TECHNOLOGY INTEGRATION AND HIGH POSSIBILITY CLASSROOMS

Building from TPACK

JANE HUNTER
Technology Integration and High Possibility Classrooms provides a fresh vision for education in schools based on new research from in-depth studies of technology integration in exemplary teachers’ classrooms. This timely book meets the demand for more examples of effective technology integration by providing a new conceptual understanding that builds on the popular and highly influential theoretical framework of technological, pedagogical content knowledge (TPACK).

Technology Integration and High Possibility Classrooms details four rich case studies set in different contexts with students ranging from ages 6 to 16. Each case study articulates in very practical terms what characterizes exemplary teachers’ knowledge of technology integration and how that is applied in classrooms. This highly accessible book clearly demonstrates how theory informs practice and provides new possibilities for learning in 21st-century schools.

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Building from TPACK

Jane Hunter
For my loving parents, Patrice and Noel
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It gives us great pleasure to be invited to write the foreword to Technology Integration and High Possibility Classrooms: Building from TPACK. This book is timely and valuable, focusing as it does on issues that are both relevant and critical to teaching and learning in this day and age. As faculty members in the Department of Educational Psychology & Educational Technology at Michigan State University, we work with a variety of teachers from a range of subject matters and grade levels. This means being constantly aware of the key issues humming at the forefront of not only higher education, but also K–12 teaching and learning. For us, matters of educational psychology, including how we teach, what we teach, and how students learn, is of central importance in driving the use of technology for the classroom. As educators who teach other educators, we have seen firsthand how technology is shifting and reshaping the landscape of our field and demanding that we revisit some core foundations of thinking, teaching, and learning.

We live in what may be described as ‘exponential times’—as the rate of change for new technologies and advancements seems to be multiplicative and accelerating. Devices, games, new media and other digital technologies have already transformed the way that we live by reforming our ideas of work and play. From smart phones to Twitter, from YouTube channels to multiplayer games, technology has created major shifts in how we interact with information and with each other. It has opened up the world in many ways, to allow for ‘24/7’ communication across the Globe—via email, Twitter, Facebook, and varied other social networking tools. Comedian Louis C. K. has joked about how different a place our world is in recent years than it was for most of human history. He has noted how cross-country USA travel, which would have once taken numerous years to accomplish (during which time people would have been born and died along the way, or as he puts it: “you’d end up with a different group of people than you
started with”), is now just a trip of a few hours—during which you have ample Wi-Fi, movies, and other media available at hand.

Looking ahead to the future assures more of the same accelerated rate of technological innovation, and this requires the field of education to be adaptive and creative. The continued debate and discussion about technology and what it can offer to 21st-century education is of increasing significance in our world. These issues are taken up by Dr. Hunter, in particular in the first chapter of the book where the technology contexts of Australia, the USA, the UK, Singapore and South Korea are considered. In many ways, the opportunities that technologies present are unparalleled in the possibilities and affordances that they can offer to teachers and students in the classroom. While traditional face-to-face interactions can be restricted by convenience and propinquity, virtual interactions can be varied and range across countries and times zones. This means that students can interact with people in different places, from different backgrounds, and even be in contact with experts on certain topics or other students studying the same topic. While immediate tactile experience can be limited, virtual experiences and information technology can open the possibilities up tremendously—and our imagination in how we use such new tools is unlimited.

However, with all of these new and ongoing advancements in the world of education and the world at large, this does not mean that things are always (or ever) easy and straightforward in the world of educational technology. The rapid rate of change can be a tremendous challenge for teachers, who often may feel as if they are trying to “hit a moving target,” as technologies fall away from the scene just as quickly as new ones arrive. As the pressure heightens for teachers to better understand new ways to integrate technology into their existing teaching practices, billions of dollars and countless resources are often put into hardware, software and professional development and training—often without consequential results.

Despite these investments, in many classrooms and contexts across the world, technology integration still remains in fairly basic levels of use. To draw upon the SAMR model that Dr. Hunter discusses in the book (which uses levels of technology integration from basic to advanced, as: Substitution, Augmentation, Modification, and Redefinition), many teachers find themselves stuck in the Substitution or Augmentation phases of classroom technology use. In this, they may find that they are simply replacing an old technology for a new one, without necessarily adding any significant value for the teaching/learning process. Or teachers may find that they are using simple, feature enhancements, rather than discovering where the real affordances of that technology are with regard to explaining disciplinary ideas.

