The Professional Knowledge Base of Science Teaching
Preface

This is the second book in the series from the Monash University–King’s College London International Centre for the Study of Science and Mathematics Curriculum. This centre was established in 2002 with initial support from the Monash University Research Fund (new areas), and in the context of the signing of an agreement between Monash and King’s, two years earlier, that led to the establishment of the then Monash University London Centre.

The first book in the series, *The Re-Emergence of Values in Science Education* (D. Corrigan, J. Dillon & R. Gunstone [Eds.], Rotterdam: Sense Publishers, 2007), considered the state of science education in the twenty-first century through a lens of values. The book presented a ‘big picture’ of what science education might be like if values once again become central in science education. However, overwhelmingly the experiences of those who teach science have been in an environment which has seen the de-emphasizing of values in both science and science education. So there is a disparity between the evolutionary process that science is undertaking and that undertaken by science education (and school science education in particular). In this book, *The Professional Knowledge Base of Science Teachers*, the focus is on exploring what expert science education knowledge and practices may look like in the emerging ‘bigger picture’ of the re-emergence of values.

We used the same approach to the creation of this book as we did with the previous book focussed on values in science education. In order to attempt both the creation of a cohesive contribution to the literature and having authors able to assert their own voices without restrictive briefs from us as editors, we again organised a workshop involving the authors and ourselves to enable a more interactive and formative writing process. Authors completed a first draft of their chapters in time to distribute them to all workshop participants before we met. The workshop then involved discussions of individual chapters and feedback to authors, and considerations of the overall structure and cohesion of the volume. Authors then rewrote their chapters in the light of these forms of feedback. As with the values book, the workshop was scheduled around the European Science Education Research Association (ESERA) conference, but on this occasion the workshop took place at the Monash University Centre in Prato (Italy) rather than in the same city as ESERA.
As well as for the values book, this procedure had previously been used very successfully in the production of two other books in which the editors had variously been involved *The Content of Science: A Constructivist Approach to its Teaching and Learning* (P. Fensham, R. Gunstone & R. White [Eds.], London: Falmer Press, 2000); *Improving Science Education: The Contributions of Research*, (R. Millar, J. Leach & J. Osborne [Eds.], Milton Keynes: Open University Press, 1994). We believe that this process significantly improves the quality of the final product and provides an opportunity for what is, sadly, a very rare form of professional development—considered and formative and collaborative (and totally open) discussions of one’s work by one’s peers.

We gratefully acknowledge the funding of the workshop through contributions to the Monash-King’s College London International Centre for the Study of Science and Mathematics Curriculum from the Monash University Research Fund and from King’s College London.

May 2010

Richard Gunstone
Deborah Corrigan
Justin Dillon

*A very sad postscript*

Late in August, as this book was in its final stages of production with Springer, we received the tragic news that Sandi Abell had lost her battle with cancer. In 2009 this illness meant Sandi had to return home to USA from the ESERA conference, and so could not attend our workshop for this volume in Prato. Even so, as we remember with both affection and sadness, her desire to maintain engagement with our workshop meant we had a wonderful discussion of her chapter via Skype, with her in her home and all the rest of us at our workshop. We are grateful for her contributions to this book. Much more importantly we acknowledge her major contributions to science education research, and through that to the thinking of many researchers around the world including the three of us.

August 2010

Richard Gunstone
Deborah Corrigan
Justin Dillon
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About the Authors

Sandra K. Abell As noted by the editors in their foreword, Sandi Abell passed away during the production of this volume. During her outstanding academic career, Sandi was a remarkable and highly influential contributor to science education research and development. She served as a president of the National Association for Research in Science Teaching and was recognized as a Curators’ Professor of Science Education at the University of Missouri. There, she directed the MU Science Education Center where she inspired learning, curiosity, and/or laughter on a regular basis. Much of her research was concerned with understanding the process of becoming a teacher of science, from pre-service preparation throughout the teaching career. Among her many publications were co-editing the *Handbook of Research on Science Education* (2007) and co-authoring *Seamless Assessment in Science: A Guidebook for Elementary and Middle School Teachers*. These, and much else, will continue to influence science education and teacher education for many years to come.

Glen Aikenhead is professor emeritus, Aboriginal Education Research Centre, University of Saskatchewan, Canada. His research and development projects over the years have emphasized relevance of school science for students’ everyday lives. His current work in cross-cultural Indigenous science education involves science curricula, textbooks and teacher professional development that recognize the importance of Indigenous knowledge to understanding the physical world for all students. This has led to a co-authored book *Bridging Cultures: Indigenous and Scientific Ways of Knowing Nature* (2011).

Jacinta Bartlett is an early childhood educator with a passion for researching design and technology education. She completed a BEd (hons) (H1) at Monash University in 2010. Jacinta has co-lectured at Monash University in early childhood technology, science and mathematics education and has published and presented at several national and international conferences. She is currently working with young designers in a preschool setting as well as assisting with research into early childhood educators’ understandings of technology with her colleagues at Monash University.
Amanda Berry is an associate professor in science education in the Faculty of Education, Monash University. Her research interests have grown from her experiences as a high school science teacher seeking to better understand and improve learning within her science classes. Her current research focuses on the development of science teacher knowledge, the professional learning of teacher educators and the development of a pedagogy of teacher education that responds to contemporary educational issues. Recent books include *Tensions in Teaching about Teaching: Understanding practice as a teacher Educator* (2008) and *Understanding and Developing Science Teachers’ Pedagogical Content Knowledge* (2006) (with John Loughran and Pamela Mulhall).

