equally between the tigers.
- Do you think this photo was taken in the morning, afternoon or night? Explain why.
- Do you think a tiger will walk into this room today? Explain why or why not. What are some things that you think will happen today? What are some things you think will not happen today?
- Do tigers live inside or outside? Why? What animals can live inside? What animals should only live outside? Why?
- If there was one more tiger in the picture, how many would there be? (2) Draw that many tigers and write the matching number. Then, add one more tiger to your picture - how many are there now? (3)
  Keep adding one more tiger at a time, drawing and labelling the number, until you reach 5 tigers.

FOUNDATION - YEAR 2

- This tiger has a pair of eyes, and a pair of ears. What is a pair? How many are in a pair? How many pairs can you make using sticks / rocks / pebbles / teddies? Try counting by 2s using the pairs you've made to help.
- Which animals are heavier than a tiger? Which ones are lighter? Imagine placing them on a see-saw with a tiger - draw how the see-saw would tilt to show which animals weigh more and which animals weigh less than a tiger.
- 20 tigers were walking in the jungle. Some were adults and some were cubs. There were more adults than cubs. How many might have been adults? How many might be cubs? How many different possibilities can you think of?
- 24 tigers learnt to walk in equal lines. How many lines might they walk in and how many tigers would be in each line? Use counters to represent the tigers in their lines and then draw each possibility you come up with. There are 8 possibilities - can you show them all?
- This tiger has 3 different colours on its coat. Make a repeating pattern using 3 different colours. Swap with a friend and continue each other's patterns. Then make a different repeating pattern, using the same 3 colours. How many different repeating pattern can you make using the same 3 colours?
- We asked 20 people which animal they liked more: tigers or monkeys. More people chose monkeys! Draw a graph to show what the results might look like.
- A drone took a photo from above a group of tigers. It was very easy to see that there were 8 tigers in the group without having to count them individually. What might the photo have looked like? Explain why it was easy to see that there were 8 tigers.
- Animal posters like this cost $1.50 to buy in a shop. How many posters would you like to buy and how much would that cost altogether? Prove your answer in 2 different ways.

YEARS 3 - 6

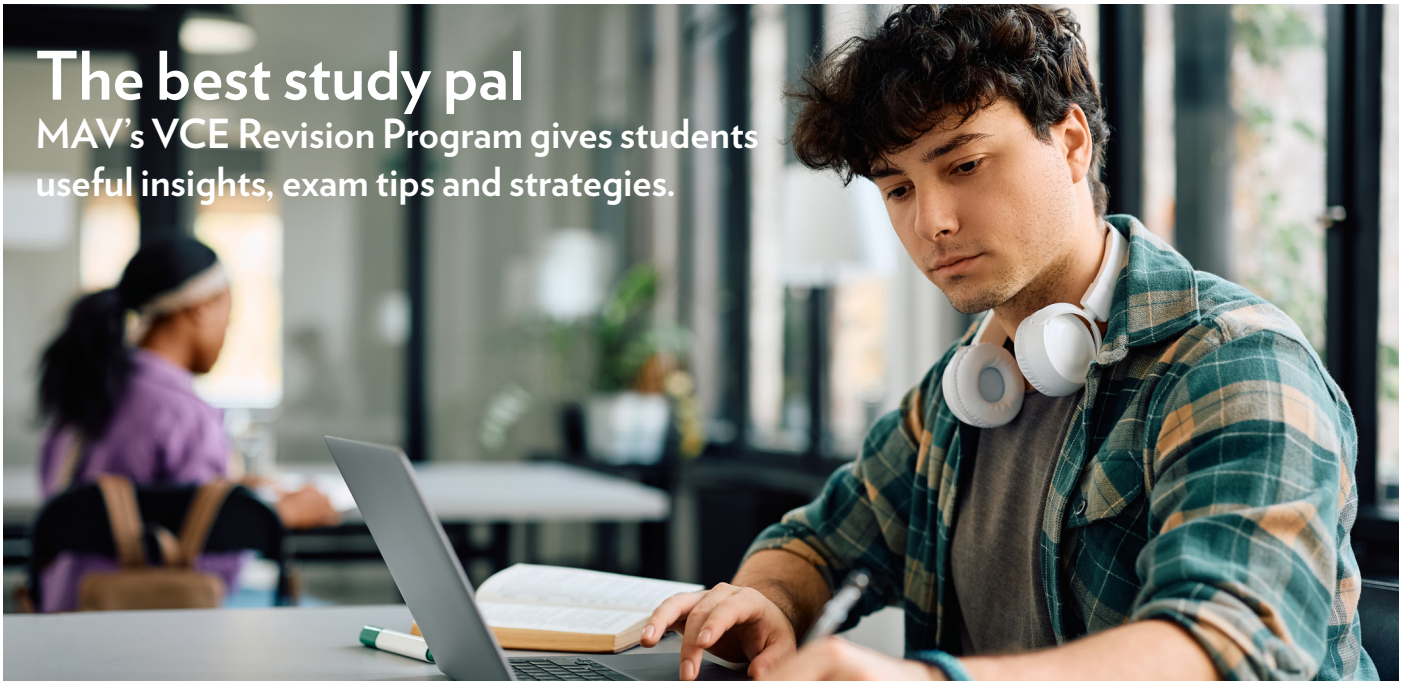
- The average tiger lives for approximately 15 years. Create a timeline showing at least five different birth years and how long each tiger would live over it's 15-year lifespan.
- Two tigers have a combined weight of 215.5kg. Each tiger weighs at least 90kg. What might the weight of each tiger be? How many different solutions can you show?
- Did you know that India is home to half of the world's tiger population? How many tigers do you think live in India, and what would that mean the total number of tigers worldwide is? Show different possibilities.
- If an adult tiger is 37.6 cm taller than its cub, and the cub's height includes a decimal, what could their heights be? Find at least five different, realistic possibilities for both the adult tiger and the cub.
- This tiger walked into the water and stayed there for 57 minutes. What time might it have entered the water and what time did it leave? Prove your answer using a timeline. Show at least 6 different possibilities.
- Tigers only need to hunt for their food once a week. Create a graph based on 100 tigers and their weekly hunting habits. Your graph should show that:
  - Twice as many tigers hunt on Tuesday than Monday.
  - More tigers hunt on Wednesday than any other day of the week.
  - Friday is the least popular day for hunting.
  - 10 tigers hunt on Saturday.
- Is the tiger symmetrical? Explain your reasoning. Find and photograph objects around you that are symmetrical, then create a presentation to demonstrate symmetry using your images.