This is, of course, where the TPACK (Technological Pedagogical Content Knowledge) model can become valuable as a framework for the effective integration of technology for teaching and learning, as Dr. Hunter demonstrates in this book. The central focus of the TPACK framework is on a specialized kind
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of teacher knowledge, involving the interplay of three essential forms of knowledge: Content, Pedagogy, and Technology. The most purposeful and gainful use of technology in teaching subject matter means that teachers must understand and negotiate the relationships between these three forms of knowledge. As teachers develop such sophisticated and interrelated knowledge, they develop a form of expertise for teaching with technology. Such knowledge is different from, and more extensive than, the knowledge of a disciplinary expert (e.g. a social scientist or a mathematician), a technology expert (e.g. a computer programmer) and a pedagogical expert (an experienced teacher with knowledge of general pedagogy). To really integrate technology for impactful learning, TPACK-focused teachers have to become sensitive to the changeable relationship and interaction between these three aspects of knowledge.

At its core, TPACK is also directly related to teacher creativity, as the framework acknowledges that teaching (particularly in novel, and technology-rich contexts) is complex, and requires both problem seeking and problem solving. The flexibility and range of knowledge that are necessary to integrate technology thoughtfully makes technology-savvy teaching an inherently creative act.

Along with technology integration, creativity has become an increasingly recognized and vital component of excellent teaching. That is not to say that the overall topic of creative education is new to the 21st century. In fact, the importance of creativity has vital roots that stretch back far into the history of teaching. One of the most prominent thinkers in the history of educational psychology and philosophy, John Dewey, strongly advocated for the necessity of the arts and creativity across all domains of human knowledge; and at this crossroads of human knowledge, first and foremost, is the domain of teaching and learning.

However, as our world becomes increasingly complex and globally interconnected, the need for creativity has only strengthened. Creative thinking skills will be essential in order to navigate the diverse knowledge bases, technological acceleration and multifaceted problems that have characterized recent years and decades. The Partnership for 21st Century Skills, along with countless scholars, authors, and educational experts, has emphasized creativity as one of the most valuable, beneficial and coveted cognitive skills for the future. Yet understanding and cultivating creativity among teachers and students has not always been an easy task, particularly in the climate of high-stakes, standardized assessment that is part of many educational systems.

It is clear that the most effective uses of technology for teaching and learning must be grounded in a creative mindset that embraces openness for the new as well as intellectual risk taking. This is, however, a major challenge for most new teachers, and it is an area of educational research that has not been addressed in depth by most teacher education programs or professional development opportunities.

There has been a comparative lack of studies on creative teaching across the landscape of educational research, and yet there is a strong and increasing need
for more of this kind of work. These interconnected and contemporary educational issues of creativity and technology are often treated as being independent of each other. We argue however, that research today needs to focus on understanding the interplay between these two domains. An important research approach towards developing this understanding is learning from successful classroom teachers and their strategies to navigate both these factors in their teaching practices.

For this reason, and many others, we are greatly pleased to see that Dr. Hunter’s book, *Technology Integration and High Possibility Classrooms: Building from TPACK*, seeks to provide thoughtful and detailed cases of classrooms in which exemplary teachers have integrated technology with creativity and imagination. The focus on each of the teacher cases of Gabby, Gina, Nina and Kitty is unique depending on their approach and context, and the cases investigated and considered here help us to form a more complete understanding of innovative and effective technology integration for teaching and learning. The classroom research showcased in this book focuses on different strands of TPACK tied in to teacher understandings of theory, creativity, public learning, life preparation and contextual accommodations in a new model for technology integration known as *High Possibility Classrooms*.

If we are to meet the demands of the present, and more importantly, the future of education, the field of educational research needs more rich case studies of successful teaching with technology. Given this, we are very happy to see that Dr. Hunter has taken on the task of helping to fill in the picture of what excellent, creative, and technology-rich teaching and learning looks like across different classrooms.

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This book grew out of my doctoral research. In essence, it represents how I believe learning and teaching should occur for students in all schools. Doing the research was stimulating, hard work; such is the road of the PhD traveler. Thank you to the University of Western Sydney, Australia and the Research Committee in the School of Education for giving me the opportunity to conduct the study in the first place. The supervision I received from Associate Professors Geoff Munns and Bronwyn Cole in the College of Arts was extraordinary; these two people are great teachers and their humility and insight made each PhD meeting a rich learning experience.

