

THE JMSS WAY

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The John Monash Science School is Victoria's first specialist school for sciences, mathematics and associated technologies. The school opened in 2010 on the Monash University campus in Clayton and since opening, has achieved some fantastic milestones, one of which includes, being recognised as a MAV Maths Active School.

Mathematics plays a very important part of life at JMSS. From the beginning, Monash University Academic (and Mathemagician) Burkard Polster played a pivotal role in the development of a modern mathematical curriculum.

The majority of our Year 10 students study Core Mathematics, a subject based around a traditional Year 10 mathematics course but with a few twists. Students begin the year by investigation problem solving and inductive and deductive reasoning and then throughout the year are encouraged to explore and investigate the topics of study. A project that gets students to answer the question 'How could I use mathematics to change the world' always results in some fascinating ideas and innovations.

A unique elective subject, called Logic to Magic, is also offered to Year 10 students as an additional subject in their curriculum. In this subject, students explore and play with the mathematical ideas and concepts

which are responsible for making famous mathematicians, well, famous. Burkard will regularly come and co-teach this subject with their maths teacher and students will explore everything from card shuffling and mental arithmetic to fractals, origami and homeomorphically irreducible trees of degree 10.

The end of semester examination of this subject is always entertaining to watch as students shuffle decks of cards and build origami shapes within the examination itself.

The final question on the exam is also to identify the pattern that the multiple choice answers follow (in the past this has included the fibonacci sequence and the first digits



of Pi). This subject is also taught through JMSS' virtual science school, Emerging Sciences Victoria, which enables Year 10 students from across Victoria to attend and interact in real-time virtual classes twice a week and learn the unique content from two of our mathematics teachers.

IMMERSION DAY

JMSS also takes a day out of its regular program each year to run a Maths Immersion Day for all Year 10 and 11 students. During this day, students are put into small teams that move around the school to solve maths puzzles and problems.

The day is modelled after the movie Fermat's Room and so students are solving

problems in an attempt to avoid being squished and the tag-line for the day is *Do the Maths, Stay Alive*. The day culminates in a lecture from Burkard Polster who goes over the answers to all the puzzles that students encountered during the day.

Mathematics is one of the largest subject areas at JMSS. On average, we have nine Maths Methods classes running in Year 11 and in Year 12 annually. Of our Year 12 cohort, roughly one third will complete Specialist Maths and the school also offers the computer science subject, Algorithmics (HESS) where students investigate algorithm design patterns and techniques to model and solve problems.

In Year 11 we also offer a super-subject called Computational Physics that combines the study of Specialist Maths 1&2 with Physics 1&2. Students studying this subject have six lessons each week (as opposed to the usual three) and make use of computational engines such as Mathematica and Matlab to model and solve physics and maths problems. Students who complete this course get credit for having completed Specialist Maths 1&2 and Physics 1&2.

While JMSS is a selective school, we select students based on their passion and interest in science and so we can end up with quite a wide variety of mathematical abilities in our maths classes.



Our classes are team taught with, typically, two teachers and 50 students in each class. This provides us with the opportunity to differentiate learning for individuals and groups within each class more effectively as well as experiment with different types of activities and learning sequences.

The culture of the school is built around the *JMSS* way which is really about always doing your best and learning from your experiences.

Due to the nature of the school and the students who come here, mathematics assessment tasks can be quite difficult at JMSS in order to ensure that we provide high achieving students with the

opportunity to demonstrate their level of understanding. As a result, incoming students have to learn quickly that it is OK to struggle sometimes and that the important thing is to learn from mistakes and to continually strive towards improvement.

We provide students with a skills based feedback on assessment tasks rather than the traditional percentage of correct answers. This skills based feedback provides students with an idea about how they are progressing against a benchmark set by the school in identified skill areas rather than topic areas.

This allows students to be able to focus on improving their skill from topic to topic rather than treating each topic as its own, isolated silo of learning and avoiding statements such as 'I like trigonometry but am terrible at algebra'.

A MATHEMATICS ACTIVE SCHOOL

Being a MAV Maths Active School is a way of recognising that a lot of the things that we have become accustomed to doing here at the school is actually quite special.

It also is a constant reminder for our school community that mathematics is an important part of life at JMSS. We really do pride ourselves on our approaches to teaching mathematics at JMSS and are



committed to sharing our experiences and knowledge with other schools and teachers.

We regularly have visits from schools and universities who are interested in our model of teaching and learning and since opening in 2010, JMSS has always ensured that it has presenters at the MAV Annual Conference to present on topics such as using data in mathematics to inform teaching and learning, the Year 10 maths course at JMSS, SOLO Taxonomy, possible extensions of topics and concepts relating to the Specialist Maths and Maths Methods courses, use of scratch and block based coding programs in mathematics, and a new skills-based feedback model being introduced at JMSS.

If you want to learn more or organise a school visit, please feel free to contact me at luke.bohni@jmss.vic.edu.au.

John Monash Science School is an MAV accredited Mathematics Active School.

Maths Active School accreditation is a great way to showcase your schools' effective mathematics teaching and learning programs. To be accredited, schools must complete an application that will be reviewed by the MAV's team of mathematical education consultants and the MAV Council.

For further information go to www.mav.vic.edu.au/about-us/maths-active-schools.html or contact Ellen Corovic ecorovic@mav.vic.edu.au or 03 9380 2399.