



## Mathematics Undergraduate Teaching: Perspectives and Interactions

**TLRI grant holders:** Professor Mike Thomas, Dr Hannah Bartholomew, Professor Bill Barton, Dr Barbara Kensinton-Miller

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### Introduction

The project is investigating undergraduate mathematics lecturing at the University of Auckland, and aspects of students' experiences. Three related components focus on the professional development of lecturers, interactions in lectures and the use of questioning to promote mathematical thinking in large lecture groups, and the ways in which diverse groups of students relate to and identify with mathematics.

### Aims

The project aims to investigate mathematics lecturing at the undergraduate level at the University of Auckland. It will combine lecturer and student perspectives, and examine ways in which interactions take place. The lecturer perspective and lecture interactions components are both concerned with improving mathematics lectures, the former by investigating professional development for lecturers, and the latter by investigating questioning strategies that promote mathematical thinking in large lectures. The student perspective component takes a step back from lectures themselves, and explores the ways in which diverse groups of students relate to and identify with mathematics more generally. Three theoretical frameworks (one for each component) will be developed to make progress on a combined model for future research. As well as this theoretical output, and the formation of a comprehensive picture of the mathematics lecture environment, we will develop and trial a strategy for lecturer development, develop and trial new lecturing interactions to promote mathematical thinking, and describe and build into lecturer development our new insights into student behaviour and expectations. We expect that the results will be easily generalisable to other mathematical lecturing contexts, and the models developed will be adaptable to investigations of undergraduate lecturing in other fields.

### Why is this research important?

Mathematics is an area of strategic importance for New Zealand. Diverse areas such as code breaking, genetics, telecommunications, medicine, banks and military operations all require highly trained mathematicians. Yet despite our dependence on the field, student participation in undergraduate mathematics in New Zealand is growing only slightly, and is declining as a proportion of total undergraduate numbers. Furthermore, in this country representation of women and Maori and Pasifika students remains well below population norms. Such persistent under-representation raises questions about both the accessibility and the appeal of the subject to diverse groups of students. This research will deepen our understanding of the tertiary environment in order to overcome these problems.

### What we plan to do

#### Data

Each component will collect its own data, targeted at answering its own research questions. Across the project as a whole, the data collected will include: video-recordings and observations of lectures; de-brief sessions and interviews with lecturers; student questionnaires; student interviews; and focus group discussions with small groups of students. The focus of the lecturer perspective component will be the collection of detailed data relating to lecturers' actions and intentions, and their reflections on these. The primary data set for the student perspective component will be a series of unstructured, in depth, narrative style interviews aimed at eliciting rich data about how mathematics fits within students' lives as a whole. In the lecturer interactions component, semi-structured interviews will focus more directly on students' and lecturers' expectations of, and experiences in, lectures.

### Analysis

The data collected within each component will be analysed first by the team members involved in that component. The majority of data collected will be qualitative, and its analysis will be an ongoing, cyclical and highly reflexive process whereby analysis will inform the next phase of data collection. The three components will come together at regular intervals in order to explore connections between them and to allow the components to inform and enhance each other.

### Our partners:

The lecture interactions and lecturer components are working with groups of mathematicians within the University of Auckland. The team involved in the lecturer perspectives component includes Dr Steven Galbraith, Dr Mike Meylan, Dr Clare Postlethwaite and Dr Steve Taylor. In the lecture interactions component, the partners are the team involved in teaching maths 108, a large, multi-stream lecture course. The individuals involved varies from semester to semester, but always includes mathematicians who are not otherwise engaged in research in mathematics education. The student perspective includes in its research team two former masters students who are teachers in Auckland schools: Lisa Darragh from Kowhai Intermediate, and Jeanette Saunders from St Cuthbert's College.

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