MERJ special issue—editorial

Greg McPhan • Steve Tobias

Published online: 9 August 2011

© Mathematics Education Research Group of Australasia, Inc. 2011

The overall theme for this Special Issue is Mathematics Education in Rural Schools: Evidence-based approaches. Guiding the selection of papers to be included was the desire to present a range of approaches that highlighted some of the more general and specific issues that impact on mathematics education in rural contexts.

In the Australian context, the Melbourne Declaration of Educational Goals for Young Australians (MCEETYA 2008) articulates a focus on equity and social justice in education. The document recognised the need for collaboration amongst stakeholders to commit to promoting excellence in Australian schooling that is free from (amongst other things) discrimination based on geographic location, that builds on local cultural knowledge and experiences of Indigenous students, and that establishes partnerships with local communities. The Declaration also contains a commitment to the development of a high-quality teaching workforce in all Australian schools. However, care needs to be exercised when advocating change. Reform agendas, such as those that have emerged as a consequence of the American Reform and Reinvestment Act (ARRA) of 2009, can actually work against the ongoing efforts to sustain quality teaching and learning in rural areas. Charter schools are being encouraged, but in many rural areas local resources are not always sufficient to establish and develop such a structure. In some instances, the high turnover rates of qualified teachers or the lack of access to basic infrastructure can impact adversely on a community's capacity to sustain quality schooling.

Large-scale national survey data has provided a clear picture of the teaching and learning environment, the priorities, and the professional learning needs of rural teachers (Lyons et al. 2006). Included in the findings were the impacts of high annual staff turnover rates, difficult to staff schools, professional isolation, teaching outside areas of qualification, unmet professional learning needs, accessing quality learning experiences and opportunities for students—including alternative activities for gifted and talented, special needs and Indigenous students. Data that has been

G. McPhan (✉)

SiMERR National Research Centre, Faculty of the Professions, School of Education,
University of New England, Armidale, New South Wales 2351, Australia
e-mail: gmcphan2@une.edu.au

S. Tobias

Faculty of the Professions, School of Education, University of New England, Armidale,
New South Wales 2351, Australia
e-mail: stobias@une.edu.au

analysed in reports, such as, the Trends in Mathematics and Science Study (TIMSS) (Thomson et al. 2009), the Programme for International Student Assessment (PISA) (Thomson et al. 2010 and National Assessment Program in Literacy and Numeracy (NAPLAN) (MCEECDYA 2010) all point to the distinct differences in outcomes for rural students when compared with those from metropolitan areas. Whilst the overall results for mathematical literacy for 15 year-olds, for example, are encouraging, the detail concerning comparative performance of rural/remote students and their metropolitan peers continues to tell a different story with up to 1.5 years difference in schooling level.

The issues facing rural education communities are recurrent and complex, requiring constant investigation and advocacy. The articles included in this Special Issue highlight priorities within three relevant areas, namely:

- Support for teachers through meaningful and targeted professional learning;
- Strategies that contribute to improved learning outcomes for students; and
- Support for communities through a consideration of social justice initiatives.

The importance of establishing a productive relationship between teachers and professional learning (PL) providers is the focus of the study by Beswick and Jones, in which they take as their starting point the particular difficulties identified by teachers when accessing PL opportunities. In the State of Tasmania, where the backdrop to teaching and learning is provided by geographic isolation, topography, population dispersion, and socio-economic disadvantage, there are additional hurdles associated with arranging teacher relief or managing classroom commitments. Even considering alternatives, such as the use of ICT or online learning platforms at both system and subject association levels, presents the additional headache of access to an effective supporting infrastructure. The removal of such hurdles is an important commitment that needs to be undertaken by all educational stakeholders to ensure that there is equity of access to quality professional learning. Contributing to the overall success of the professional learning model reported in this article was the notion of embedding PL within the context of teachers' work to facilitate shared experiences. The model described is an intensive one and there is some interesting feedback from the providers and school principals that reinforces the value of building relationships that promote effective learning.

Bansalil and Rosenberg further explore the issue of problems in practice. Their account of the South African context also provides insights into the constraints associated with accessing professional learning. Here, however, professional learning initiatives and a national focus on a nation's skills is an emerging priority and not one that is an integral part of the core business of teachers' endeavours. They present a 'lens' in the form of a Zones of Feasible Innovation (ZFI) model that describes the constraints under which teachers might be operating and which might limit the range of strategies that they draw on in teaching. The more problems, such as socio-economic disadvantage, no electricity or poor content knowledge, the tighter the ZFI. Their work with teachers who are being retrained to teach mathematics will resonate with those who are concerned about the growing number of out-of-field teachers (Ingersoll and Gruber 1996; McConney and Price 2009). Equally relevant is the idea that 'journeys' around transforming practice have multiple starting points and widely differing resource bases.