YEARS 7 AND ABOVE

- The tiger population has declined by 93% since the early 20th century. Estimate what the population might have been back then and what it could be today. Plot this change on a graph, showing at least five different points over time. Be sure to label each point clearly. Remember, the population decline may not have been steady — there could have been periods where the population temporarily increased.
- Use a map of the world, divide it up into Cartesian coordinates and plot each of the countries with tigers roaming free on the map, using information from https://wwf.ca/stories/13-countries-wild-tigers. List the Cartesian coordinates for each country. Choose two countries and provide directions to get from one to the other using the Cartesian coordinates.
- A random sample of over 100 tigers found that 47% were female and 53% were male. How many tigers might have been in the sample, and of those how many would have been female and how many would have been male? Show the number of males and females for at least five different sample sizes.
- Tigers can run at a top speed of 65 km/h. If a tiger runs 175 km without stopping, how long would it take? Now, if the tiger ran 175 km, with half the distance at 65 km/h and the other half at 30 km/h, how much longer would it take to run the 175 km?

MAV education consultants can come to you and create a professional learning plan to build the capacity of teachers at your school. Reach out to our friendly team: primary@mav.vic.edu.au or secondary@mav.vic.edu.au.

VCE REVISION PROGRAM 2025



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THE MATHEMATICAL ASSOCIATION OF VICTORIA

BUILDING CAPACITY

Jen Bowden, CEO, MAV

STRENGTHENING PRACTICE THROUGH PARTNERSHIP

South Yarra Primary School recently hosted a tailored professional learning program in partnership with MAV, led by myself and Education Manager, Dianne Liddell. The initiative was designed to build the capacity of early career teachers by connecting them with expert mentors, experienced colleagues, and a decade-long partnership that continues to support professional growth across the school.

The program was developed through collaborative planning with school leaders, who shared insights into the school's current instructional model and its alignment with the Victorian Teaching and Learning Model (VTLM) 2.0. The current model, embedded and highly visible across the school, is a result of years of reflective development, grounded in research and a deep understanding of the school's unique context. MAV and school staff agreed that the model's similarities highlighted the strength of South Yarra's instructional model and its clear connection to broader departmental priorities.

The program recognised the high quality practice already embedded across the school. South Yarra Primary has a strong tradition of using guided inquiry, open-ended tasks, and problem-based learning to deepen conceptual understanding and promote supported application.

The professional learning program built on established school-wide teaching strategies. Teachers were encouraged to be flexible and adaptive, ensuring they could make informed decisions in response to student needs without abandoning what they know works. As one teacher noted, it was reassuring to know they didn't have to 'throw the baby out with the bathwater'– existing excellence was not only acknowledged but elevated.

A key strength of the program was its careful structure, which prioritised a supportive and collaborative environment for early career teachers. Jen and Di modelled lessons that reflected the school's instructional model, allowing all teachers to observe effective practice in action. These modelled lessons became a catalyst for professional dialogue, enabling teachers to unpack pedagogical decisions and connect them to the school's shared framework.

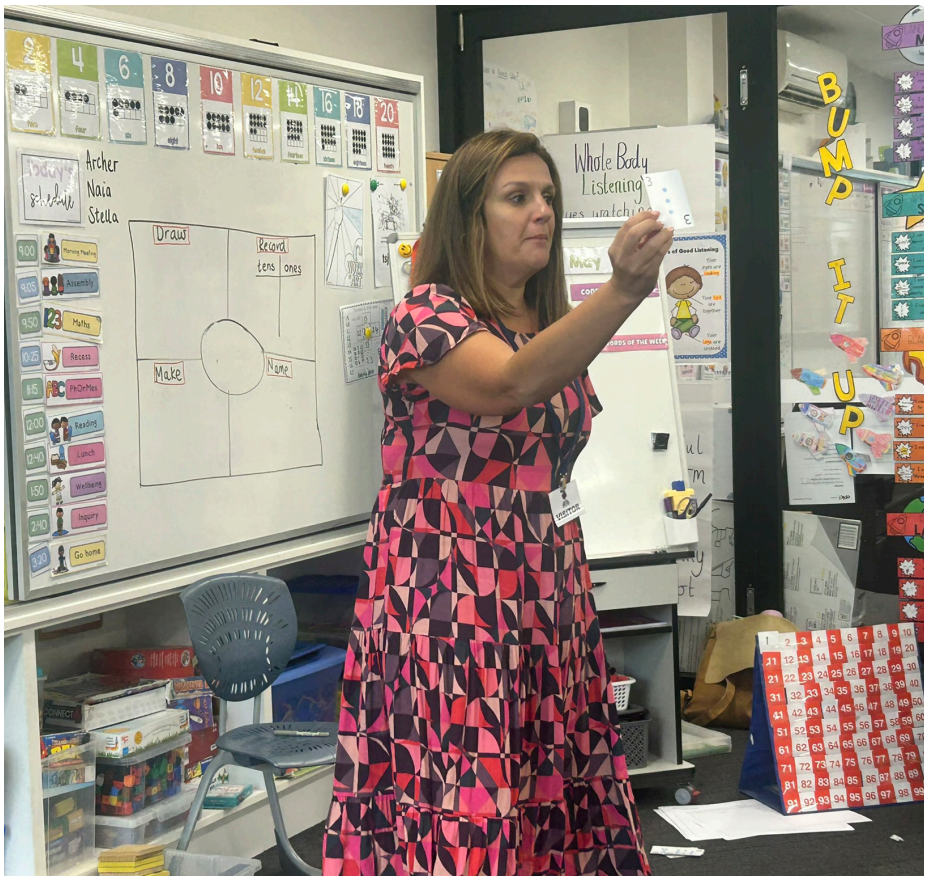


Figure 1. MAV's Education Manager, Dianne Liddell, at South Yarra Primary School.

Following these observations, teachers took part in a guided planning session supported by experienced mentors. This session encouraged collaboration, deepened understanding of pedagogical content knowledge, and ensured that the planning process considered student needs, curriculum requirements, and evidence-based instructional strategies. Teachers then implemented their planned lessons the following day, with peer and mentor observations offering further opportunities for feedback, reflection, and shared learning. To extend this professional learning, an after school workshop focused on deepening teachers' understanding of VTLM 2.0, particularly the explicit teaching dimension. Jennifer guided staff through Department of Education resources *Focus the Learning, Explicit Explanation and Modelling, Scaffold Practice*, and *Monitor Progress* – encouraging staff to reflect on how these are embedded in their own classrooms.

