

Challenging and improving mathematics teachers in primary and secondary contexts

Meet Jodie Hartmann

Bowraville Central School's MGT trainer



Lifting student success in mathematics through initiative 10 of the NSW Mathematics Strategy

The Mathematics Growth Team (MGT) consists of school-based expert secondary mathematics teachers embedded in schools to support, challenge and improve the pedagogical and assessment practices of mathematics educators in both primary and secondary contexts.

Their end goal is to improve student outcomes in mathematics and redefine the mathematical mindsets of children, parents and communities (Anderson, Boaler and Dieckmann, 2018).

Being school-based and having a consistent 0.4 teaching allocation within a school allows team members to maintain currency with constraints and challenges faced by current teachers. It also improves their ability to provide personalised professional learning at the point of need for relevant individuals and teams of teachers (Martinovic et al., 2017).

Embedding the MGT into schools also allows for mentoring and coaching to occur with staff in situ over a sustained period of time, which is a crucial part of implementing long-term changes in teaching practice (Cartwright, 2020). Existing staff in schools where the MGT operates will have scheduled time to facilitate regular lesson observation, structured discussion on pedagogy, reflection on practice and action research.

Bowraville Central School Mathematics Growth Team Trainer in practice

The layers of complexity within Bowraville Central School require a tailored approach that has the flexibility to adapt to the ever-changing needs of the school community. The support of the MGT, enables staff to have that flexibility to be responsive to the learning needs of the students, whilst having support to access and utilise evidence-based practices.

Focus 1: Building Relationships and encouraging collaboration within and across stages (K-12)

A key part of the uplift has come from building relationships and collaboration between teachers. It has highlighted that we need to work in an agile manner and adjust where appropriate.

The MGT release time was built into the timetable (constructed in 2019 and implemented in 2020). This scheduled key staff working within mathematics from K-12 for individual meeting times throughout the fortnight - highlighting the lack of faculty groups and deepening the sense of staff working independently rather than collaboratively. This approach was soon altered, forming targeted professional learning groups where there was the ability to develop a collaborative approach within the school structure.

These professional learning communities became the vehicle and the space for staff to explore different pedagogies in mathematics, including examining attitudes and research. This provided the framework for teachers to discuss mathematics teaching and learning with reference to impact and data.

"It is important to have a person to lead that team who not only has the strength in pedagogy, but also has strength in leading people and being able to ask the interesting and difficult questions, to lead conversations where everyone is participating"

Lee, Classroom Teacher



Focus 2: Professional Learning – strengthening teacher practice and teacher confidence

'The MGT embodies the elements of high-quality professional learning. It is informed by global research, that supports the professional growth of all teaching staff to deepen teaching practice for ongoing growth in student progress and achievement. At Bowraville Central School our staff reported that the initiative greatly increased their confidence in the pedagogy of teaching mathematics, saying things like 'we now know how to explain to our students why the solution to a mathematics problem is the solution and the only possible solution'. As a former mathematics teacher, myself, I am truly inspired by the impact of this initiative.'

Principal David Taylor reflects on the implementation of the MGT at Bowraville Central School.

Initially professional learning centered on strategies that could be quickly and effectively integrated into staff pedagogical practices.

This included a wide range of professional learning around lesson structures:

- Newman's prompts
- Literacy in mathematics
- Number Talks
- Talk Moves
- STEM
- ReSolve and NRich
- an introduction to the research of Jo Boaler.

Over the course of the year, the professional learning focus shifted to enable staff to deeply engage with the research around growth mindset and engagement whilst linking this to curriculum. As a result, staff have participated in courses from youcubed.org, facilitated and directed through the professional learning communities and driving questions that target specific teaching and learning needs linked to curriculum. This was reinforced during the professional learning communities to embed change in teaching and learning practices across the school.

"I think if you didn't start challenging teachers' thinking about maths and not providing opportunities for professional learning... that people would still be quite reticent. I think that starting with the professional learning and exploring what you think about maths...helps you be honest about it"

Lee, Classroom Teacher.

Focus 3: Targeted support – working alongside teachers to support student success

Targeted support included team teaching opportunities, demonstration lessons, observations, pre-lesson planning and preparation and post-lesson reflection and review discussions. This was individualised for each teacher and the content of these conferences was tailored to the specific needs of each staff member. This was an opportunity to reflect on teaching practices with the lens of what works best and what supports significant student growth. Staff analysed systems of data and looked for trends to target student support.

