

CELEBRATING 10 YEARS OF FIRST YEAR IN MATHS

We look back on 10 years of talking about teaching maths and statistics at first-year level.

What is still relevant? What has changed? What new challenges lie ahead?

Please join us in person at:

Building 69 Room 401 (entry via Priestley Building 67), University of Queensland, St Lucia Campus

Or online via Zoom link: <https://uqz.zoom.us/j/86599202983>

Day One	Thursday 6 th July
9:15 – 10:00	Coffee and Registration
10:00 – 10:15 Welcome	Professor Joe Grotowski , Head, School of Mathematics and Physics Michael, Don and Deb , FYiMaths Organising Team
10:15 – 11:00 Discussion	Poh Wah Hillock (The University of Queensland) Reflections on a decade of maths support and course transformation
11:00 – 11:30	Morning Tea
11:30 – 12:00	Leanne Rylands (Western Sydney University) The Mathematics Education Support Hub: 10 years of excellence
12:00 – 12:30	Liam Timms, Olivia Jessop, Sarah Hampson (The University of Queensland) UQ SCIE1000: A case study
12:30 – 1:30	Lunch
1:30 – 2:30 Workshop	Jo-ann Larkins (Federation University) Let's talk about the elephant in the room – Maths exams
2:30 – 3:15 Discussion	Jim Pettigrew (Western Sydney University) Reflections on generative AI in University mathematics
3:15 – 3:45	Afternoon Tea
3:45 – 4:15	Chris Duffy (The University of Melbourne) Welcoming Students to the Community of Mathematicians
4:15 – 4:45	Amanda Shaker (La Trobe University), Christopher Brignell (University of Nottingham), Mathew Pugh (Cardiff University) Incentivisation and its effect on engagement and student performance
4:45 – 5:15	Deborah Jackson (La Trobe University) An overview of mathematics and statistics support across the past decade – what has changed and what has sustained?

***Please join us for drinks and dinner (at own cost) at a venue to be advised.

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Day Two	Friday 7th July
9:15 – 9:45	Coffee and Registration
9:45 – 10:15	Rosie Cameron (University of Canterbury) Blended delivery of homework to provide effective feedback in first-year discrete mathematics
10:15 – 11:00 Discussion	Tanya Evans and Euan Lindsay (University of Auckland) (Presentation via ZOOM) The unintended consequences of lecture capture in university mathematics education: a systematic review of the research literature
11:00 – 11:30	Morning Tea
11:30 – 12:00	Aaron Wiegand (University of the Sunshine Coast) Gone with the Wind, The Sound of Music, Alien and Star Wars: films done wrong
12:00 – 12:30	Simon James and Julien Ugon , (Deakin University), Kerri Morgan (RMIT University) Decentralised and Personalised Learning for Diverse Cohorts in Maths
12:30 – 1:30	Lunch
1:30 – 2:15 Workshop	FYiMaths Team Upcoming conferences: Developing your ideas for conference papers
2:15 – 2:45	Laure Helme-Guizon (University of New South Wales) We made major changes to FY. Which ones? Why? Did it work?
2:45 – 3:15	Don Shearman , Jim Pettigrew, Shatha Aziz (Western Sydney University) Diagnostic testing with Numbas
3:15 – 3:45	Afternoon Tea
3:45 – 4:30 Discussion	R. Nazim Khan (University of Western Australia) Bridging Mathematics: Is the bridge broken?
4:30 – 5:00	Julia Collins (Edith Cowan University) “Choose your own adventure” assignments: benefits and challenges

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Poh Wah Hillock (The University of Queensland)

Reflections on a decade of maths support and course transformation

I will share my work on first year maths support & course transformation. My first presentation at the FYiMaths workshop (in 2013) was on the Support Learning Tutorial 😊. Will reflect on my journey since.

Leanne Rylands (Western Sydney University)

The Mathematics Education Support Hub: 10 years of excellence

The presentation will be a reflection on 10 years of the Mathematics Education Support Hub (MESH) supporting students and staff with their mathematics and statistics.

I will cover (i) what MESH has done well; (ii) some threats; (iii) a little on applying for teaching awards.