Teachers explored how the department's Lesson Plans could be adapted to meet the specific needs of South Yarra's students, supporting consistent and high-quality teaching practice across the school.

This professional learning program exemplifies the power of long-term, strategic partnerships. By bridging the insights of experienced educators with the enthusiasm and curiosity of early career teachers, the program fostered a culture of reflection, collaboration, and continuous improvement. Early career teachers were supported in building their instructional knowledge but also connected with the historical and pedagogical wisdom that shapes South Yarra Primary's ongoing success.

Through expert modelling, intentional collaboration, and alignment with system priorities, this initiative has laid a strong foundation for sustained professional growth – ensuring all teachers, regardless of experience, continue to learn from one another in pursuit of improved outcomes for every student.

BUILDING FLOW

Joel Pinto and James Dann, Brighton Grammar School

In a dynamic mathematics classroom, students are most engaged when they experience a state of 'flow,' a concept developed by psychologist Mihaly Csikszentmihalyi. Flow occurs when students are deeply immersed in learning, striking the perfect balance between challenge and skill level. This flow channel or 'flow state' fosters intrinsic motivation, enjoyment, and enhanced performance. During our MAVCON 2024 workshop, we explored how secondary mathematics teachers can build flow in their classrooms to improve student engagement and learning outcomes.

A critical tool in understanding flow is the Flow Channel diagram (see Figure 1), which maps student experiences on two axes: challenge level and skill level. Students experience flow when these two elements are balanced. If the challenge is too high and skills are too low, students feel anxious. If the challenge is too low and skills are high, students become bored. In a maths classroom, a student may experience these different states of emotional being and therefore the instruction, the tasks and the classroom environment should be conducive to promote flow.

Csikszentmihalyi outlines the conditions necessary for achieving flow. Some key factors include, a clear goal or challenge that stretches but does not overwhelm students, immediate feedback that helps students adjust and improve, a balance between skill level and task difficulty, a sense of control, intrinsic motivation and enjoyment.

EMBEDDING THESE FACTORS INTO A MATHS CLASSROOM TO ACHIEVE FLOW

There are three keys to success:

- A clear goal.
- A learning intention.
- Success criteria.

In previous years, I used to be content with writing the chapter title on the board and thus carry on with worked examples and teaching. At Brighton Grammar School, the mathematics faculty have developed a consistent practice of producing a unit plan that is handed to students at the start of every topic.

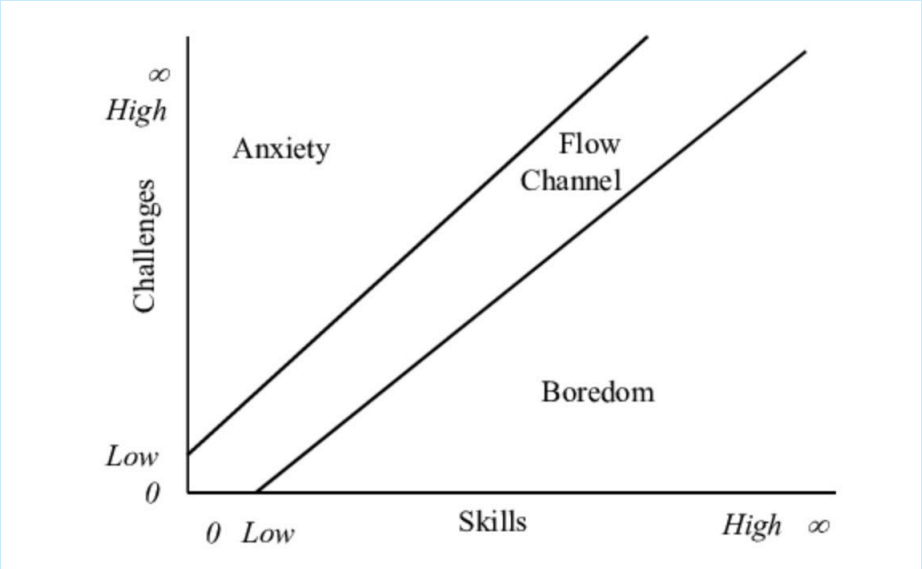


Figure 1. The Flow Channel. Mihaly Csikszentmihalyi, The Flow (1990).

The unit plan breaks down each topic into Topic Success Criteria (TSC). (Figure 2.) I use that very language in class and it also is reflected in my explicit notes. (Figure 3.)

This in turn 'chunks' the lesson into manageable parts but also sets achievable goals for different parts of a lesson. This mitigates the anxiety felt by students as now the language used by students is 'I don't get part 3' rather than, 'the whole thing' (is confusing). Moreover, there seems to be a drive by students to master individual TSC's, contributing to the flow of the classroom as students immerse themselves into independent work.

A side note on note taking – pun intended! Over the years, through observing practice of some very experienced maths teachers, I have admired the use of prior knowledge questions to set the tone for a lesson, getting students to retrieve skills that might be pertinent to the lesson to follow.

I try to embed this very practice in most of my lessons, particularly with the first TSC of the lesson. Moreover, if the prior knowledge question and the first TSC question is crafted well, in my experience students have been able to bridge an understanding of their own. Figure 4 shows an example of one such lesson, the prior knowledge question of squaring the number 10 (Year 6) to introducing Logs (Year 10), using 10 as a base.

ROUTINES

Csikszentmihalyi explains how 'habits of discipline which force our attention into routines that bypass the big problems' can minimise anxiety and promote student control and focus – a student in 'automatic pilot' mode.

So what does my routine in a standard maths classroom look like? Students walk through the door where I position myself at the entrance – the 'threshold' – they find themselves not only greeted by myself but also reminded of some of the expectations amd perhaps some individual feedback. They then move to their allocated seating plan to begin a retrieval task (paper or laptop based) for seven minutes whilst I find flow in marking the roll and writing notes on the board.

Once students finish their retrieval task, their laptops are closed, books are open and they have six minutes to complete what is on the board before we transition into explicit instruction. This is one example of an entry routine. It's never perfect but what I have seen (and what my instructional coach observes when he visits my class) is that students know what is expected of them and therefore more engaged, focused and feel a sense of achievement within the first 13 minutes of class.

