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Contemporary Australian Primary Science Teacher Education

Triumphs, Tensions and Future Directions

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Foreword

The quality of primary science education has been the focus of considerable writing and research. A range of concerns have been critically examined including preferred pedagogical approaches, the affordances of authentic learning contexts, the inadequacy of allocated time, low levels of science confidence amongst generalist teachers, increasing complexity of curriculum content, decreasing student engagement, a need to embrace technology, the importance of scientific literacy, and the contribution of STEM education. While not an exhaustive list, these areas of study illustrate a perceived divide between aspirational expectations and the reality of school-based practice.

Understanding primary science education requires careful attention to a holistic picture which is characterised by a range of complexities. Research has not always successfully captured the intricate interconnections of the many areas of influence. The available picture, at best, provides a fragmented impression. As a consequence, a persistent focus has been placed on the inadequacy of generalist primary teachers as science educators. This has sustained a narrative calling for the 'upskilling' of practicing primary teachers and has continually placed the burden for improvement on the shoulders of teachers themselves. Maintaining this focus has also, very effectively, deflected attention from other influences. The relationship between teacher preparation and school-based practice is an important consideration in primary science education, but one which has often not gained deserved attention. While this is a complex space, influenced by changing political agendas and mandated requirements, there is a need to understand how pre-service education aims to build particular perspectives about primary science teaching and learning and the potential of such endeavours to ultimately influence school-based practice.

This book widens the research lens to examine how and why primary science teacher education is enacted in Australian Initial Teacher Education (ITE) programs. The importance of effective ITE is amplified as the authors draw on a range of contemporary research to illustrate the approaches, values and beliefs of primary science teacher educators who strive to provide their students with authentic learning experiences, enhanced science knowledge, and meaningful engagement with science education pedagogies. Tensions are clearly illustrated between the task of creating

learning conditions which enable pre-service teachers to become confident and competent science educators and often competing expectations and accountabilities of changing political priorities and agendas. Examining the impact of these changes from the perspective of those whose responsibility it is to prepare undergraduate primary teachers for their professional career provides a new research perspective in primary science education.

Providing effective pre-service teacher education emerges as a challenging endeavour. The book provides insight about how this work is impacted by bureaucratic decisions, often limited by policy and prevailing research agendas and inevitably shaped by requirements to follow mandated curriculum and embed teaching approaches which have gained prominence. Innovation in teacher preparation relies on the ability of teacher educators to demonstrate expertise and resilience as they effectively negotiate complex policy and practice issues. The authors show us how such challenges often make it difficult for pre-service teacher educators to make a positive contribution to their field. Building purposeful partnerships between universities, schools, and community organisations exemplifies this challenge and the many inherent tensions of their work. Teacher educators recognise such collaborations enable their students to experience science in meaningful contexts while developing knowledge of science as a discipline; a particular way of thinking and working. STEM education can also be effectively enacted through such partnerships as the contribution of science knowledge and skills can be easily highlighted, improving the integration of theory and practice through authentic primary education and community-based contexts. A shared professional responsibility for the preparation of teachers can also be nurtured through such collaborations, drawing on the mutual inspiration generated when experienced teachers work alongside pre-service teachers. In these contexts, success can be carefully scaffolded, increasing pre-service teacher confidence and competency. Yet to do so, teacher educators must expertly juggle the pressure of restricted time in terms of limited opportunities for science learning within crowded course requirements and as a consequence limited time to engage with outside partners. This also presents a challenge of nurturing sustained connections with external groups when the service of mutual benefit may be short term in nature. The prevailing course structures and accountabilities magnify the effort required of science educators to achieve the obvious benefits of such experiences. The results are often a testament to the persistence of science educators who aspire to elevate the quality of science education, remediate science disengagement, and empower pre-service teachers to advocate for science education.

The chapters bring into sharp focus how political and educational agendas are inevitably entwined and shape the primary science landscape. The authors critically examine a current course accreditation change in Australian ITE requiring pre-service primary teachers to undertake studies in an area of specialisation. Consideration is given to the associated opportunities and the potential constraints raised by this requirement for pre-service and school-based science education. As the implications of a specialisation in science education remain uncertain for both pre-service teachers and primary science educators, a call for further research highlights a need to understand the nature of expected expertise in this ill-defined space. The book

explains how graduates may expect to move into a range of school roles and aligned responsibilities, further challenged by potential confusion between the work of a 'hybrid specialist' and generalist teacher. Difficulties are also anticipated for schools as they work to determine the type of practice architecture required to support such new roles. The impact on primary science education remains unknown yet within this uncertainty, teacher educators must grapple to find meaningful ways to respond to such policy changes.

I find this book provides a new perspective on primary science education. It is a compelling account of research into teacher preparation and the influences which enable or constrain the contribution of this work to the achievement of quality primary science education. The work encourages new ways of thinking and working to produce research that is responsive to educator needs. Most importantly I appreciated how this book disrupts the deficit discourse which prevails. It goes well beyond superficial discussions of teacher inadequacy and the pursuit of technical competence which have been persistent drivers of change in primary science. I valued the focus on contemporary issues and the thoughtfulness displayed as findings were interrogated to gain a deeper insight about the implications for state of primary science education. I trust anyone who has an interest in primary science education will arrive at a similar conclusion through their reading.

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Chapter 1
What Is the State of Play for Primary Science Teacher Education in Australia?

As a primary science teacher educator, my driving purpose is to support pre-service teachers in becoming confident and competent future teachers of science. While my approach to achieving this has evolved over the last 15 years, my focus on inquiry-based and place-relevant practices has not shifted; instead they have strengthened.
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1.1 Introduction: Why This Book Now?

The spotlight on initial teacher education (ITE) in Australia continues to burn brightly (e.g., Ellis, 2022). This attention remains largely due to competing (and perhaps in some ways, complementary) demands emerging from a significant national ITE reform agenda (Brandenberg et al., 2016) and the foregrounding of a critical teacher shortage in the aftermath of the recent COVID-19 global pandemic (McLean Davies & Watterson, 2022). Through the intersection of these two concerns, a narrative has emerged around ITE policy and practice across the country, landing both on the political radar and in the public consciousness, calling for improvement in the quality and 'classroom readiness' of graduate teachers (Green et al., 2018). Australia does not stand isolated in this particular duality with similar tensions playing out on the worldwide stage (see: LeTendre, 2021; Murray et al., 2019; Welch, 2022). What is largely unknown and unknowable, however, is what happens next to create movement from airing to taking action against these concerns.

While it seems that the global stage might be set for change, what remains unsaid and untested is a more explicit understanding of what such large-scale conversations and considerations might mean (if anything) at a 'grassroots' level. Within the context of ITE, the concept of grassroots can be imagined at a level as granular as a specific course (e.g., a singular unit of study), in terms of disciplinarity (e.g., a learning area such as science or math) or as a more holistic educational perspective (e.g., First nations knowledges). Shifting the focus from the macro to the micro matters because, in reality, change will ultimately be enacted in the development and delivery of ITE

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