Anthony Clark is a professor in the Faculty of Education at the University of British Columbia, and co-director of UBC’s well known Centre for the Study of Teacher Education. Before coming to Canada he was a classroom teacher in Australia for a number of years. His research interests include the practicum in teacher education and teaching and learning in higher education.

Rebecca Cooper is a research fellow in science education in the Faculty of Education, Monash University. Whilst working as a Physics, Science and Mathematics teacher, she has also been involved in pre-service science teacher education and delivering professional development for science teachers. Her research interests include considering how science teachers develop pedagogical content knowledge, improving the quality of science teaching to increase student engagement and finding ways of making school science more relevant to students.

Deborah Corrigan is an associate professor in the Education Faculty at Monash University. Currently she heads the faculty’s Science Education Research Group in the Centre for Science, Mathematics and Technology Education, and has previously been director of undergraduate and pre-service programs and associate dean (teaching). She has extensive research and development experience in the areas of science education, particularly chemistry education, and teacher education/teacher development/teacher learning (both pre- and in-service). She is currently involved in Victorian science teacher professional learning programs for both the Victorian Government and the Catholic Education Office, and the Science Learning Hub for the New Zealand Ministry of Research, Science and Technology. Her most recent book is the precursor to this volume, *The Re-emergence of Values in Science Education* (2007), which she also edited with Justin Dillon and Richard Gunstone.

Bronwen Cowie is currently director of the Wilf Malcolm Institute of Educational Research, Faculty of Education, and the former director of the Centre for Science and Technology Education Research at the University of Waikato, New Zealand. She has been a teacher of science in secondary schools. She has directed a number of large national research and development projects and has extensive experience in classroom-based research. Her research interests include the nature of assessment for learning interactions in science and technology classrooms, student voice, culturally responsive pedagogy and the role of ICTs in learning science.
Justin Dillon is professor of science and environmental education and head of the Science and Technology Education Group at King’s College London. Justin joined King’s in 1989 after teaching science in London schools for ten years. He is an editor of the *International Journal of Science Education* and president (2007–2011) of the European Science Education Research Association. His research interests include teaching outside the classroom, public engagement with science, environmental education and teacher development.

Gaalen Erickson is a professor in the Department of Curriculum and Pedagogy at the University of British Columbia. He has had a long-standing research interest in examining the methods and theories used to identify and interpret student and teacher learning in the context of science education. As a former director of the Centre for the Study of Teacher Education at UBC, he also developed with colleagues and graduate students a research programme on models of teacher professional development examining the relationships between research and practice as they are enacted in projects documenting the nature of practitioner inquiry and professional knowledge.

Maria Evagorou is a lecturer in science education at the University of Nicosia, Cyprus. Her research interests focus on exploring young students’ argumentation and system thinking skills within the context of science. More specifically, the emphasis of her work is on young students’ talk when they engage in the discussion of socio-scientific issues, and how the use of online technologies can enhance students’ argumentation skills and their understanding of a system. Maria has received awards for her research in argumentation at the AERA Science SIG and EdMedia 2008 Conference, and has published in international journals.

Peter J. Fensham is an emeritus professor at Monash University where he was associated for many years with the development of its internationally acclaimed research in science education. His book *Defining an Identity* discusses how science education has evolved as an international field of research. His membership of the Science Expert Group for the OECD PISA project enabled him to contribute to novel ideas for assessing scientific literacy. His current research interests are in policy making with respect to science education and how control of the curriculum for school science is changing. At present he is an adjunct professor at the Queensland University of Technology.

Helmut Fischler is professor of physics education at the Freie Universität Berlin. His research activities are focused on students’ learning and teachers’ professional development. Investigations on students’ learning refer to their problems to understand conceptions of modern physics. His research on (student) teachers analyses the relationship between their subject matter and pedagogical content knowledge on the one hand and their decision making in classrooms on the other. Currently he is guest professor of physics education at the Linnaeus University, Kalmar/Växjö, Sweden.

Richard Gunstone is now emeritus professor of science and technology education at Monash University where he continues to engage with research on science learning, teaching and curriculum, and the mentoring of younger academics. He initially
joined Monash in 1974 after a career as a high school physics, science and mathematics teacher. Among his current projects is being editor-in-chief of Springer’s *Encyclopedia of Science Education*, due to be published in 2012.

**Beverley Jane** was a science educator at Monash University where she linked theory and practice by teaching science curriculum units in local primary schools. Her popular books *Science for Children* and *Technology for Children* (with Marilyn Fleer) continue to influence the pedagogical development of pre-service teachers across Australia. Now an ordained minister, she plans workshops for grandparents on how to foster their grandchildren’s understanding of science.

**Alister Jones** obtained his master’s degree and PhD from the University of Waikato, New Zealand. He is currently dean of the Faculty of Education at the University of Waikato, and is the past director of the Wilf Malcolm Institute of Educational Research and of the Centre for Science and Technology Education Research. He has been a teacher of science in secondary schools and has been involved in research in science and technology education in both England and New Zealand. His research interests involve aspects of science and technology education, including teacher development in science and technology education, teaching and learning of physics and curriculum development, and assessment in technology education.

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