CASE STUDY

MATHS SUCCESS AND JOY
Bacchus Marsh College
“Far too many Australian students make too little learning progress each year. Many students who fall behind never catch up, while many highly able students are not stretched.” (Grattan Institute) \(^{1}\)

- Learn how one school is using a data-driven teaching approach to enable students to grow and thrive in maths.
- Find out how to adopt the same model in your school and more about Maths Pathway by using the links and references at the end of this case study.
- Watch the ALL Maths Pathway video to see the program in practice.
  https://youtu.be/V5p767a2n50

The ALL Case Studies are practical examples of how joy and data can come together in learning. Inspired by the inaugural Australian Learning Lecture, delivered by Sir Michael Barber, the ALL Case Studies examine how data gathered through the use of diagnostic tools in real learning experiences provides greater insight into how each student learns. Data enables educators to help learners find joy in learning, to flourish and tackle life’s opportunities.

*Data, far from being in opposition to joy is an important ingredient in it.*
What is the problem?

“We have students coming in at all levels of ability in Year 7 – from Grade 2 to Year 8 level” says Samantha Goodman, a Leading Maths Teacher at Bacchus Marsh College, a secondary school on the northern outskirts of Melbourne. “Overall, we were seeing students with low growth in maths and low engagement, and this was very concerning.”

The Foundation for Young Australians reports that 75% of future jobs will involve Science, Technology, Engineering and Maths (STEM), yet 42% of Australia’s 15-year-olds are not proficient in maths. The OECD reports that “Proficiency in mathematics is a strong predictor of positive outcomes for young adults, influencing their ability to participate in post-secondary education and their expected future earnings.”

While there is a powerful imperative to lift the level of students’ mathematical skills the challenges confronting teachers in most maths classrooms can be daunting. The Grattan Institute noted in their recent report on targeted teaching, that “Despite heroic efforts by many teachers, our most advanced students are not adequately stretched while our least advanced are not properly supported. Many fall further behind over time.” Samantha Goodman’s experience of the range of levels within one class is supported by the Grattan Institute’s findings: Grattan reports that there can be between five to eight levels within a single class.

“We found that our students can rote learn, but many students are not able to show understanding and problem solve,” reports Samantha Goodman. The challenge for the Year 7 Maths teachers at Bacchus Marsh College is to extend the knowledge and skills of every student regardless of their starting point.

Targeted teaching, using accurate information about what students know and are ready to learn next, is known to have a significant impact on student learning and now forms one of the professional standards for teachers. In practice, this could mean that in one class there are 25 students at 25 different points of readiness; so each of the 25 students needs to be learning something different. There are practical and pedagogical challenges with this model. For a single teacher “almost super-human ability” is required to maintain up-to-date data on the learning needs of each student, as well as organising and preparing differentiated learning materials, while also maintaining valuable direct instruction, student discourse and collaborative group-work.

How does Maths Pathway help?

Maths Pathway is at the centre of a movement of teachers and schools who are overcoming the practical problems of differentiation. The Maths Pathway package includes tools, professional learning and consulting support allowing teachers to overcome the practical problems of differentiation. Teachers implement a learning model that enables a more targeted approach to teaching. The assessment cycle within that model is in five parts: set up and diagnosis; coursework; assessment; feedback; data and reporting.

Students need to be aware of their starting point, in order to set out on a path to reach their goals. “New thinking about assessment is focusing on understanding where students are in their learning in order to identify appropriate starting points for action, and evaluate the effectiveness of such action” says Professor Geoff Masters, CEO of the Australian Council for Educational Research (ACER). The Maths Pathway tool diagnoses where each student has gaps and competencies, within a subset of the curriculum, and then provides each student with targeted coursework for a two-week cycle. As Justin Matthys,
founder of Maths Pathway, explains “we’re able to set work at the ‘Goldilocks zone of learning’: it’s not too hard, not too easy; it’s just right.”

The learning activities are mainly hand-written tasks completed in exercise books. Students view questions and worked solutions on their computers, and participate in small-group mini-lessons to build key concepts. If students are stuck on their work, they can view a video for each activity or ask a friend for help – the computer recommends classmates to act as peer tutors, based on the strengths of other students in the class. Approximately 50% to 80% of class time is spent on individualised and small-group work, and the remainder is spent on hands-on learning, class discussion, and collaborative problem solving tasks designed by the teachers.

“We should praise the process, not students’ intelligence … and we should reward effort, strategy and progress if we want to see real growth in students.”

At the end of each two-week cycle students are assessed. Each student’s test is tailored to reflect the work they have been covering. The tests are not designed to expose failure, but are instead designed to track individual progress, as well as provide valuable information to teachers.

Once the tests are completed students and teachers reflect on results. Students review what work they have mastered and where they have made errors, followed by a brief meeting with their teacher to discuss progress.

During these meetings, teachers emphasise soft-skills, attitudes and habits; and set learning goals with the student. As Hattie and Timperly note, feedback is most powerful when there is a learning context, and the feedback addresses a student’s interpretation, not lack of understanding. The regular tests provide context and immediacy to the feedback each student receives.