Liam Timms, Olivia Jessop, Sarah Hampson (The University of Queensland)

UQ SCIE1000: A case study

We present a case study describing a student-staff partnership that aimed to increase student engagement in the online, external, zoom-mediated workshops of a foundational course in modelling and programming. Students enrolled externally had reported they were unclear of online workshop learning objectives, and tutors observed that engagement was consistently lower and more challenging to facilitate than in face-to-face workshops. The online workshop experience was redesigned to address these challenges by implementing the concepts of nudging, expectation management and engagement from Brown et al's (2022) conceptual framework of enhanced online learning. New resources were developed and implemented week-to-week during the semester, to receive real-time feedback from tutors and students. The project outcomes included 12 Jupyter Rise online workshop sheets updated to incorporate signposting and explicit prompts to enhance student engagement, 12 Kahoot quizzes, 12 tutor "run sheets", as well as the implementation and documentation of a novel strategy for a "facilitator/moderator" dynamic between the two academic staff leading the session. This project aimed to benefit the externally enrolled students, and the student partners, who developed stronger researcher identities. The student partners had the lived experience to relate to online students, as well as professional tutoring experience, and this intersection of knowledge highlights the value that tutors can provide as student partners.

Jo-ann Larkins (Federation University)

Let's talk about the elephant in the room – Maths exams

In 2012 Paola Iannone and Adrian Simpson mapped the assessment regime in mathematics in Higher Education in the UK and found it heavily dominated by invigilated closed book examinations. A follow up in 2022 found that little had shifted. Recent work I've undertaken with Katherine Seaton of Latrobe University shows that the post covid assessment landscape in mathematics in Australia is still dominated by heavily weighted examinations. However, there are pockets of change and the methods of invigilation are shifting or disappearing. Some Universities have firmly turned their backs on returning to large scale face-to-face examinations whilst others are rushing to return to familiar ground to assure academic integrity in a world of AI tools. This is a big change from two years ago when I was told a project exploring examinations in STEM had nothing useful to add to our academic understanding of assessment.

Mathematicians do not feel they have a place at the table where decisions are being made around the future of assessment within their universities and that 'one size fits all' approaches aren't addressing the unique challenges of effectively assessing mathematics. They also feel underprepared to argue effectively for the importance of assessment norms in mathematics and frustrated their arguments are dismissed as irrelevant or evidence of an unwillingness to change.

The literature is also patchy on the complete justification of mathematics historical assessment regime.

In this workshop we will explore our understanding the role of assessment in mathematics with a particular focus on examinations. To have our voices heard within the higher levels of learning and teaching within our universities we need to clearly be able to explain our Why.

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Jim Pettigrew (Western Sydney University)

Reflections on generative AI in University mathematics

In late November 2022, Open AI released a chatbot that promises (or threatens) to significantly disrupt university mathematics assessment, curriculum and teaching. ChatGPT is one of a generation of Large Language Model generative AI technologies that is not only challenging educators to rethink their assumptions about, and practice of, assessment, but also what it is they want students to learn, and how, during a course of mathematical study. In this talk I will outline the various dimensions of generative AI's potential influence on university mathematics, the challenges and opportunities it poses to 'traditional' educational approaches, and offer some philosophical questions for discussion. I will pay particular attention to the question "what characteristics and competencies would an AI technology need to be able to convincingly simulate, and hence replace, a human university mathematics educator?"

Chris Duffy (The University of Melbourne)

Welcoming Students to the Community of Mathematicians

Each year we collectively teach thousands of first-year students wanting to complete degrees in a wide variety of disciplines. Consequently, for most of us our focus is quite fairly on teaching students about the mathematical tools they need so they can go on to study degrees in disciplines like physics and economics.

Designing subjects to accomplish this requires wide consultation with stakeholders in cognate disciplines across our campuses. The service nature of these subjects sometimes requires us to sacrifice the opportunity to meaningfully discuss with students the distinction between using mathematical tools in problem solving and doing mathematics. In these subjects there are often so many mathematical tools to discuss that finding space to have meaningful discussions with students about the art and practise of the modern mathematics is difficult to prioritise. In leaving these conversations strictly in the margins (or worse, on the cutting room floor), we limit our students' ability to picture themselves as (future) mathematicians.

In this talk I discuss a strategy I used to welcome students of all levels and motivations into the community of mathematicians. In addition to exposing them to current issues and ideas in the mathematical community, this strategy provides a consistent space in the subject for students to engage with ideas that may help them succeed in their studies.

