WHO IS TASKED WITH MODERNISATION OF MATHEMATICS EDUCATION? RESEARCH MATHEMATICIANS AND MATHEMATICS EDUCATION RESEARCHERS BRIDGING THE DISCIPLINARY GAP

Tanya Evans

Presenting Author: t.evans@auckland.ac.nz
Department of Mathematics, University of Auckland, New Zealand

KEYWORDS: Undergraduate mathematics, developmental research, blended learning, assessment, professional development

In this address, I focus on a systemic issue facing tertiary mathematics education - a lack of research-informed evidence-based approaches to teaching and learning. The issue highlights the disciplinary disconnect as many research mathematicians do not research in mathematics education. A consequence of this is that many mathematicians contribute to the academic inertia by teaching in a traditional transmitting method - the mode of teaching they are familiar with - simply replicating the teaching they received. In contrast - on the other end of the spectrum - there is increasing experimentation with new modes of delivery by enthusiastic innovators who, in some cases, lack the skills required for conducting rigorous educational research as part of their innovative endeavours. Innovations are often based on integration of new technological gadgets for use in mathematics education with only anecdotal evidence about their merits.

Rapidly accelerating advances of emerging technologies are likely to exacerbate the problem. Globally, the higher education sector is challenged to keep up with the times and reassess its sustainability in a technological era. Blended learning, the integration of face-to-face and online instruction, is now widely adopted as the ‘new normal’ in course delivery across tertiary institutions. Yet the people who are tasked with educational modernisation are not generally supported by mathematics education researchers in their attempts to try out new technology-assisted instruction.

In addressing this disciplinary disconnect, I outline a proposal for a field of research in university mathematics education that aims to bridge the gap by focusing on the following research themes:

Theme 1: Developing frameworks for conducting evaluation research in a realistic university setting for testing an innovation that aims to integrate insights from broader educational research. I will talk about a suitable methodology for this type of developmental research, which is gaining prominence as an effective approach in mathematics education – design (-based) research (Bakker, 2018). To demonstrate how this methodology can be used, I draw on my recent work, in which an innovation involving regular online pre-lecture quizzes was designed, developed, implemented and evaluated. The aim of the intervention was to optimise the effect of distributed (spaced) practice on long-term memory retention. At the completion of the first iteration of design research, our findings suggest that this relatively small change

in course instruction can improve efficiency and effectiveness of educational exchange (Evans, Kensington-Miller, & Novak, 2019).

Theme 2: Investigating the mechanisms involved in successful professional development projects in mathematics departments and developing frameworks for dissemination of effective/efficient teaching and learning practices in a realistic departmental setting. This largely unexplored area of research, if developed, can potentially have a major impact on the university mathematics education. I will talk about my current research project with Barbara Jaworski involving a professional development discussion group in the Department of Mathematics at the University of Auckland. This project draws on the pioneering research in this domain that was conducted at the university in the last 10 years (Barton, Oates, Paterson, & Thomas, 2014; Oates & Evans, 2017; Paterson & Evans, 2013; Schoenfeld, Thomas, & Barton, 2016).

REFERENCES

Bakker, A. (2018). *Design Research in Education: A Practical Guide for Early Career Researchers.* London and New York: Routledge.

Barton, B., Oates, G., Paterson, J., & Thomas, M. O. J. (2014). A marriage of continuance: Professional development for mathematics lecturers. *Mathematics Education Research Journal 27*(2), 147-164.

Evans, T., Kensington-Miller, B., & Novak, J. (2019). Exploring the impact of pre-lecture quizzes in a university mathematics course. In M. Graven, H. Venkat, A. Essien & P. Vale (Eds.). *Proceedings of the 43rd Conference of the International Group for the Psychology of Mathematics Education* (Vol. 2, pp. 232-239). Pretoria, South Africa: PME.

Oates, G. & Evans, T. (2017). Research mathematicians and mathematics educators: collaborating for professional development. In K. Patterson (Ed.), *Focus on Mathematics Education Research* (pp. 1-30). New York: NOVA Science Publishers.

Paterson, J. E., & Evans, T. (2013). Audience insights: feed forward in professional development. In D. King, B. Loch (Eds.) *Shining through the fog: The 9th DELTA conference on undergraduate teaching and learning of mathematics and statistics* (pp.132-140). Kiama, Australia.

Schoenfeld, A., Thomas, M., & Barton, B. (2016). On understanding and improving the teaching of university mathematics. *International Journal of STEM Education, 3*(1), 1-17.