Given that attracting and retaining qualified teachers of mathematics is a widely recognised and experienced problem (e.g., Harris and Jensz 2006), Goos et al

explore the implications of problems associated with filling teaching vacancies or of teachers teaching mathematics outside their area of expertise. Their article addresses two important aspects of professional learning that has an impact: support for teachers to undertake curriculum and pedagogical planning; and collaborative partnerships with colleagues and the research team that fostered a sense of shared responsibility to make learning happen. A model of numeracy and its teaching across the curriculum provided the framework for enriching teachers' practice, and an important outcome reported in the article is the teacher development trajectories that emerged. These trajectories provide in general terms some evidence of teachers' initial priorities when undertaking the professional learning and also about how their thinking changed. A specific case of one rural teacher is provided in more detail and provides insightful commentary about an individual's changing identity as a teacher.

The issues of professional connectedness, isolation, the capacity to provide quality learning opportunities and experiences for students and, more importantly, where to start are further explored by Pegg and Panizzon in their article about the creation of learning communities around a common purpose within six rural and regional schools. The model of professional learning used in the study is entitled Improving Teachers Approaches to Mathematics (ITAM). An important aspect of the model is the sense of ownership that it can provide for teachers as they build and extend their skills and knowledge base related to an identified issue. Two of the schools are discussed in some detail and it is the commentary around the processes associated with implementation and the efficacy of the model that provided an important addition to the literature about establishing and maintaining learning networks that meet the needs of schools and teachers in rural areas. Of particular value were the development of leadership amongst participants and the feedback mechanisms that both helped to contribute to a commitment to further action.

Linking student learning to specific professional learning activities is documented in the study by Ell and Meissel. Their article provides some relevant commentary related to an important aspect of student learning. Evidence, in the form of student performance data in mathematics, is used as a way of informing the selection of pedagogical strategies that teachers might incorporate into their action plans for improving student learning outcomes. Teacher action plans that were prepared within a cluster of five primary schools formed the basis of ongoing collaborative conversations about student learning. These schools were rural with a large percentage of Indigenous Maori students. Teacher planning was further facilitated with support from a numeracy consultant and a researcher to provide the necessary data analysis perspective. Overall, the teacher-led cluster created conditions that resulted in improved student performance (in terms of effect sizes), something that the authors attribute in part to the sharing of data and teacher intent—the particular problem that was identified for attention.

Loong, Doig and Groves provide a particular perspective about the rural/urban 'divide' in their article. Against the background of equity of access for rural and urban students, their investigation into the use of ICT in mathematics by primary students provides interesting reading. In addition to students' perceptions about mathematics and ICT that were obtained from survey data, comparisons are presented of the use of a number of ICTs to support learning in mathematics at school (interactive whiteboards), and at school or home

(audio-visual equipment, calculators, internet, and computer software). The significant differences reported for this group of students relate to:

- Interactive whiteboard usage at school (greater for rural students);
- Calculator usage at school (greater for urban students);
- Internet usage a school (greater for rural students); and
- Software usage at school (greater for rural students)

The authors highlight the positive attitudes towards mathematics that were expressed by students as a result of their ICT experiences. They add that, in the context of their study, although there are similar levels of resourcing for urban and rural students, opportunities exist to address teacher pedagogy related to the range of uses for ICT tools that might maximise student learning in mathematics.

Supporting teacher professional learning to enhance student learning is a theme that runs (implicitly and explicitly) through the articles presented in this special issue. The question of translating teacher intent—often the productive outcomes of professional learning, into practice is discussed in the article by Hardré where she investigates student motivation for learning mathematics and other core subjects in rural schools. The areas of similarity and of difference between teachers' and students' perceptions makes for interesting reading. It would come as no surprise that there is general agreement from both groups concerning learning goals. When it comes to teacher style and support in mathematics compared with a subject, such as English, the story is somewhat different. The suggestion is made that greater alignment might be achieved through teacher understanding of *how motivated students are* and *how students are motivated*. Within the discussion there is ample material that might form the basis of targeted professional development including teachers' reliance in the classroom on intuitive rather than theoretically-based strategies, on content-based rather than context-based strategies, and a belief in what students *should want* as distinct from what they *do want*.

