

Maths Pathway Program Logic

Last updated 21st January 2016

Why

Program title

- Maths Pathway

Program purpose

- To lift the mathematics learning outcomes of students in Years 5 through 10, both in terms of academic attainment and also beliefs students hold around mathematics learning.
- To do this by changing teachers' conception of success in mathematics learning away from standards and achievement, and towards progression and growth – and to see embedded within course structures, lesson delivery and assessments.

Critical issues

- Within a mathematics class, students have a wide range of learning needs, creating a need for targeted teaching. However, common practices for course structure and assessment centre around one-size-fits-all standards and achievement, which limits the degree to which lesson delivery can tailor to diverse learning needs. Added to this is the fact that success in mathematics is commonly conceived by teachers (and communicated to students) via performance on one-size-fits-all assessments, which de-emphasises or precludes any conception of progression and growth being measures of success.
- Many Year 5 to Year 10 students hold negative beliefs about mathematics: maths anxiety is a highly prevalent issue among students; a large proportion of students identify as being intrinsically poor at maths; and very few students enjoy mathematics.
- Many Year 5 to Year 10 students possess only a shallow understanding of mathematics: many conceive of mathematics as a set of step-by-step recipes; many students struggle with worded problems; and very few can confidently apply mathematics in unfamiliar contexts or different subject areas.
- There is a need both at the system level and the school level to lift mathematics learning outcomes: all students (particularly those at the top and bottom ends) need to exhibit more growth on tests like NAPLAN; more students need to choose and achieve in Year 12 mathematics; and a greater proportion of Year 12 mathematics students need to be taking higher level mathematics subjects.

What

Inputs (resources)

- Maths Pathway teacher professional development resources.
- Maths Pathway individual student learning resources.
- Maths Pathway diagnostic, formative and summative assessment resources.
- Maths Pathway eLearning systems for teachers and students.
- Rich learning resources provided by Maths Pathway and by others, such as Maths300.

Activities

- Formal agreement by school leadership about a shared vision for how mathematics learning should look.

- Two-day training for a number of mathematics teachers in the school who will lead professional development for the rest of the teaching team, lead change within the school, and be connected with a network of teachers across other schools doing the same. Any teachers who have been through this two-day training are referred to as “in-school trainers”.
- Implementation of the new learning model across one or two cohorts of students – generally Year 7 for secondary, or Years 5 & 6 for primary. This learning model includes a change to the way the mathematics course is structured, delivered and assessed such that growth along a continuum is the common focus and each student’s learning needs are being precisely targeted. The model includes a set of classroom practices intended to create a positive and productive learning environment, have a variety of individual, small group and whole-class rich learning, enable deep feedback and goal-setting, inculcate intrinsic motivation, and contain data-driven targeted intervention.
- A professional development course delivered throughout a semester, run by the “in-school trainers” with all members of the teaching team. This involves regular meetings, collective accountability to student growth data, video and written professional development resources, and reflection on classroom practice. The professional development aims to equip teachers with everything needed to implement the model successfully, and leads naturally into a process of ongoing collaborative innovation driven by data.
- In subsequent years, new grade levels of students are included in the implementation until all students in Years 5 to 10 are included. Any teachers new to the learning model also go through the professional development course, guided by “in-school trainers”.
- Ongoing change leadership activities undertaken by in-school experts, supported by the Maths Pathway organisation and by the community of Maths Pathway teachers. This includes positive engagement with stakeholders such as parents and school leadership, as well as positive support of all teachers undergoing the transition.
- Participation by in-school experts in community events throughout each year that keep the Maths Pathway Teacher Community connected, including a refresher PD course once a year and STEM engagement days for students.

Recipients

- Year 5 to 10 students and their teachers.
- At least a full grade level of students within a school at a time.
- Schools of any sector, including regional schools and schools with low ICSEA values.

Assumptions/constraints

- Access to a computer device for every student in every mathematics class, such as a desktop computer, laptop or iPad.
- Relatively reliable internet connection to the school, and a way for students to reliably access that connection, such as via a reliable wi-fi network.

Outcomes

Short term outcomes (0.5 to 1 years after)

- Outcome 1
 - Description: Average student growth of at least 1 year per year in each school
 - Success indicator / key performance indicator: Maths Pathway assessments showing average growth rate of at least 100% across the school
 - Data store: Maths Pathway system

- Outcome 2
 - Description: Reduced rates of mathematics anxiety.
 - Success indicator / key performance indicator: Fewer students feeling at all anxious about maths, or students feeling anxious about mathematics to a lesser degree.
 - Data store: Unknown.
- Outcome 3
 - Description: Reduce student self-perception of being intrinsically poor at mathematics.
 - Success indicator / key performance indicator: Fewer students identifying as being intrinsically poor at mathematics, or more students believing that they are capable of learning and growing in mathematics.
 - Data store: Unknown.
- Outcome 4
 - Description: Students enjoying mathematics more.
 - Success indicator / key performance indicator: More students enjoying learning mathematics, or fewer students hating mathematics.
 - Data store: Unknown.
- Outcome 5
 - Description: Students better understanding how mathematics works.
 - Success indicator / key performance indicator: More students able to explain and justify why the mathematical techniques they use work, or fewer students conceiving of mathematics as a set of step-by-step recipes.
 - Data store: Unknown.
- Outcome 6
 - Description: Students better able to solve non-routine problems.
 - Success indicator / key performance indicator: More students able to solve worded problems, or more students able to solve problems posed in an unfamiliar form.
 - Data store: Unknown.
- Outcome 7
 - Description: Students able to apply mathematics across contexts.
 - Success indicator / key performance indicator: More students able to apply mathematics in different subject areas, or more students able to apply mathematics to real-world projects.
 - Data store: Unknown.

Medium term outcomes (3 years after)

- Outcome 1
 - Description: Average student growth of at least 1.5 years per year
 - Success indicator / key performance indicator: Maths Pathway assessments showing average growth rate of at least 150% across the school
 - Data store: Maths Pathway system
- Outcome 2
 - Description: Improvement to the growth between NAPLAN tests compared with historically for the same school on three measures:
 - Success indicator / key performance indicator: Three indicators: 1. The median of the improvement of all students. 2. The mean of the improvement of the bottom 10% of students. 3. The mean of the improvement of the top 10% of students.
 - Data store: Detailed NAPLAN results given to the school

Long term outcomes (6 years after)

- Outcome 1
 - Description: More year 12s choosing maths (in contexts where this is optional)
 - Success indicator / key performance indicator: An increase in the proportion of year 12 students enrolled in mathematics subjects in the school compared with historically
 - Data store: Year 12 enrolment records kept by the school
- Outcome 2
 - Description: Year 12s choosing higher level maths
 - Success indicator / key performance indicator: An increase in the proportion of year 12 students in the school enrolled in the advanced and intermediate streams of year 12 mathematics
 - Data store: Year 12 enrolment records kept by the school
- Outcome 3
 - Description: Better year 12 results from high performers
 - Success indicator / key performance indicator: An increase in the year 12 maths results from the top quartile for the school than historically in all three streams of mathematics.
 - Data store: VCE/HSC/QCE/etc result records kept by the school