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EDITORIAL

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Burgeoning Research in STEM Education in Australia is a special issue of J-STEM that illustrates the breadth of STEM education research being undertaken in Australia. Showcased is research that investigates STEM education implemented in various educational settings and how implementation is influencing student learning, supporting teacher practice, informing the delivery of the curriculum, and shaping the nature of schools. This special issue captures the diversity and complexity of the STEM education research undertaken.

STEM education and associated research in Australia are nascent form. The emergence of the STEM term came to prominence in Australia in 2010 when the Office of the Chief Scientist championed the need for improving the flow of graduates into the STEM fields. Although STEM education research was underway at the time, the Chief Scientist brought a sense of importance and urgency to the need for research to inform practice. Since then, the research field of STEM education in Australia has grown considerably.

In Australia, as in other countries, the conundrum of the STEM acronym preoccupies the rhetoric about theoretical conceptions of STEM. The ambiguity of using the STEM acronym when referring to the disciplines as a collection of individual disciplines as well as when referring to the interdisciplinary nature of the disciplines is compounded further by the emergence of other acronyms, such as STEAM (Fraser, Earle, & Fitzallen, 2019). In their article, MacDonald, Hunter, Wise, and Fraser focus on the spaces between STEM and STEAM to elucidate the benefits of broadening our notion of interdisciplinarity in those contexts. Their article challenges readers to step out of their respective disciplines and consider the possibilities and benefits of working with other disciplines to shape education.

Interdisciplinary learning is at the core of the activity implemented with Year 5 students by Fitzallen, Wright and Watson. The activity involved designing and trialling seed dispersal devices. This provided an engaging Science context within which learning was based on the intersection of two frameworks, the engineering design process (Katehi, Pearson, & Felder, 2009) and the practice of statistics (Watson, Fitzallen, Fielding-Wells, & Madden, 2018). This allowed for the exploration of the direct inter-relationships of the disciplines of Mathematics and Engineering within that context. Fitzallen and her colleagues draw attention to the need to plan specifically for outcomes in all disciplines relevant to an activity to shift learning for some disciplines from being incidental to bring purposeful and potentially developmental.

In their article, Anderson, Wilson, Tully and Way examine the outcomes of supporting teams of teachers to plan, deliver, and evaluate integrated STEM learning activities. Based at the STEM Teacher Enrichment Academy, the authors delivered a professional learning program that involved students designing and constructing a wind powered car. As well as reporting on positive outcomes for the students and teachers involved in the project, Anderson and her colleagues report on the benefits of engaging with members of the local community and the role they can play in shaping student learning outcomes. They also point out that it is imperative schools take a lead in making STEM learning sustainable by building teachers' capacity to deliver STEM learning through continued professional

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development, revitalised school curricula, and changes to the structure of schooling.

Fraser, Beswick and Crowley also report on a project that involved working with teachers. Their research included novice and experienced teachers of STEM subjects from schools in rural, regional, and remote (RRR) Australia and was based on a peer-mentoring model of delivery. The project, STEMCrAfT, was designed to support teachers to evaluate and select appropriate STEM resources. In their article, the attention was on investigating the participants' perceptions of the enablers and inhibitors of effective teaching of STEM in RRR school contexts. Interestingly, principals and school leadership were cited as major contributors to potential solutions to issues faced. Also, of benefit were parental engagement and understanding of the importance of STEM education, and contributions from community members.

Mentoring through the provision of role models was a key component of the study reported by Barkatsas, Cooper, and McLaughlin. In their article, they illustrate the benefits of providing learning opportunities that emphasise the development of STEM skills in creativity, design, entrepreneurship, problem solving, adaptive thinking, and digital literacy. Outcomes of the Women in STEM (WISE)-STEM in Situ project comprised the potential of building of students' STEM self-identity so they could be creators of their own futures and the benefits of exposure to STEM equipment and resources not utilised or available in school facilities. The article serves the STEM education research community further by reporting on the development and implementation of a survey, STEMTAS, to measure affective changes as a result of participating in innovative and challenging STEM learning opportunities. The authors suggest the survey is one way of monitoring affective changes that may influence students' future studies and career aspirations.

This special issue ends with a book review written by Richelle Marynowski, from the University of Lethbridge. The book, STEM Education: An Emerging Field of Inquiry (2019), aims to support STEM teaching and learning during the compulsory years of schooling and beyond. The book also draws attention to the way in which research conducted in the Australian context aligns with STEM education research conducted in other countries. Collectively, the articles in this issue provide insight into what constitutes STEM education and practices in Australia could be used to further STEM teaching and learning internationally.

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