In the article by Thornton, Giles, Prescott and Rhodes, the theme of enhancing educational outcomes continues with attention turning to the difficulties faced by remote Indigenous communities in building a sustainable school environment. The essential elements of successful professional learning are highlighted: supportive partnerships between stakeholders; a strong contextual basis to support learning; collaboration; and ongoing feedback. What is added to this mix is the story of Philomena, an Indigenous Teacher Assistant. Although a single instance of one person's 'journey' to full teacher status, it is reflective of the experiences of all students participating in the *Grow Our Own* program detailed in this article. Attracting and retaining quality teachers in remote locations is problematic for a host of reasons including the sense of isolation experienced and the difficulties these teachers face with culture and language. The *Grow Our Own* program option allows preservice students with existing strong community links to develop (professionally) and also to build the mathematical knowledge of students they know well through activities that are an extension of the 'day-to-day responsibilities of life' in remote communities.

Owens et al provide a more global perspective of the cultural underpinnings of learning in their article. It is global in the sense that the strengths of Indigenous knowledge from distinctly different cultures provide a basis for establishing context—a sense of place, and its links to the (mathematics) curriculum. Important

elements of the discussion provided in the article include the importance of partnerships and the need to engage students, ideas that are priorities for many. By taking an ecocultural perspective—and this article clearly articulates the scope of such a perspective, the authors highlight the need to preserve the integrity of learning in an Indigenous way. The role of cultural knowledge is described as one that is not peripheral to mainstream mathematics education, but which is intertwined with it. This is an informative article for those whose teaching and learning perspective acknowledges the intersection of school and community, or whose perspective takes in the notion that negotiated knowledge encouraged by educational systems values the processes of the home-school-home continuum.

Of the many statements that could be selected to provide a link between the articles in this Special Issue, one has been chosen from the article by Owens et al: *The dialogue presented in this paper involved an extended yarning across Indigenous nations*. Similarly, the research presented in these nine articles involved extended collaborative engagement across rural mathematics teaching and learning communities. It is to be hoped that these articles provided stimulus to sustain engagement by all of us within the mathematics education community not only to investigate the recurrent issues of teacher professional learning, improved student learning outcomes and social equity within rural locations, but also to ensure that the messages are heard across contexts. Ongoing efforts and the preparedness to share findings and perspectives have the potential to strengthen learning for rural stakeholders and to inform practices in some metropolitan contexts, where similar teacher, student and community issues are emerging.

We hope that you, like us, find the articles informing and that the elements of success that they contain around improving learning outcomes in mathematics education for rural stakeholders will stimulate further ‘yarning’ that draws on evidence-based research.

References

- Harris, K.-L., & Jensz, F. (2006). *The preparation of mathematics teachers in Australia*. Report prepared for the Australian Council of Deans of Science
- Ingersoll, R. M., & Gruber, K. (1996). *Out-of-field teaching and educational quality*. National Center for Education Statistics, Statistical Analysis Report
- Lyons, T., Cooksey, R., Panizzon, D., Parnell, A., Pegg, J. (2006). *Science, ICT and mathematics education in rural and regional Australia: The SiMERR National Survey*. A research report prepared for the Department of Education and Training
- McConney, A., & Price, A. (2009). Teaching out-of-field in Western Australia. *Australian Journal of Teacher Education*, 34(6), 86–100.
- MCEECDYA. (2010). *National assessment program—literacy and numeracy. National Report for 2010*. Retrieved 11 April 2011 from <http://www.nap.edu.au/Test+Results/National+reports/index.html>
- MCEETYA. (2008). *Melbourne declaration on educational goals for young Australians*. Retrieved 20 October 2009 from http://www.mceecdya.edu.au/mceecdya/melbourne_declaration,25979.html
- Thomson, S., Wemert, N., Underwood, C., Nicholas, M. (2009). *TIMSS 07: Taking a closer look at mathematics and science in Australia*. TIMSS Australia Monograph No 11. Retrieved 14 September 2010 from <http://www.acer.edu.au/timss/data-and-reports>
- Thomson, S., de Bortoli, L., Nicholas M., Hillman, K., Buckley, S. (2010). *PISA in brief. Highlights form the full report: Challenges for Australian education: Results from PISA 2009*. Retrieved 16 February 2010 from <http://www.acer.edu.au/ozpisa/reports/>