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Brazil Delta 2017: the romantic path of mathematics

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FOREWORD



Brazil Delta 2017: the romantic path of mathematics

This thematic collection draws together the six papers finally selected for publication from 23 full-paper submissions for the Brazil Delta Conference, the 11th biennial conference on the teaching and learning of undergraduate mathematics and statistics, which took place in Gramado, Brazil from the 26th November to the 1st December 2017. This marks the second time the group of passionate undergraduate mathematics education professionals have met in South America under the Delta symposia umbrella, the first being the sixth Delta '07, held in the World Heritage Los Glaciares National Park in Patagonia, Argentina. The other nine conferences in the series have been held variously in Australia (1997; 1999; 2005; 2013), New Zealand (2003; 2011) and South Africa (2001; 2009; 2015). This collection also marks the sixth time selected papers from the conference have been published as a special issue of the *International Journal of Mathematical Education in Science and Technology* (iJMEST), and the first time this has been published as an Open Access (OA) Supplement Issue. We acknowledge the continued support of the Editors and publishers at iJMEST and Taylor and Francis for extending the dissemination of our Delta community's scholarship and research. More about the Delta network, including links to papers from each year's *Proceedings* (the papers published separately to the special iJMEST issue), can be found at <http://www.deltaconference.org/>.

The conference location of Gramado evokes the truly international and collaborative flavour of our undergraduate mathematics community. Situated in southern Brazil, this summer holiday resort lies on the tourist scenic route known as Rota Romântica (Romantic Route). European settlement began in 1875, with Portuguese immigrants from the Azores Islands, German immigrants arrived five years later, followed shortly after by Italian immigrants from the Caxias do Sul. The influence of these groups is clearly seen in the European architecture, with a naturally Brazilian flavour. The *romantic* nature of the conference location is reflected in the span of the papers across a range of noble mathematical goals and overarching student perspectives. Mathematically, these include approximations for e and π ; an examination of student-lecturer discourse with Galois theory; and challenging notational assumptions with vectors in engineering mathematics; through to student experiences including promoting inquiry, equity and enrichment for first-year students, and student perceptions of graduate learning outcomes in mathematics.

The first paper [<https://doi.org/10.1080/0020739X.2017.1352045>] sets the scene for the collection, with its focus on inquiry-based learning, equity and student experiences that each of the other five papers extend in some dimension. The collaborative team of authors (Tang, El Turkey, Cilli-Turner, Savic, Karakok and Plaxco) from five US universities provides a theoretical framework within which we might align the characteristics of inquiry to better engage our students in active learning and support equity in the classroom. They

suggest that integrating content that allows students to use mathematics to critically analyze social justice will help achieve equity beyond the classroom towards the global society.

The second paper [<https://doi.org/10.1080/0020739X.2017.1352046>] from the University of Pretoria, South Africa (Wiggins, Harding & Engelbrecht) builds on the student-equity theme from a different angle, addressing enrichment in first-year courses for academically strong mathematics students, again using the approach of inquiry-based learning. They describe how their programme was an eye-opening experience for the instructor, and how the approach succeeded in widening student's *view of mathematics* (a suitably romantic goal?) and provided a deeper understanding of complex numbers to the participants.

The third paper [<https://doi.org/10.1080/0020739X.2017.1352043>] (Brown, Texas A&M University, Galveston, USA) begins the sequence of three studies framed around particular mathematical content, and as such epitomizes the blending of mathematics research, enquiry and educational goals central to the Delta community. It proposes how searching for repetitions or partial repetitions of digit strings in their expansions in different number bases leads to approximations of e and π . Brown suggests that the discovery of such fractional approximations is an entry point into mathematics research for students and teachers.

The fourth [<https://doi.org/10.1080/0020739X.2017.1360527>] and fifth papers [<https://doi.org/10.1080/0020739X.2017.1356390>], one from the US (Stewart, University of Oklahoma) and the other from South Africa (Craig, University of Cape Town), consider educational issues associated with mathematical content. Stewart explored the narrative between a student and lecturer as the class moved toward the proof of the Fundamental Theorem of Galois Theory, and observed how the disparity between the mind of the mathematician and the student became apparent during the theoretical examination of the discourse. Stewart notes that one effective outcome of the project was the fruitful collaboration of the mathematicians and mathematics educators; 'bringing them on the same table encouraged productive pedagogical conversations', surely evoking the Delta ideals. Craig demonstrates how our common expert belief in notation as transparent and unproblematically symbolic of underlying processes independent of notation is in fact in strong contrast with the student experience where the less familiar notation is experienced as harder to work with.

The final paper [<https://doi.org/10.1080/0020739X.2017.1352044>] by a team of researchers from four universities in Australia (King, Varsavsky, Belward and Matthews) rounds off the series by exploring the perceptions mathematics students have of the knowledge and skills they develop during their study. Their results showed that while students strongly valued outcomes of transferable skills such as communication, writing, collaborating and thinking ethically, they did not believe these were adequately included or assessed in the curriculum and felt less confident in using such learning, surely reinforcement for the value of initiatives suggested in earlier papers.

We believe the six papers presented here effectively demonstrate both the range and commonality of issues confronting lecturers and students in the field of contemporary undergraduate mathematics education, and given their attention to student perspectives and the pursuit of engagement with and enjoyment of mathematics, are consistent with the romantic setting of the conference itself. The papers also reflect the wider scholarship and research presented at the Brazil Delta 2017 conference, and the unique blend of mathematical practice and educational perspectives offered by the bringing together of research

mathematicians and educational researchers under the Delta umbrella. We hope you might join us again at the next Delta '19 conference, to be hosted in Perth, Australia.

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