Amanda Shaker (La Trobe University), **Christopher Brignell** (University of Nottingham), **Mathew Pugh** (Cardiff University)

Incentivisation and its effect on engagement and student performance

A common perception within Higher Education is that many students are "assessment-driven", i.e. that engagement with coursework activities increases where assessment marks are attached. "Incentivised engagement" involves adding incentives, which can be marks or otherwise, to particular activities within a subject. However, there is little evidence as to the benefits of incentivised engagement, and the evidence that does exist is not clear. In a second-year undergraduate statistics subject, a small amount of marks were awarded for engagement with pre-class readings during the second half of the semester, but not the first. In this talk, we present the estimated outcomes of this intervention in terms of student engagement and performance.

Deborah Jackson (La Trobe University)

An overview of mathematics and statistics support across the past decade – what has changed and what has sustained?

This presentation looks at the development and growth of mathematics and statistics support over the past 10 years and discusses support initiatives that have improved student learning experiences. We consider what has changed, what has sustained, and what is good practice.

La Trobe's journey of support delivery through that time will be highlighted with discussion on how we adapted to changing needs with long-term evaluation showing unequivocally positive trends and feedback.

Rosie Cameron (University of Canterbury)

Blended delivery of homework to provide effective feedback in first-year discrete mathematics

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One of the challenges of a large first-year discrete mathematics course is how to deliver timely and effective feedback to students who have had very little previous exposure to axiomatic mathematics. In recent years we have introduced both computer-graded quizzes (using the STACK Moodle plugin) and collaborative whiteboard tutorials. These two activities replace a pdf homework sheet and come with both advantages and limitations. In this talk I outline the rationale behind this approach with reference to the SOLO taxonomy and literature on feedback. I then reflect on my observations from the first full iteration of this method and introduce some research questions for further investigation.

Tanya Evans and Euan Lindsay (University of Auckland) (Presentation via ZOOM)

The unintended consequences of lecture capture in university mathematics education: a systematic review of the research literature

Lecture capture (LC), the process of recording face-to-face lectures for future viewing, has become a common technology in Western universities in the twenty-first century, yet research on its effectiveness has lagged behind its implementation. In the wake of the Covid-19 pandemic, the urgency of obtaining clear answers about the impact of LC is paramount, given that the recent worldwide shift to online teaching as an emergency response has resulted in an unprecedented use of LC at scale. In this presentation, we report on a systematic review of the literature on the efficacy of LC in tertiary mathematics education. Relevant databases were searched in Jan-July 2020 using the PRISMA screening protocol. Data analysis was conducted qualitatively, focusing on (1) student perceptions' of LC, (2) the effect of LC on attendance, and (3) the relationship between lecture capture usage and student attainment. The literature is consistent in the opinion that students and administrators positively view LC for its utility and flexibility despite the moderately strong evidence that most institutions face attendance drops. However, most students do tend to see attending lectures/watching recordings as an "either-or." The literature predominantly reports a negative association between attainment and the use of LC as a substitute to live lectures. The proportion of students who choose to skip live lectures has steadily increased over the last decade as the student campus culture adjusts to LC. Within this group, LC is used imperfectly, providing false benefits and promoting surface learning strategies. There is evidence that regular use of LC by this large group of students may diminish the quality of their learning. We offer research-informed, evidence-based recommendations to mitigate LC implementation's unplanned and counterproductive impact.

Aaron Wiegand (University of the Sunshine Coast)

Gone with the Wind, The Sound of Music, Alien and Star Wars: films done wrong

Allegedly, when Victor Fleming was told that his film (GwtW) should be no longer than ten minutes, he expressed concern that it would be difficult to compress so much narrative into such a short amount of time, and that context and emotive engagement would be lost. He rejected the follow-up suggestion to release the film as 22 ten-minute short-films and went on to create what is arguably one of the greatest films of all time. In support of course directors (coordinators) who wish to create epic, award-winning video-lessons, I will present evidence that student engagement with video materials is independent of video length, both in terms of clicking on the video link in the first place, and also the proportion of video watched. Time permitting, I will also illustrate a correlation between engagement with the video materials and grade outcomes, although causality will be left to the audience as a take-home exercise.*

Simon James and **Julien Ugon**, (Deakin University), **Kerri Morgan** (RMIT University)

Decentralised and Personalised Learning for Diverse Cohorts in Maths

Since 2019, the mathematics team at Deakin has gradually introduced a new teaching model in mathematics subjects where students work through self-paced modules according to their learning goals. This decentralised model allows for weaker students to spend more time consolidating core material to achieve a pass grade, while students with a stronger background can progress forward more quickly and engage with higher level tasks. There are no lectures delivered in the traditional sense, with teaching time and resources instead being directed towards continuous feedback and learning support. We will give an overview of our model and how it is implemented in a first year Discrete Mathematics subject and give some reflection on our experience.