More importantly, I see the students in 'auto pilot' mode, doing the things expected of them and the students who experienced anxiety in a maths classroom have bypassed this emotion upon entry and feel more in control during the class.

Besides reading *Flow*, I strongly suggest reading *The Classroom Management Handbook*, by Mark Dowley and Oliver Lovell – a book with plenty of evidence-based strategies to better engage your students in the classroom.

Building flow in the secondary mathematics classroom is a powerful way to enhance student engagement, motivation, and achievement. By carefully balancing challenge and skill level, setting clear goals, providing immediate feedback, and fostering deep focus, teachers can create an optimal learning environment. When students experience flow, they not only perform better but also develop a deeper appreciation for mathematics and a lifelong love for learning.

Have you booked your ticket to MAVCON25 yet? It's the very best opportunity to learn, network and be inspired. If you enjoyed this article and are keen to expand your professional development and be at the forefront of mathematics education, visit www.mav.vic.edu.au and register for MAVCON25.

Topic Success Criteria – Self-Assessment Checklist

1. I can convert between logarithmic equations and exponential equations. Sample Question Write an equivalent statement to the following (a) $\log_{10} 1000 = 3$ (b) $2^5 = 32$	10A: 1–2
2. I can evaluate simple logarithms without a calculator. Sample Question Evaluate the following logarithms without a calculator. (a) $\log_2 8$ (b) $\log_5 625$ (c) $\log_3 \frac{1}{9}$ (d) $\log_{10} 0.001$	10A: 4–5
3. I can evaluate logarithms using a CAS calculator. Sample Question Evaluate, correct to three decimal places, using a calculator. (a) $\log_{10} 7$ (b) $\log_{10} 0.5$	10A: 6

Figure 2.

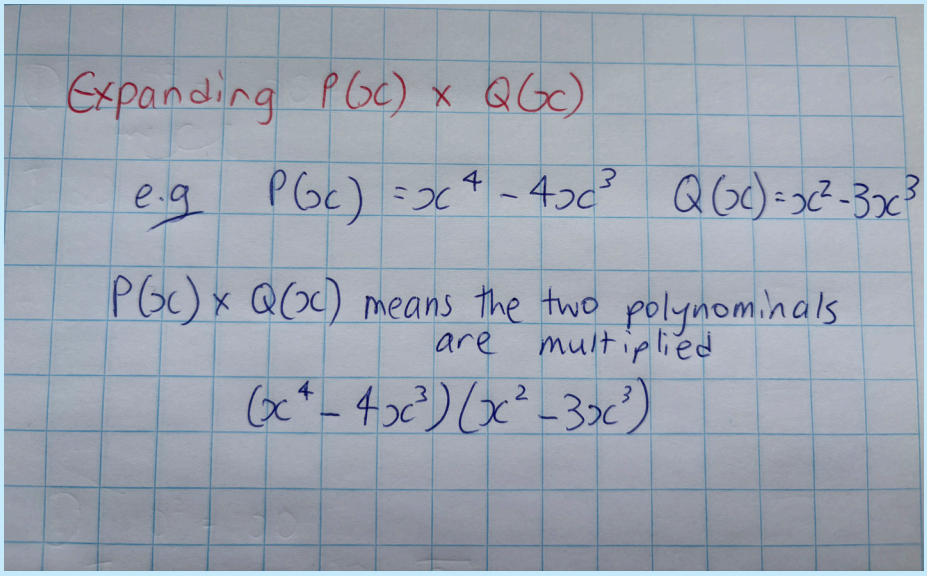


Figure 3.

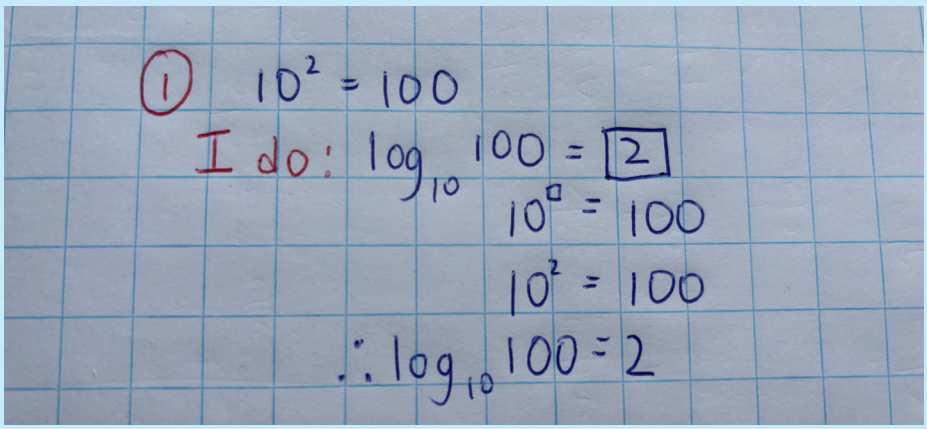
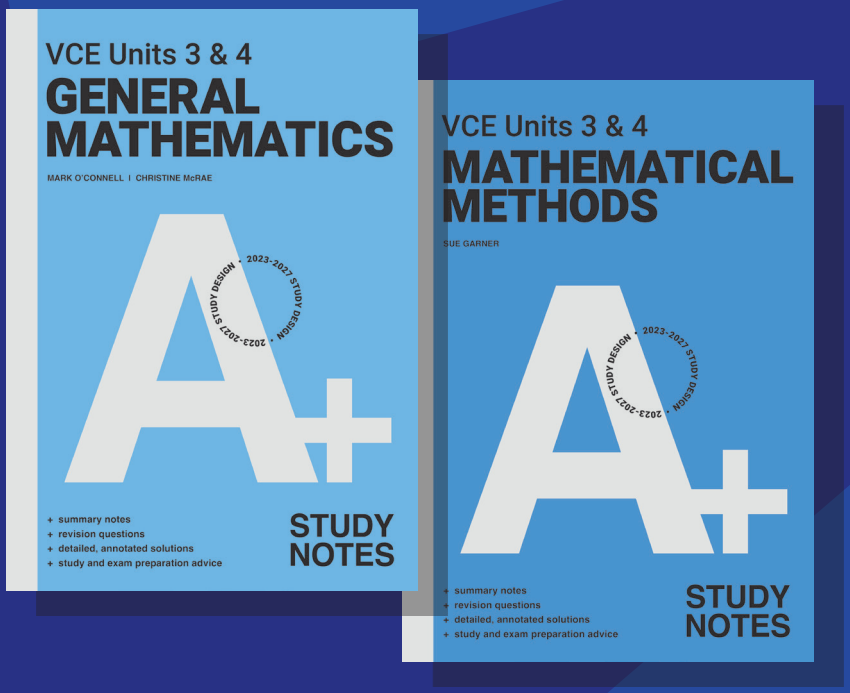


Figure 4.



