

Retrieval Practice and its effect on student engagement

Case study – Embedded Instructional Leader Pathway Mathematics Growth Team

Carolyn Nolan is an Embedded Instructional Leader (EIL) at Lambton High School, located 6km north west of Newcastle's CBD in the NSW Hunter Region. Working with colleagues and students, Carolyn is based at the school to support, challenge and improve the pedagogical and assessment practices of mathematics educators in secondary contexts.



Carolyn Nolan
Instructional
Leader

The Embedded Instructional Leader Pathway (EILP) is a core element of the Mathematics Growth Team (MGT), aiming 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 continuing to teach allows team members like Carolyn to maintain currency with the constraints and difficulties faced by 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 Pathway 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).

In EILP schools, teachers participate in contextualised professional learning, which takes on different formats dependent on teacher's needs. These formats include lesson observation, structured discussion on pedagogy, action research and reflection on practice.

Case in point: Lambton High School

Lambton High School on Awabakal country is a proudly comprehensive high school catering for students from Years 7 to 12. The current student population is 1166 with a strong focus on learning and high expectations for student success. They provide quality education in a caring, culturally safe, engaging and challenging learning environment that values pride in identity and sense of belonging. Every student can achieve through opportunities in high potential and gifted programs, and through a wide range of extra-curricular activities and effective support programs.

Key focus areas for the EILP at Lambton High School

Focus 1

Know the students and how they learn

In 2021, Carolyn and staff at Lambton High School identified a proportion of underachieving students exhibiting off-task behaviours, limiting their access to the curriculum. Carolyn delivered an adjusted curriculum and trialed a variety of pedagogies to target these students' needs, resulting in significant and positive increases in behaviour, confidence and academic outcomes.

Carolyn joined the EILP in 2023 and worked with MGT Trainer Leanne Hancock to share her knowledge and experience across network schools. She emphasised the importance of knowing your students and leveraging evidence-based research, including visible learning (Hattie, 2008), thinking classrooms (Liljedahl, 2021), mathematical discussions (Smith & Stein, 2018), mathematical mindsets (Boaler, 2015) and What Works Best (DoE, 2020).

Carolyn mentored staff in using strategies to examine multiple data sources to develop a thorough profile of students' current mathematics understanding and school experiences, including reflecting on assessment and wellbeing records. This led to enhanced knowledge of students' social needs and the implications for classroom practice. Faculty members utilised this data to inform entry points for lessons that allowed students to connect their current knowledge with new content.

Incorporating a stronger student voice had immediate effects in empowering teachers. It motivated reflection on existing practices and built the confidence to implement a variety of new pedagogies to meet student needs.

There is more conversation in the room and greater willingness to risk being wrong when sharing a problem-solving strategy. The repetition of skills is helping their recall of concepts and some students are showing improved ability to progress through a multi-step problem."

Margo Freer
Mathematics Teacher, Lambton High School

Focus 2**Formative assessment strategies as part of the teaching and learning cycle**

Carolyn delivered professional learning demonstrating the aims of the syllabus with a focus on the flexibility of delivery to meet the needs of students. Carolyn shared the value of observational formative assessment throughout a lesson, demonstrating its power to maintain student engagement and boost confidence in learning mathematics (Hattie, 2016; Wiliam, 2017; Liljedahl, 2021).

Faculty members observed Carolyn modelling the implementation of formative assessment strategies to support student learning in the classroom. Carolyn supported staff to plan their lessons based on their knowledge of their students, formative assessment strategies and the teaching and learning cycle. Staff were guided with in situ support when implementing classroom lessons. Following lessons, teachers received with encouragement and constructive feedback during reflection meetings.

Focus 3**Retrieval practice**

Data was collected to understand how students were learning, and it was found that they needed to increase their recall of taught concepts to access new ones. With the help of MGT Trainer, Leanne Hancock, Carolyn researched the Five Question Approach (Attard, Ley and Holmes, 2018) and presented it to the staff. The strategy provides formative assessment data for teachers and helps students retrieve knowledge and skills. Staff immediately found value in this strategy and the majority began embedding it across all classes. Carolyn delivered professional learning on the implementation and impact of this for network schools and the MANSW conference, where John Ley himself recognised her for the quality of her presentation.

“Students have improved in confidence and are now willing to try questions that are unfamiliar. The Five Question Approach has been a great opportunity to help students revisit concepts they might not completely understand.”

Kevin Rees, Mathematics teacher. Lambton High School)

Find out more

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Focus 4**Productive struggle – problem solving**

After analysing student feedback and external data, staff discovered that students were reluctant to engage in tasks that were not focused on fluency. They implemented the Five Question Approach, incorporating a problem-solving question to address this. Professional learning was provided by Carolyn, allowing staff to immerse themselves in mathematical problem-solving and experience productive struggle (Liljedahl, 2021; Kaplinsky, n.d.; Nottingham, n.d.). Staff reflected on differentiating tasks and provided low-floor, high-ceiling activities and prompts to support student learning (Boaler, Smith & Stein, n.d.). They created and found relevant questions to increase student learning.

Observable impacts

The impact of the Mathematics Growth Team at Lambton High School is visible through a wide range of different elements, including:

- **Increased sophistication in professional dialogue.** Staff regularly discuss the best strategies to support students learning. Carolyn provided individualised support for teachers to reflect on their own practices.
- **Increased student outcomes and engagement.** A 17% increase in students meeting the course outcomes in formal assessments between Semester 1 to Semester 2.
- **Increased student engagement.** Students thrive on the opportunity to work like a mathematician with contexts to problem solve. Students enjoy showing how they think and engage mathematically in classrooms with 44% reduction in reports of disruptive behaviour between 2022 and 2023.
- **Academic recognition.** Carolyn and Leanne had John Ley, co-researcher of the Focus Five teaching strategy, praise the quality and results obtained by Lambton High School.

“Love, love, love it!”

“I love the problem solving every lesson – it is fun.”

“Good way to start the lesson each day.”

“It has helped me to revise the topics and I feel I know the work so much better.”

Reflections of Year 8 students