

Improving Mathematical content knowledge of teachers and students

Case study – Mathematics Growth Team

The Mathematics Growth Team (MGT) trainer, Daniela Elford, has been with Alstonville High School for two years focusing on professional learning and knowledge sharing amongst colleagues to enhance the mathematical content knowledge amongst teachers and students.



**MGT trainer,
Daniela Elford**

The MGT, an initiative of the NSW Mathematics Strategy and the Best in Class Teaching unit, has the goal to improve student outcomes in mathematics and redefine the mathematical mindsets of children, parents and communities (Anderson, Boaler and Dieckmann, 2018). The MGT is school-based with a 0.4 teaching allocation which allows trainers 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). Working within the school allows the MGT trainers to mentor and coach 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 have scheduled relief face-to-face (RFF) time to facilitate regular lesson observation, structured discussion on pedagogy, reflection on practice and to action research.

Case in point: Alstonville High School

Alstonville High School delivers 7-12 curriculum to its community on the far north coast of NSW. The school is located 20 minutes from the coastal town of Ballina and 45 minutes from Byron Bay.

The mathematics faculty has six permanent members of staff coming from a diverse range of backgrounds. Some have come from industry, others retrained from other teaching areas (primary, science, PDHPE) while tenure differs amongst the staff cohort.

Key focus areas for Alstonville High School

Focus 1

Stage 4 program approach

The Stage 4 program at Alstonville High School was identified as being textbook dependent, over-crowded and had a level of repetition. This led to the perception amongst staff was there was no time for rich or alternative tasks. Teaching was focused on procedure rather than conceptual understanding.

The mathematics faculty and the MGT trainer worked together to identify opportunities to redesign the scope and sequence of the Stage 4 program to use driving questions, learning intentions and success criteria to sequence teaching and learning programs. In turn, the redesign allowed for selection of effective student activities to meet the success criteria.

To support the program redesign, professional learning focused on rich tasks for student engagement, procedural practice and developing conceptual understanding. Visual representations were also used to support conceptual understanding amongst the faculty.

Focus 2

Mathematical content knowledge

Informal conversations with teachers and students identified that some mathematical context was not clearly understood and there was opportunity to improve delivery. Experience and knowledge within the faculty was also impacted with a number of experienced Stage 6 Advanced and Extension 1 and 2 teachers leaving the school. Additionally, with the majority of the faculty either retrained in mathematics or coming from industry there was limited deep conceptual understanding of Stage 6 content.



The MGT trainer used 2-hour, fortnightly professional learning sessions to focus on Stage 6 Advanced and Extension 1 and improve mathematical content knowledge. The content was developed based on survey responses, informal conversations and the need for deeper discussion about mathematics. The professional learning also helped identify connections between the various content areas covered.

The professional learning focused on deepening the understanding of mathematical content knowledge by engaging teachers in activities that could be used with students to develop understanding beyond procedures and modelling alternative ways to introduce and teach a concept.

“It’s very useful and has challenged my own repertoire of teaching techniques and delivering problem solving skills to students.”

“They have been a valuable resource to help develop my knowledge of concepts and skills. Thank you.”

Feedback captured as part of evaluation survey for Mathematics Advanced/Extension Professional Learning

Observable impacts for Alstonville High School

Focus 1

Stage 4 Program

A diverse range of learning resources were explored, critically analysed, and adapted to the school’s context. This enabled teaching programs to incorporate multiple learning strategies, beyond what a textbook alone could provide. Teachers were required to engage more deeply with the syllabus, consider why content is included and what the focus for student learning should be. The impacts of this approach have been:

- improved collaboration as teachers worked together on the development of new units of work and resources

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- increased sharing of resources including student activities, rich tasks, assessment, etc
- integration of evidence-based teaching practices such as visible learning, visual representations and rich tasks
- stream-lined program with significantly less units of work, meaning more time to build conceptual understanding.

Focus 2

Mathematical content knowledge

A focus on improving mathematical content knowledge through professional learning has seen deeper discussions about mathematics amongst the faculty. It has also pushed teachers at Alstonville High School to challenge themselves mathematically and by putting themselves in the role of student, they have now had learning experiences similar to what they want to create for their students. Professional learning and knowledge sharing have exposed teachers to different models of teaching practices, particularly questioning strategies.

The impacts of this approach include:

- improved collaboration between staff as they got to know each other as mathematicians through small group activities
- improved content knowledge
- changes to teaching practice within the faculty.

Find out more

For more information regarding the Mathematics Growth Team:

E MGT@det.nsw.edu.au