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MEANINGFUL CONNECTIONS

Claire Embregts - Community manager, MAV

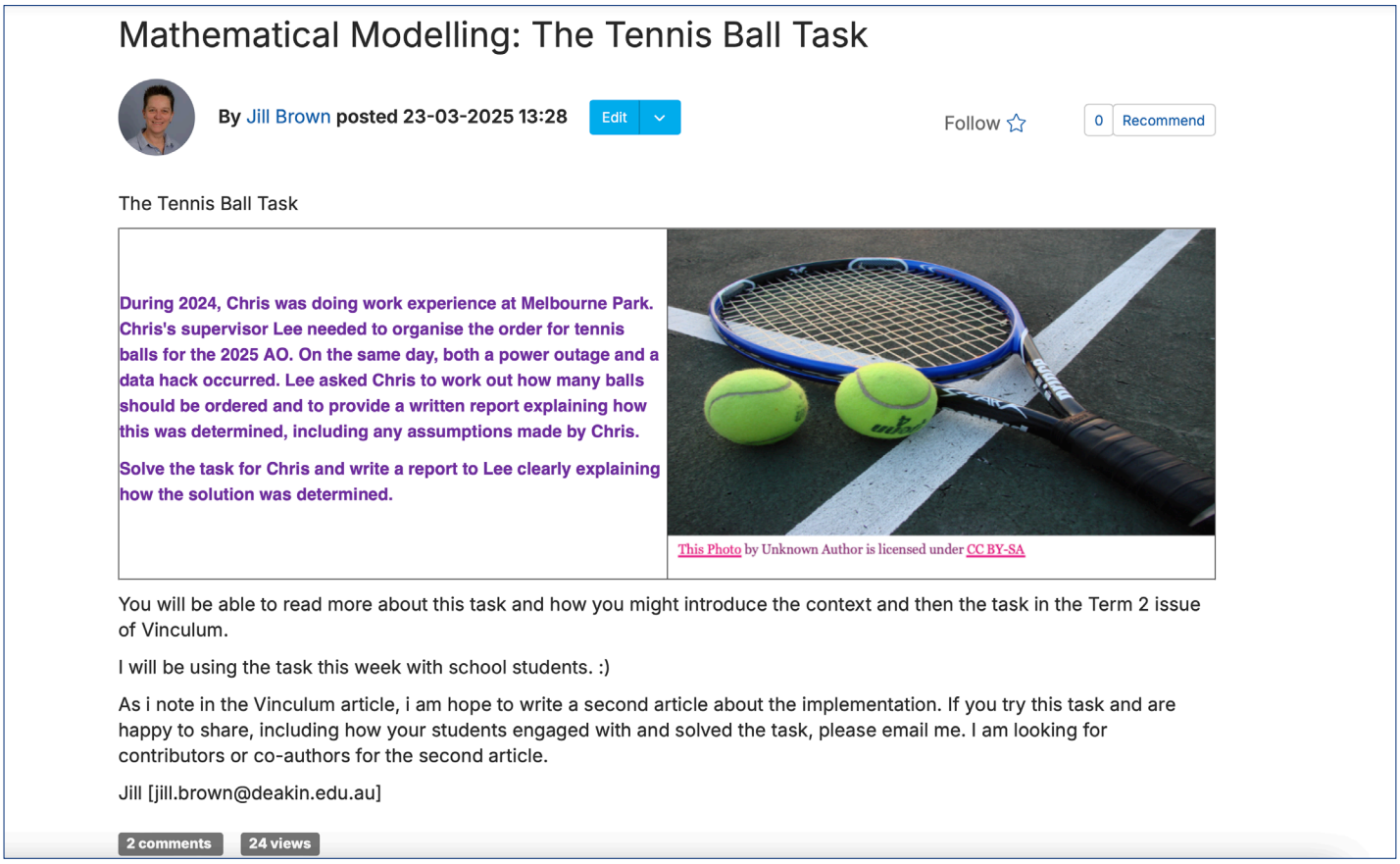

Figure 1.

FROM QUIET SPACES TO MEANINGFUL CONNECTIONS: HOW EVERY VOICE SHAPES OUR COMMUNITY

In the Term 4, 2024 edition of *Common Denominator*, we explored the value of collaborative professional learning and the power of building community among mathematics educators. This article picks up where that left off – focusing on how our online community space supports those ideas in practice. While things may appear quiet at times, even a single post or shared resource can make a meaningful difference. Whether actively contributing or observing, every interaction helps shape a more connected, supportive professional environment.

THE POWER OF ONE POST

Earlier this year, community member, Dr Jill Brown from Deakin University, shared a real-world inspired task involving tennis balls, the Australian Open, and a workplace-style scenario (Figure 1). It was designed to challenge students to think critically, make assumptions, and communicate their reasoning – skills at the heart of rich mathematical thinking.

The post didn't just offer a task; it opened a door. The contributor noted they were trialling it with students that same week and invited others to try it too – and even offered the opportunity to co-author a follow-up article based on how students engaged with it.

While it might have only received two replies and 24 views, the potential impact of this one post was huge:

- It gave educators a ready-to-use task.
- It encouraged classroom experimentation.
- It invited professional collaboration.

We hope to see more of this kind of interaction – where a single share can spark a chain of ideas and opportunities for others, and even a single post or shared resource can make a meaningful difference. Every interaction helps shape a more connected, supportive professional environment, whether actively contributing or observing.

QUIET DOESN'T MEAN INACTIVE

It's easy to assume that a quiet online space isn't being used – but in practice, we know that's not the case. Many members visit the community to browse resources, read discussions, or follow along with others' experiences without necessarily posting themselves. This kind of quiet engagement still adds value. It's a form of professional learning that happens on your terms – when you need it and in the way that suits your workload.

