TRANSFORMING LOCAL PRACTICE INTO A FORCE FOR CHANGE: WHY SOTL IN UNDERGRADUATE MATHEMATICS MATTERS

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Context

- High level mathematical skills are becoming increasingly essential for
  - all branches of science
  - our future work force – in jobs we can't yet imagine
- Mathematics educators are keenly aware of the need to equip students from fields as diverse as biology, engineering and economics to provide graduates with these skills

Contrast

- Removal of prerequisites from mathematics dependent degrees

  - Students turning away from high level mathematics subjects even though they want to pursue quantitative dependent disciplines
  - Enrolments in intermediate and advanced senior secondary mathematics have been declining for over a decade

Consequence

- Vast numbers of students commence their tertiary studies mathematically underprepared
- Pressure on students: extra study, limited pathways
- Pressure on staff: workload, retention, teaching, progression
- People doing heroic work, largely unacknowledged

FYiMaths network 2012-2014

- To **build leadership capacity** and raise the profile of individuals and teams coordinating and teaching first-year mathematics subjects/programs.
- To **promote and support innovative approache**s to first-year learning and teaching in mathematics.
- To develop useful mechanisms for dissemination and embedding of **outstanding practices** in first-year learning and teaching in mathematics.
- To **develop and enhance deeper understanding and knowledge** of the learning processes in mathematics, particularly in the transition from school to university.
- To **identify learning and teaching issues** in first-year mathematics.

Approach

- Interviews Interviews with 40 academics in 26 universities in Australia and one in New Zealand.
- Over a 12 month period
- Convinced colleagues that our goals were genuine

FY Coordinators

- **Significant benefits** by providing oversight and coordination of FY provided broad perspective of student needs.
- The roles were **varied and complex.**
  - high managerial and administrative workloads, often with limited administrative support.
  - wide range of responsibilities requiring broad expertise.
- **None had a position description** and many roles had developed in an ad hoc way.
- **Limited positional authority** made it difficult to affect change.
- **Lack of professional development** impacted on capacity.
- **Negative impact** on career prospects.
- **Few** were actively involved in disciplinary or education research

Approach

- Workshops in June 2013, 2014 and 2015 at The University of Melbourne.
- We acted as facilitators
- Feedback from the group shaped our agenda

Teaching Challenges

- Diversity of student backgrounds (knowledge and competencies)
- Service-teaching to a wide range of disciplines, often within the same class, presents challenges in contextualizing the mathematics.
- Limited time for teaching innovation due to high workloads
- Isolation from colleagues within their Faculty, Institution and mathematics colleagues in other institutions.

Practice

- Surprised that their concerns were global not local
- Weren't turning to the literature
- Few attending T & L conferences
- Working in isolation to solve problems

- Curious since mathematics research is not conducted that way

Main Concern

- Assumed knowledge entry standards created significant challenges across the sector
  - Across all states, size and types of institution
  - High failure rates
  - Range of responses in providing support services, adapting curriculum and teaching practices
  - Increased workloads for academics
  - Individuals felt powerless to change this

Driving Change

- *National Forum on Assumed Knowledge in mathematics: its broad impact on tertiary STEM programs*
  - Influenced the discussion of pre-requisites
  - Media Attention
  - On the agenda at the ACDS AGM
  - Were able to bring about a minor change in the HESF
  - Presentation to Universities Australia forum
  - Generated a lot of discussion in a variety of institutions
  - Collected data that is being used widely

Driving Change

- *Joint conference Connections and Continuity with AAMT and ACDS.*

  - First of its kind to bring together tertiary and secondary mathematics educators to discuss practice
  - Move towards a shared understanding of differing perspectives

Community of Practice

- Sharing of practice
- Links between secondary and tertiary sectors
- Inspiring research
  - OLT projects
  - Institutional studies
  - Growth in conference presentations
  - Grant applications and collaborations
  - Recent publications

- Growing interest in being involved in SoTL
  - Requests for professional development opportunities

Growing SoTL participation

- Professional development for mathematicians
  - Research approaches and educational theory
- Recognition of research activity
  - Promotion criteria
- Institutional support for research projects
  - Time release and research support
- Developing leadership
  - Empowering individuals

FYiMaths project 2012-2014

- **National network** in contact with every School of Mathematics in Australia and The Universities of Auckland and Waikato.
- **Growing** with over 200 people on contact list and **State based groups** emerging.
- **Supporting** valuable networking and collaborations between Schools of Mathematics and Statistics.
- **Links with key organisations including** AustMS, AMSI, AAMT, Universities Australia, Head of Schools of Mathematics, Australian Council of Deans of Science.
- **Workshops** provide a forum for disseminating research and networking.
- **Awareness raising and advocacy** on major challenges in FY mathematics and now extending beyond this to undergraduate mathematics more generally and maths support.

Are we there yet?

- The FYiMaths network is planning to expand
  - State based groups
  - Links with peak bodies
  - Building international connections with Undergraduate Mathematics Education researchers

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Australian Government

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FYi Maths