FYiMaths Team

Upcoming conferences: Developing your ideas for conference papers

The next twelve months sees a bumper crop of opportunities for us to engage with the international tertiary mathematics education community.

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The talks at FYiMaths are as interesting and of as high quality as those presented internationally, and in many cases, the Australian experience is ahead of what's happening overseas. We should think of sharing our results with the broader community.

In this workshop, we will discuss upcoming opportunities for submitting papers. Bring along any ideas that you are working on – the FYiMaths Brains Trust (aka all of you) can provide ideas help and support to turn your ideas into a submission. This could include the talks you are giving at this workshop.

Laure Helme-Guizon (University of New South Wales)

We made major changes to FY. Which ones? Why? Did it work?

First year students used to have two 50-minute in-person tutorials per week. We have replaced one of them by weekly 'Möbius lessons', which students do online in their own time. These are formative as students are allowed unlimited attempts and can get confirmation that their answers are correct before submitting.

We have replaced the two unseen pen-and-paper class tests by two lab tests, which are online, randomised, supervised and auto-marked. Student have access to the question bank a week before the actual test.

We introduced a (randomised) assignment whose main focus is mathematical writing.

The final exam now puts much more emphasis on understanding and using the mathematical tools in unfamiliar situations than in the past. The final exam is now where students get to prove they deserves a high distinction.

I will explain why we made those changes and what the data says about the impact of those changes, for instance by looking at how well students did in second year courses.

Don Shearman, Jim Pettigrew, Shatha Aziz (Western Sydney University)

Diagnostic testing with Numbas

The MESH team at Western Sydney University has used the Numbas diagnostic test mode to develop several diagnostic tests for students participating in our online, self-paced Maths Start refresher workshops. The Numbas diagnostic algorithm is an adaptive test algorithm: questions presented to students are determined by their answers to previous questions. The length of the test is shortened by the fact that students are not asked questions whose answer can be predicted from previous answers. These tools (we have avoided the use of the word test) have been used at the start of four of our five workshops to provide students with a baseline of their abilities in skills covered by each workshop and inform them of the topics where they need to focus their study.

In this talk we will discuss the development process necessary for producing a successful diagnostic test, review the results for the first run of the tests and discuss some insights obtained from applying item response theory to the directly answered questions and those for which the algorithm predicts the answer.

R. Nazim Khan (University of Western Australia)

Bridging Mathematics: Is the bridge broken?

Over the last thirty years the number and levels of mathematics bridging units have proliferated exponentially. This is in direct response to the lowering of mathematics entry requirements by universities into their engineering and science degrees. These days students will often take up to two bridging units before enrolling in the core mathematics units required for their degree. In this paper we investigate if the performance of students in their core mathematics units depends on their background. In addition, we explore if the completion rate also depends on mathematics background. In particular, we test the following hypotheses:

H1: Do students who take mathematics bridging units perform worse in their core mathematics units?

H2: Do students who take mathematics bridging units have a lower completion rate for their degrees?

The results are expected to confront and inform university admission policies.

Julia Collins (Edith Cowan University)

"Choose your own adventure" assignments: benefits and challenges

In a large (250 students) first-year Maths for Computing unit I introduced new "choose your own adventure" written assignments in 2021 where students could choose their own functions, matrices, graphs and examples for solving problems. I will discuss the benefits and challenges of running an assignment like this, and our introduction of Gradescope this semester to assist with the marking.

Important information for speakers

We have a very packed schedule this year which means we will need to stick to the timelines so as not to encroach on the next session. There is no slack in the system!

Speakers with 30-minute sessions:

- *Please let your Session Chair how much of your 30 minutes you would like to leave for Q&A*
- *Make sure your presentation is uploaded prior to the session and it is running well*

Speakers with 45-minute sessions (marked as Discussion):

- *You will have 30 minutes to talk and 15 minutes Q&A unless your talk finishes early in which case you will have more time for Q&A*
- *Make sure your presentation is uploaded prior to the session and it is running well*

Workshop conveners:

- *Please make sure you have everything you need for your session*
- *Instructions to participants should be clear and can be emailed prior to the workshop if needed*