We also understand that sharing something in a public space, even one that's closed and member-only can feel daunting. Questions like 'Is this worth posting?' or 'What if no one replies?' often hold people back. But the reality is: even a brief reflection, a helpful link, or a classroom win can spark ideas for others. As we saw in the tennis ball task example, sometimes all it takes is one thoughtful post to open the door to broader collaboration.

So, if you've been quietly observing, that's okay. But know that when you're ready, the community is here to hear from you – whether you're looking for ideas, offering support, or simply sharing something that worked well in your classroom. Being present – whether visibly or not – is still a valuable contribution to the collective experience.

KEEPING THE DOOR OPEN

The goals for online communities isn't to flood them with constant content – it's to keep the space open, welcoming, and ready when needed. Whether you're looking for fresh teaching ideas, hoping to connect with other educators, or wanting to see what others are doing in their classrooms, communities are designed to support you in your own time and in your own way.

We'll continue highlighting valuable contributions over time, highlighting great discussions, and making it easier for members to navigate and participate. We're also exploring ways to better integrate the community with other elements of our digital platforms so that accessing the community feels seamless and natural. And remember, your contribution doesn't have to be perfect or polished. A quick question, a photo of student work, or a reflection on something that went well (or didn't!) can be enough to inspire a colleague or spark a new idea. The more diverse the voices in the space, the richer the experience becomes for everyone.

So, if you've been wondering whether to post – consider this your invitation. We'd love to hear from you.

LOOKING AHEAD

We're thinking about what comes next as we continue to shape this space together. What kinds of topics spark your interest? What challenges or successes would you like to share? And how can we make the community easier to use, more responsive to your needs, and even more valuable in your day-to-day work?

We're always open to feedback and your suggestions to improve the platform.

We want spaces that reflect your voice, experiences, and ideas. Your contributions help make our community meaningful. Whether you're actively posting or quietly reading, you play a role in supporting maths education across Victoria.

We want to hear from you! The MAV Community is a closed space, and we know there are many other online communities — such as Facebook groups and social media forums — where educators connect and share ideas. What online spaces do you find most useful for networking and sharing professional insights? Help us better understand the broader landscape by sharing your go-to platforms. Email your suggestions to Claire, cembregts@mav.vic.edu.au.

Your input will help us explore new ways to support and connect the mathematics education community.

You can read more about Jill's mathematical modelling tennis ball task in the Term 2 2025 edition of *Vinculum*.

PROMOTING RESEARCH

If you are conducting research and would like to advertise it in MAV's journals or magazine, follow the guidelines below. Note that the promotion of research is subject to available publication space and is not guaranteed.

- Keep your writing succinct and brief **(maximum 250-350 words)**. Less is best.
- Provide Human Ethics Research Committee (HERC) approval number (non-negotiable).
- Clearly state the purpose and objectives of the research project.
- Outline the participant criteria (e.g. teachers, students, parents, age range).
- Briefly describe what will be involved for participants (e.g. surveys, interviews, classroom observations).
- Highlight the benefits of participating and indicate the expected time commitment required from participants.
- Provide details on confidentiality and privacy protection for participants.
- Include the researcher's affiliation and contact information.
- Specify any relevant deadlines.
- Provide a QR code (as a separate high res JPEG file) for readers to follow for more information and/or linking to your study.
- Submissions should be plain text in a Word document and emailed to office@mav.vic.edu.au.

At the conclusion of your study, we warmly invite you to consider submitting an article to either of our journals, *Vinculum* (secondary) or *Prime Number* (primary), to share your research findings with the mathematics education community.

THE MATHEMATICAL ASSOCIATION OF VICTORIA

CHALLENGING TASKS: FOUNDATION

Melissa Paola, Macalie Vlah, and Lana Harris - Essendon North Primary School

BUILDING A GROWTH MINDSET AND MATHEMATICAL THINKING WITH FOUNDATION STUDENTS

At Essendon North Primary School (ENPS), we believe that Foundation students are completely capable of engaging in rich, inquiry-based mathematical thinking. Educators may assume that problem-solving through challenge and inquiry is beyond the reach of 5 and 6 year olds. However, our experience has shown that when provided with the right environment, scaffolding, and support, young learners flourish in their mathematical development.

Our goal is to foster growth mindsets, persistence, and problem-solving skills, equipping our students with the confidence to tackle mathematical challenges independently.

PRIORITISING CHALLENGING TASKS IN FOUNDATION

Children are naturally curious and capable. When given meaningful mathematical problems to explore, they develop a productive mathematical mindset that extends beyond the classroom. Our approach is grounded in four key pedagogical elements:

Deliberate and collaborative planning: ensuring challenge is built into the learning trajectory.

Spotlighting student thinking: making their strategies visible and providing opportunity for verbal reasoning.

Using formative assessment effectively: tracking progress and identifying next learning steps.

Coaching and collaboration: continually refining our teaching practices to improve student outcomes.

By embedding challenging tasks within play-based learning, structured inquiry, and explicit teaching, we have seen significant improvements in engagement, mathematical discourse, and problem-solving persistence in our students.

IMPLEMENTING: LAUNCH-EXPLORE-SUMMARISE

At ENPS, we have four Foundation classes across two team teaching spaces.

We introduce challenging tasks in Term 3 and 4, after expectations and routines have been established and practised frequently. At this stage, we introduce a structured Launch-Explore-Summarise model to guide our approach to problem-solving.

1. The anticipate phase

Before teaching a lesson, we collaborate as a team to anticipate student responses and prepare strategies for differentiation. Our planning includes identifying learning goals and curriculum objectives, mapping students' prior knowledge and expected responses, purposeful task selection, and designing enabling prompts (to support struggling students) and extending prompts (to challenge high achievers).

2. The warm-up

Each lesson begins with a quick five minute warm-up to activate prior knowledge and build fluency. This might include Number Talks to encourage mathematical discussion, a mental maths challenge to strengthen numerical reasoning, or a quick card game or hands-on activity targeting foundational skills. Our students become familiar with these activities quickly, making for a smooth and efficient transition between warm-up and launch.

3. The launch phase

This is where we introduce the main problem – a rich mathematical challenge designed to engage students and encourage critical thinking. We use real-world contexts, children's literature, and play-based scenarios to make problems meaningful and accessible.

For example, in our *I'm Fabulous Crab!* task, inspired by the picture storybook by Nicki Greenberg, students are given this prompt:

Fabulous Crab decorated his shell with 10 jewels. Some are red and some are yellow. What could his shell look like?

