Preface

The idea for this book stemmed from various conversations I have had with my dad. My dad has a Papal knighthood, he was Under-secretary to both President Obote and President Amin, and he has worked as a Company Secretary for a large multinational company. So, he is used to working under pressure and in demanding circumstances, however, he finds using a computer exasperating. Sometimes when we are pursuing a computer related task, (whether it involves email, skyping, searching the Internet, using spreadsheets, word documents or video/photos editing), he says, ‘but how did you know to do that?’ Or, ‘why did it do that?’ Or, ‘how can I get this to do this?’ Most of his questions are a bit of a challenge for me, as I tend to prefer working with an Apple Mac, whereas my dad uses a PC. So taking what I know about how I use my Mac and finding a way to help my dad use his PC has made me more aware of the various facets that comprise this notion of multiple literacy when using information communication technologies. My dad and I are, (I think) subject competent (in our particular fields and with the English language), he is better than me at information processing, and our technology competence varies. I began to wonder about this balance between subject (discipline and language), information processing and technology competence, with respect to the use of ICT in science education. With this in mind, I asked my international colleagues to document their notion of multiple literacy in science education by describing their research or activity in the area. My international colleagues are using contemporary tools of communication within their specific, culturally dependent and context specific, environments and this book seeks to document rationales, theories and ideas that underpin their use of ICT in various formal and informal science education domains.

The book begins with a ‘chapter’ that discusses, more academically, the ideas signaled in the conversation I have had with my dad. The first chapter is a transcript of a conversation, between colleagues, about technology informed and warranted literacy. During the conversation a colleague said,

“I question whether there is one definition for digital literacy which is constant in time and across different societies. There are new technologies coming out all the time and hence digital literacy twenty/thirty years ago would have meant something quite different from what we might think of today. I also wonder whether there is a requirement for the phrase digital literacy, why do we have the word digital there? Are we not just talking about literacy using the contemporary tools of communication?”

So that is really the question. Are we just talking about literacy in science education when using contemporary tools of communication? To try to address this question, the book contains chapters that illustrate the nature and challenge of technology inclusion and infusion in formal science education (whether it be primary, secondary or tertiary education) and informal education (site visits, computer games).

The first few chapters illustrate the nature of multiple literacy found when information communication technologies are used in science education. For example, the chapter by Ng describes the promotion of scientific literacy through the use of digital literacy. Mackenzie’s chapter follows Ng and provides
concrete descriptions for the use of various technologies in science education, highlighting the need for multiple literacy in terms of attitude, science and technology. Mackenzie’s chapter signals the promise of technologies and strategies for secondary school science from a Scottish school teacher’s perspective. However, the need for caution is signalled in the next chapter, with a focus on simulations. Eilks, Witteck and Pietzner draw attention to the challenges when using multimedia aids to support the development of chemistry ideas and concepts. Rodrigues and Williamson add to the multiple literacy discussion by adding literacy and information literacy to the previously identified aspects of digital literacy and scientific literacy. They explore cognition and examine a social context and the resulting pupil engagement. The next batch of chapters focus on the development of multiple literacy within the context of science teacher education. The chapters document how teacher professional development to support digital pedagogies are attempting to move away from a focus on the addition of ICT tools to classroom practice, to a way of working in a digital world that requires competence with respect to a variety of literacies. The chapters describe projects involving teacher professional development within specific milieus. For example, the chapter by Cavas, Cavas, Karaoglan and Kisla describes a variety of ‘adopter/adapter’ characteristics and describes the challenge in developing ICT use in science education in Turkey. The chapter by Jane, Fleer and Gipps presents an Australian perspective, in which they explore a cultural-historical framework not only in terms of cognition, but also in terms of examining social contexts and engagements. Whitehouse and Hickey also present an Australian perspective of primary teacher science teacher education, and draw attention to the challenges faced when trying to promote various literacy competences (science, technical, social, etc.) in rural environments. The following four chapters show how the success and failure of ICT use in science education is significantly influenced by the multiple literacy skills of particular agencies (policy makers, teacher educators, cultural environments, institutions).

The chapters highlight the interrelationship between infrastructure, curriculum and assessment, and teacher professional development. For example, Yoong and Yuen Lew outline the Malaysian Smart School experience, a policy driven, heavily resourced, significant initiative. Yoong and Yuen Lew describe how an initiative may be ahead of the times, but still come unstuck if those implementing it have limited awareness of multiple literacy demands. In the case of Malaysia, technology issues and the fact that few teachers were proficient in ICT application, let alone proficient to teach science using the English medium for communication (most are trained in the Malay medium), as well as the fact that the learners first language was not English meant that the innovative initiative was beset with troubles. The Diallo, Traore and Fernadez chapter picks up ideas identified in the Yoong and Yuen Lew chapter, by documenting the challenges and successes in Africa in terms of infrastructure, curriculum and teacher development. Fehring addresses issues mentioned in both the Yoong and Yuen Lew chapter, and Diallo, Traore and Fernadez chapter. Fehring uses an Australian context to explore the requirements in teacher education and she shows the challenge teacher education faces in promoting the development of multiple literacy. Walker uses a Scottish study to illustrate the demands with regard to assessment practices. Walker’s chapter illustrates the ad hoc development of competences to address online assessment, and the influence of this literacy on test anxiety. Marks describes the educational challenges from a sociologist’s perspective. Thus far the chapters have focussed on formal learning environments based learning.

The next four chapters consider beyond or outside school learning environments: descriptions of field trips, the challenge for older lifelong learners and the use of recreational computer games. We start with a chapter by Lavonen, Laherto, Loukomies, Juuti, Kim, Lampiselkä and Meisalo who use a site visit to show how learning involving multiple literacy can occur in environments beyond the school locale. But their chapter also suggests that scientific literacy is more than knowledge of science, they suggest that it includes knowledge about science as well as understanding interconnections through reading, writing, speaking, and listening. Some of the argument involving the promotion of scientific literacy has at its
centre a desire to promote public engagement in science with the wider community. Murnane shows how multiple literacy is developed by some of our older members of society, but through his exploration of the development of technical competence, Murnane also highlights what we take for granted in terms of developing technical literacy. This foray into more informal learning environments is followed by a chapter by Grimley, Nilsen, Kerr, Green, and Thompson in which they describe the use of computer games in science education. Grimley, Nilsen, Kerr, Green, and Thompson discuss the implications, of various massive multiplayer online role play games, and well known virtual environments, in terms of science education challenges and requirements. The idea of computer games in science education is explored further by Magnussen who also considers the use of computer games in science education, and describes a role play game. Magnussen’s research shows how various facets that comprise and require multiple literacy (for example, complexity of game design, resources in the classroom, teachers, and other students) influence the enactment of representational inquiry competences.

So, are we just talking about literacy in science education when using contemporary tools of communication?

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