Through the support of the MGT, the staff members have been able to develop learning opportunities in a meaningful manner, engaging students in their learning and began working towards differentiating to suit the wide range of students' needs. Working alongside the Trainer provided staff with support in organising content into coherent, well-sequenced and engaging teaching and learning activities tailored to student need. Staff were supported to use evidence-based approaches and to step away from their traditional practices, to challenge students (and themselves), to take risks and to engage students in developing deep conceptual knowledge, rather than procedural fluency.

"This time last year I was very out of the textbook; 'here's an exercise, this is what we are doing, this is how you do it, now you do it'. In a class of 30, maybe 3 of them would get it. Comparing that to what I am doing this year, I haven't touched a textbook for maths yet and it's halfway through [term 1] week 6. They have just been doing group work, number talks and things like that...I think that they are learning more now than they were learning 12 months ago... the students are talking about maths more in class, they are using words that I hadn't used in my last school"

Tammy, Early Career Classroom Teacher.



Observable impacts at Bowraville Central School on students and teachers

Positive Language and a Growth Mindset: Staff are embedding positive language and growth mindset approaches into their mathematics teaching - encouraging their students to develop a growth mindset towards mathematics. Students are making positive choices about learning tasks and are positively shifting their attitudes towards mathematics.

Teaching & Learning Resources: Staff are using evidence-based approaches in the classroom. They are exploring innovative and engaging ways to develop mathematics knowledge. They are utilising a wide range of strategies and incorporating variety into their daily teaching (moving away from an over-reliance on worksheets and textbooks).

"the sheets were just the same questions over and over again.... they wanted you to do it the same way...it didn't feel like I could do it any other way..."

Finn, Year 8, Bowraville Central School reflects on how mathematics classes used to be taught.

Speed and Fluency vs. Deep Understanding: There has been a noticeable shift in focus from speed and fluency to deep understanding and deep thinking. This has resulted in different teaching and learning practices within classrooms, with students experiencing the creativity of mathematics (some for the first time).

Dianne, a secondary mathematics teacher who has been working at Bowraville Central School for over 30 years, comments on the changes that she has seen in mathematics classes since the introduction of the Mathematics Growth Team.

"For me it's all the different ways that students can show their learning, it's everything from the little whiteboards...it's about all the different ways of showing understanding"

Dianne, a Secondary mathematics teacher.

"in the past maths used be repetitive worksheets, that got very boring very quickly and now it's more interactive and you get to explore more with different strategies and ways to solve things"

Savannah, Year 8, Bowraville Central School.

Increased collaboration: Staff now participate in established professional learning communities where teaching and learning is at the centre. They seek and provide feedback to each other about pedagogical practices, sharing experiences and knowledge across stages. Conversations centre on teaching and learning approaches and about how students learn, having moved away from sharing traditional resources (such as worksheets) and discussing administrative topics.

Bringing together instructional leadership and evidence-based interventions to lift student success in mathematics.

The continuation of the MGT at Bowraville Central School is vital to the longevity of change in mathematical practices and sustained growth in student learning outcomes that will have a life-long impact on the community within which it is embedded

The work of the Mathematics Growth Team is complex and diverse, but the impact of this initiative to date is undeniable. Utilising a model that brings together instructional leadership, focused on developing contextually relevant, and evidence-based interventions, involving professional learning at the heart of all innovation, is a powerful approach to lifting student success in mathematics.

The Mathematics Growth Team enables expert school-based leaders to work alongside staff to support, mentor and challenge them to re-think the readily accepted pedagogical practices that have long outlived their effectiveness. The instructional leaders act to facilitate connections with current research whilst actively disrupting the accepted standard approaches that have resulted in lower academic achievement and engagement of students with mathematics.

"This is the most powerful, the most complicated, the most challenging and the most important work that I have done. I have a responsibility to share the news that there are different ways to teach, better ways to engage students with mathematics and a wide range of evidence to support these approaches. There are ways that I can share my love of this beautiful and creative discipline with a new generation of teachers and learners. I have the opportunity and the responsibility to our students to show them the world of possibilities and challenges that are waiting for them, I can shine a light on the complex beauty of mathematics"

Jodie Hartmann, Mathematics Growth Team Trainer.