I thank my family for moral support to not only keep me on track during the research and writing stage, but also for their encouragement to me to submit the study as a formal book proposal to Routledge. In the course of writing the thesis and finishing this book, both of my frail and very ill parents passed away within three months of one another. I had conversations with them about what I was doing leading up to that time—they both saw photos of my graduation day, the bound thesis and the draft manuscript—they were very proud—I even talked to my late mother about the book’s dedication. I miss them.

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I take responsibility for the contents of the book, including its flaws, and I trust that the four teachers who let me into their classrooms, Gabby, Gina, Nina and Kitty, feel I have honored their practice. I will always treasure the time I spent in their classrooms. Thank you to the students in each of the classrooms, the four school principals and the NSW Department of Education & Communities in Australia for approving the study in the first place.

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INTRODUCTION

Why Another Book on Technology Integration Now?

In keeping with the tsunami of technology available in schools and in educational contexts more generally over the past ten years, there is a burgeoning of information for educators about technology integration in learning and teaching. Therefore you may ask the question, do we actually need another book on the subject? And, if we don’t, then why am I writing this one? How is this book different? Many texts offer suggestions on why laptops make a difference, or how teaching in a digital age must be done and why creative, technology-enhanced classrooms are better than those that don’t have all the bells n’ whistles. Most suggest ways for teachers to use technology to engage students. Only a scant few are grounded in a robust theoretical framework, and probably of those technology integration models that are celebrated, it is TPACK, or the Technological Pedagogical Content Knowledge framework developed by Mishra and Koehler (2006), that is the most well known.

This book is different because I offer a new model known as High Possibility Classrooms, or HPC, for technology integration in learning and teaching in schools. Its origin stems from research in a doctoral study of exemplary school teachers’ knowledge of technology integration. Analysis of data from the teachers’ classrooms was developed into a series of case studies of early years, elementary, middle and high school classrooms. Each carefully constructed case study details how the teachers conceptualized their knowledge of technology integration and what is fresh in their approaches, and includes what the students in the classrooms thought about being learners in such spaces.

I have spent considerable time over the past decade or more working with pre-service and in-service teachers who use various technology tools and programs in learning and teaching in classrooms. What always interested me was the way some teachers embraced technology and why others felt there was no
need to change practice, especially when they were already achieving good learning outcomes. On closer observation, the latter classrooms remained a parallel universe to students’ digital lives outside school. Other teachers, often in the same school, knew how the latest apps enhanced classroom collaboration and shared experiences, while some could set up school servers and use interactive whiteboards. In fact, many teachers in Australia had used such technologies from the time the Blair government in the United Kingdom first introduced them into British schools.

No doubt the issue of technology integration in learning is a formidable challenge for many teachers in schools. From Wikis to Twitter, from YouTube videos to Chromebooks that offer faster computer access with thousands of apps, technology is changing how teachers and students interact with information and with each other. As the pace of ongoing conversations about technology hastens and its role in education is prioritized, we are also conscious of how technology can become obsolete as quickly as it arrives.

In the professional development workshops on technology integration I have conducted over the years, I would sometimes see teachers’ eyes glaze over when the word technology was mentioned. Yet, there were other teachers who, for example, were nearing retirement and had been so inspired by what was said or shown, that they changed their plans and decided to continue teaching . . . for just one more year. Perhaps they wanted to see if they could create the interactive, imaginative learning spaces being illustrated?

For an example, I will use the case of ‘Miss Havisham’ to illustrate the point; this is the name I will give her—not because she was witch-like or covered in cobwebs, but because she sat in a school professional development workshop in an immaculate wool suit, with coiffed hair, dark stockings finished with patent shoes and black leather gloves trimmed with white fur. Of note, was that ‘Miss Havisham’ left her gloves on throughout the workshop, perhaps as a sign that she was determined not to engage with the learning experience at hand. It was apparent when we worked in small groups a bit later in the day that ‘Miss Havisham’ had never touched a computer keyboard. She explained to me that she was finishing her teaching career and “Well . . . what was the point?” I had it on good authority that ‘Miss Havisham’ was an extraordinary performer in the classroom. Her students loved her. Nonetheless, she listened intently to the workshop content, followed simple instructions, but then stayed on well after the session ended. And finally, at the conclusion of the day, she took off her gloves. Was this a sign that I had caught her attention? Only time would tell.