The main metric in Maths Pathway is a student’s growth rate. This focuses on how many activities a student demonstrated mastery of during a set period. If a student achieves one grade level of growth in one year, the growth rate is 100%. The growth metric is based on mastery of curriculum each fortnight. The other main metrics are accuracy (the proportion of work attempted that students master) and effort (the proportion of set work completed each fortnight).

How is data useful?

“The most powerful determinants of student growth are the mindsets and learning strategies that students themselves bring to their work – how much they care about working hard and learning, how convinced they are that hard work leads to growth, and how capably they have built strategies to focus, organize, remember, and navigate challenges” contend Ron Berger, Leah Rugen and Libby Woodfin.

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In her renowned work on mindsets, Carol Dweck argues that our abilities are not fixed and that every person is capable of growing and developing. Dweck found in research into maths achievement and students’ mindsets that praising students for their intelligence, instead of the process (the effort or strategy), made students believe that their intelligence is fixed. Students who believed in fixed mindsets would avoid challenging tasks, and lose confidence and motivation when the task became hard. By contrast, students who had a growth mindset – who believe that they can improve – and whose process was praised, sought and thrived on challenges.

"We should praise wisely", says Carol Dweck. "We should praise the process, not students' intelligence… and we should reward effort, strategy and progress if we want to see real growth in students.”

The growth, accuracy and effort data provided by Maths Pathway enables Samantha Goodman to bring students into the process of learning, so that they are active participants in their own learning.

“Students understand the data: they own the data. Students can articulate their understanding of their own growth” reports Samantha. “This means we can have conversations about the data and where it leads.” Importantly, Samantha says that “the data is making the students more reflective learners.” Teachers are now able to use the fortnightly assessment data to have conversations with each student about their progression and learning skills. “Students have grown regardless of level. Where we’ve worked on soft skills those students have made the greatest growth.”

“I’m doing more targeted teaching” reports Samantha Goodman. “I’m able to get to know the students better because of more targeted teaching and knowing what the barriers are.” Samantha uses the assessment data to identify small groups within each class who need explicit teaching on particular concepts or strategies. She is able to identify individuals who need to develop their learning strategies, and because she is doing less ‘chalk and talk’ teaching she has the time to focus on individuals. Working with individuals to chart the changes in the learning mindset is seeing a real change in their achievement.

How did Maths Pathway start at Bacchus Marsh College?

Bacchus Marsh College adopted Maths Pathway in 2015. Initially the school implemented a blended program for Year 7s and 8s, using a combination of a traditional textbook and Maths Pathway. From Term Three they used only the Maths Pathway program.

As Samantha Goodman reports, “initially teachers hated the program. They found it very confronting. There is not much explicit teaching and you need to work on 25 individual programs.” Now, she says, “teachers love the data.” Teachers are able to use the data to identify issues and work with small groups more effectively.

The Year 7s at Bacchus Marsh College now spend three periods a week working on the individualised part of the Maths Pathway Learning Model, and two periods a week working collaboratively on rich problem solving using games, concrete materials and hands-on tasks designed by their teachers.
The evidence so far

Initially, Bacchus Marsh College had a mixed response to Maths Pathway from both the students and parents. After running information sessions and parent meetings, parents are now generally supportive of this new approach. As Samantha Goodman reports, it has been a case of constantly adjusting the program so that it works best for the students.

The data from Maths Pathway is bringing joy to learning. Samantha Goodman has seen a significant change in student growth levels. She says “students are staying back at lunchtime to get their data. They talk about which icon they’re on and there’s a real emphasis on a growth mentality.” Importantly, she reports that students are thinking about why their data is not as good as it could be and are reflecting on their learning behaviours.

As Berger et al. contend, developing a classroom culture in which students are constantly analysing data to improve is far more effective than sharing test results with students a few times a year. “Too often, in the name of protecting children’s self-esteem, we avoid explicit discussions of standards and where students stand in relation to them. Rather than boosting confidence, such ‘protection’ actually prevents students from advancing and blocks their understanding of what it takes to succeed... It moves conversations about progress from abstract, generic goals (eg., try harder, study more) to student-determined, targeted goals (eg., increase my reading level by 1.5 years...) and provides them with the skills to track these goals.”

Other schools which have adopted Maths Pathway are also seeing good results. Early research shows that 0.6 grade levels of learning per year occurred on average prior to using Maths Pathway. Schools which have used Maths Pathway are now seeing an average growth rate of 1.1 levels; and where the program has been most effectively implemented they are seeing an average of 1.8. At one school 85% of students reported that they disliked maths as a subject at the start of a term; that number went down to 15% at the end of the term after using Maths Pathway.

By making the data their own, students at Bacchus Marsh College have been able to set specific learning goals and are seeing real results for their efforts. They are focussing on a new kind of data, which celebrates growth, effort and accuracy. Importantly, the students and teachers are able to engage in meaningful conversations about learning strategies which support the students as they tackle work which is set at the right level for them to learn and grow. They’re finding the ‘Goldilocks zone’ and a new kind of joy in learning maths.

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Learn more:

Maths Pathway
Visit: www.mathspathway.com for information about how to join this program.

Growth Mindset
View: What is mindset? mindsetonline.com
Watch: Carol Dweck, Developing a Growth Mindset - www.youtube.com/watch?v=hiEEeMN7vbQ

Sources:


Thanks

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