This open-ended problem encourages students to explore pattern recognition, number combinations, and flexible thinking.

4. The explore phase

This is the heart of the lesson: 30 minutes of hands-on, student-driven learning, where students:

- Think for themselves, test ideas, and discuss solutions with peers.
- Use mathematical tools and manipulatives to represent their thinking.
- Receive scaffolded support from teachers, who ask pre-planned guiding questions rather than providing direct answers.
- Teachers then update a formative assessment tracker.

5. The summary phase

This phase is critical– it's not just a time to share answers, but a chance to consolidate learning and deepen understanding. We encourage students to: Explain their thinking and reasoning, compare different strategies and evaluate their effectiveness, and engage in respectful mathematical discussions, fostering a classroom culture of collaboration and reflection. By highlighting students' thinking, we make learning visible and encourage metacognitive awareness in young learners.

KEY TAKEAWAYS

1. Planning for challenging tasks

- Collaboration is essential. Our team-based approach ensures alignment and consistency.
- Challenging tasks should be embedded regularly, not treated as an occasional activity.
- Clear links to planned mathematical progressions help maintain focus and purpose.

2. Selecting the right task

- Tasks should be open-ended and low-floor, high-ceiling, allowing all students to participate at their level.
- Real-world connections (stories and non-fiction texts, songs, and hands-on experiences) enhance engagement.
- Students should be encouraged to take risks, persist, and problem-solve independently.

3. Building intrinsic motivation

- A growth mindset is key: students learn that struggle is a natural part of problem-solving.

- We foster independence by allowing students to choose their tools and strategies, and spotlighting the different ways students have chosen to solve the task.
- Mistakes are viewed as learning opportunities, not failures.

CHALLENGES AND SUCCESSES

Implementing challenging tasks required us to navigate and refine several aspects of our teaching practice. For instance, balancing student independence and explicit instruction, knowing when to scaffold learning and when to step back, planning when to use our formative assessment trackers to design like ability groups to explicitly support or extend, and supporting teachers to build their confidence in facilitating open-ended tasks.

SUCCESSES

- **Increased student confidence:** students are excited by the challenge and willing to take risks.
- **Greater autonomy:** students select, organise, and justify their strategies independently.
- **Richer mathematical discussions:** students articulate their reasoning using precise mathematical vocabulary.
- **Evidence of growth:** formative assessment data shows students applying their knowledge in flexible and innovative ways.

WHERE TO NEXT?

Our next steps at ENPS include:

- Further refining the Launch-Explore-Summarise model, incorporating insights from the Victorian Teaching and Learning Model 2.0.
- Implementing Mathematics Curriculum 2.0 to enhance alignment with broader mathematical frameworks.
- Strengthening connections between number sense and other strands of mathematics.
- Embedding consistent formative assessment practices across all year levels.

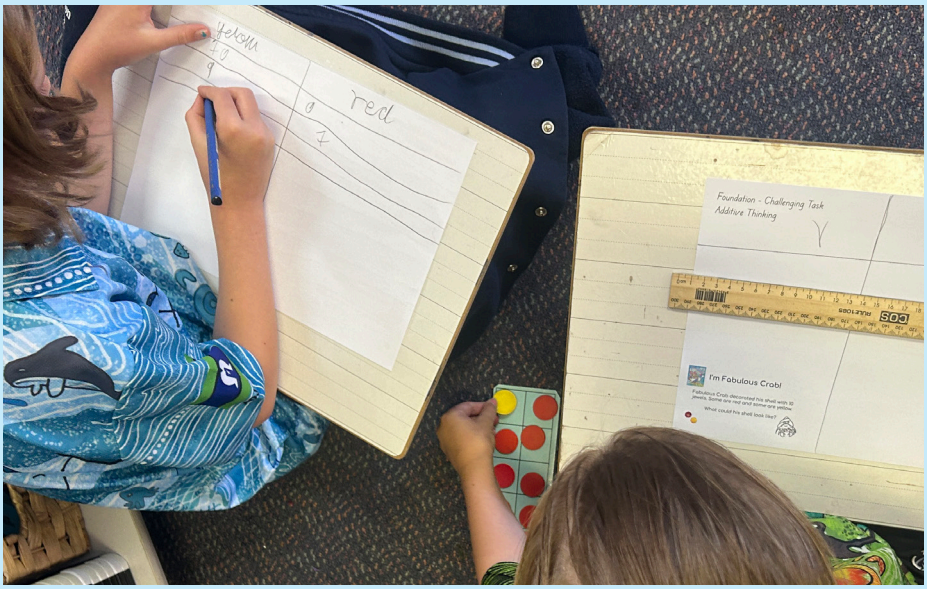

Figure 1. Foundation students using problem solving strategies of making a table and concrete materials to find the combinations of jewels.

Fabulous Crab visited our classroom on the weekend!

Hmm.. how many red and how many yellow jewels do you think he had?

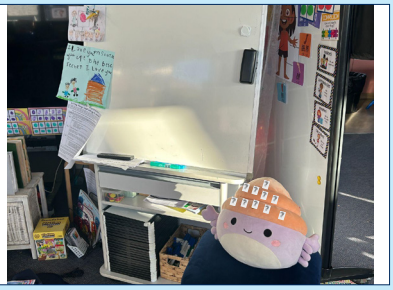

Figure 2. The challenging task question and Fabulous Crab in the classroom.

FINAL THOUGHTS

Our experience at Essendon North Primary School has shown that challenging tasks aren't just for older students. With careful planning, structured inquiry, and a strong emphasis on persistence, even our littlest learners can tackle complex problems with confidence.

By shifting away from procedural tasks towards rich, inquiry-based problem-solving, we empower students to think critically, communicate mathematically and hopefully develop a lifelong love for learning.

How can you introduce challenging tasks into your Foundation mathematics program? MAV can support this work in your school by providing coaching and in-school consulting. Email primary@mav.vic.edu.au to find out more.

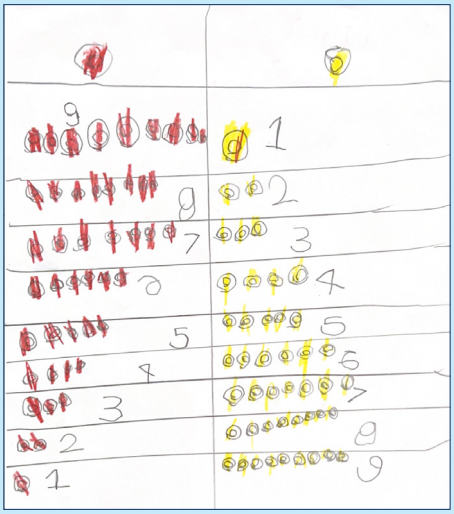

Figure 3. A Foundation student's thinking to systematically find all the combinations of jewels.

ONE MINUTE WITH MATT SEXTON

I'M...

The Director of the Mathematics Teaching and Learning Centre (MTLC) and a Senior Lecturer at Australian Catholic University (ACU) on the Melbourne Campus. I am a director on the board of the MAV.

I CHOSE A CAREER IN MATHEMATICS EDUCATION....

When I started teaching mathematics as a graduate teacher in the mid-90s, I quickly realised I wasn't 'at home' with the subject – and my students were letting me know. There's nothing like a drop in classroom enthusiasm to tell you something needs to change.

In the first few years of my teaching career, my principal allowed me to attend a professional learning session about the use of mathematical games facilitated by Ann Gervasoni. That session had a huge impact on my career in mathematics education.

In 2001, working at another school, my principal offered me the role of numeracy coordinator. I remember feeling excited yet nervous about leading mathematics improvement. To support my work, I studied a Master of Education at ACU, and I was fortunate to work with Doug Clarke, Marj Horne, Andrea McDonough, and Ann Gervasoni.

In 2008, I started my work as a School Advisor Mathematics for the Catholic Education Office (now Melbourne Archdiocese Catholic Schools), supporting schools participating in the Contemporary Teaching and Learning of Mathematics (CTLM) project to implement changes in teaching practices.

In 2010, I started work as a mathematics educator at ACU. I have appreciated the opportunity to learn from and alongside many pre-service teachers, mathematics education colleagues, and partners who choose to work with ACU.

RIGHT NOW I'M...

Researching in the area of middle leadership, finding out about practical ways that mathematics leaders lead teaching practice development in schools. I view practice development as the collective efforts that are undertaken to make mathematics teaching more informed, intentional, and impactful.

I want mathematics leaders to lead practice development so that students in our schools are more capable, curious, and creative learners and users of mathematics.

I also facilitate several mathematics leadership programs across the eastern seaboard of Australia. I am so fortunate to learn with and from many mathematics leaders who are working in resourceful ways to lead teachers' practice. I am inspired by their work and truly see them as experts. We are finding together that mathematics leadership is challenging, yet rewarding and achievable work.

I stay in this work because I believe every student deserves the chance to feel capable and curious in mathematics – and every teacher deserves the support to help make that happen.

I WAS HONOURED....

To receive the Early Career Researcher (ECR) Award by MERGA for an outstanding paper and presentation at the 2024 MERGA conference. The paper highlighted how mathematics leaders sustained reforms in their schools after participating in a large-scale project, acting as agents of sustainability through resourceful practice. I shared the award with my colleague and friend, Dr Chelsea Cutting, from the University of South Australia.

I THRIVE WHEN...

I'm immersed in new ideas that challenge how we teach and lead mathematics. Whether it's a big idea from theory or a small shift in practice, I'm energised by the possibilities for doing our work differently – and especially doing it better.

I SPEND A LOT OF TIME...

Thinking about the theoretical framework that informs my work as a researcher, teacher, and lecturer. Cultural-Historical Activity Theory (CHAT) gives me a way to understand how people, tools, histories, and intentions come together in practice. It helps me make sense of the complexities of mathematics leadership, and why sustained change in schools requires more than just new strategies – it needs collective effort, shared meaning, and intentional shifts in how we work together.

I'M READING...

For pleasure more... well, trying to – no small feat when working in academia! As a teenager, I was fascinated by Greek mythology, so I'm reconnecting with that interest by making my way through Stephen Fry's *Heroes*.

IF I COULD CHANGE ONE THING...

It would be the way society values the teaching profession. I'd elevate its status to be on par with professions like medicine and law. And with that recognition would come what's long overdue: proper funding for every school. That would include more time, support, and resourcing for mathematics leaders – so they can lead practice development, mentor teachers, and drive real change in teaching and learning. So that every student finds their home in mathematics.

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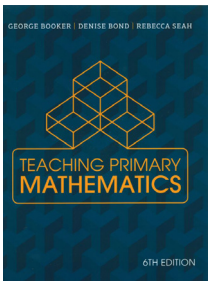

TEACHING PRIMARY MATHEMATICS 6TH EDITION

F-6

The new edition of *Teaching Primary Mathematics* continues to provides undergraduate and postgraduate students opportunities to link mathematical theory to practice and importantly, prepare them for employment.

To help student teachers keep track of the key knowledge and skills they develop as they progress through the chapter, the new edition includes chapter outcomes. The new edition has been updated to improve readability, with more activities, worked examples and visual elements to demonstrate how the theory links to practice. Increased linkages to STEM and the Australian Curriculum are included. A list of activities provides student teachers with a variety of pedagogical activities to implement in their future classrooms.

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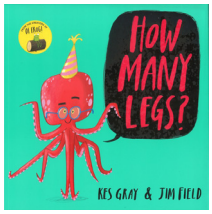

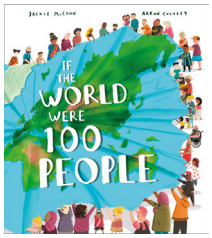

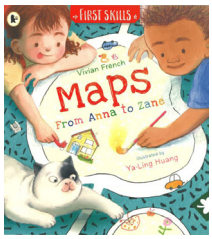

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- *100 Dogs* (K-3: number)
- *Emma's Big Counting* (K-4: number, algebra)
- *How Many Legs?* (F-4: number)
- *One Hundred Hungry Ants* (F-4: number)
- *The Escape* (F-4: number, algebra, shape)
- *Remainder of One* (F-5: number, algebra, measurement)
- *Camilla, Cartographer* (2-6: measurement, Shape)
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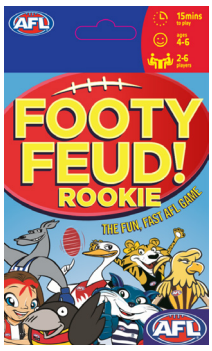

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