It was a few months later at a much larger gathering of some 500 teachers in a regional professional development workshop that I again glimpsed ‘Miss Havisham.’ I saw her through the crowded room. She approached me and eagerly explained that she had decided not to finish teaching just yet, as her classroom was about to be fitted with an interactive whiteboard, video-conferencing tools and a handful of laptops. I thought to myself: “Victory! Wow! See what
is possible! I can leave teaching now—my work as an educator is done! Well, maybe not quite?"

What this anecdote shows is the heart of technology integration. It’s not about the tools being used, but how teaching practice, when it is mindful of pedagogy and rich subject matter, can be enhanced and re-imagined when technology is used to engage students in learning. Listening to conversations among teachers in recent HPC workshops, I hear them saying that the professional development experience gave them “ideas of how to apply HPC conceptions and themes in my teaching,” “it affirms what I already do” and “as a model based on real cases of technology integration HPC offers potential for the teaching profession more broadly.” Such anecdotes are positive, though an additional study would need to test the claims I make here. HPC conceptions detailed in this book are being further validated in the classrooms of teachers in wider school settings in Australia and with teachers of varying technology skill sets.

Increasingly, I see more teachers who are willing to observe and embrace what their tech-savvy colleagues do. They understand that one of the challenges in education is to provide children with an experience of learning that is both important and relevant to their differently lived social futures. Better education cannot be more of the same; the focus of learning is moving beyond the individual and the cognitive to incorporate the aesthetic and the moral, and the interplay among these elements. What many adults may call using technology, children and young people may experience simply as living. Technology is not mysterious or magical, but is integrated into their lives, more like “prostheses than gadgets” as Erica McWilliam once said (in Craft, 2011, p. xxii).

Like Mishra and Koehler (2006), I use the term technology in this book in preference to information and communication technology (ICT). I regard the broader term technology used by them as highly useful, as it refers to tools created by human knowledge of how to combine resources to produce desired products, to solve problems, fulfill needs or satisfy wants. Within this definition, the term is also used to describe “individual tools or techniques, and all tools and techniques and knowledge” (Mishra & Koehler, 2006, p. 5). The scope of this definition includes tools such as interactive whiteboards, digital cameras, iPads, iPhones, laptops, apps, computer hardware and software, blogs and digital resources (including films, games and curriculum learning objects). The act of technology integration means including technology in teaching.

The term fresh is used in the book to describe the ‘emergent knowledge,’ or a new way of understanding how teachers who have the HPC model ‘top of mind’ integrate technology. The teachers in the research study taught students in New South Wales (NSW) government schools. The term exemplary is used to describe the practice of the teachers I studied in four phases over two years. They didn’t necessarily like the title ‘exemplary;’ preferring to suggest that most of the time they were ‘fluffing about.’
Recruitment into the research was done on the basis that the teachers were an ‘excellent fit’ against six criteria established for a purposive sample; these were:

- high level of proficiency in using a range of technology;
- use of technology daily with students in almost all teaching and learning activity;
- use of technology in an innovative and engaging manner for teaching and learning with students;
- initiation, guidance and substantial contribution to professional learning in technology with colleagues in the school context and beyond;
- participation in trials of new technology in previous projects and research in the school; and
- held in high regard by colleagues for their commitment to the profession.

Origins of HPC

In this book, I present the model of technology integration known as High Possibility Classrooms or HPC that emerged from research and data analysis in the doctoral study (Hunter, 2013). The five conceptions in the model are the knowledge components of the teachers’ beliefs and practices; the conceptions are:

- theory;
- creativity;
- public learning;
- life preparation; and
- contextual accommodations.

Each knowledge conception in the HPC model is underpinned by 22 themes that feature pedagogical strategies and student learning processes used by the teachers. I argue that these practices are essential for teachers to include in learning if they are to give students in schools the educational experience they deserve.

The study used Miles and Huberman’s (1994) notion of qualitative sampling, a similar idea to Stake’s (1998) opportunity to learn. My previous work in NSW Department of Education & Communities (NSW DEC) schools gave me some knowledge of where outstanding teachers, teaching specific stages of schooling, were located. This work “at the grass roots level in the field” gave me “insider knowledge” of where particular practice could be matched against the set of “purposive” criteria (Hunter 2007a, 2007b; Hunter & Mitchell 2011). The recruited teachers used technology in their classrooms in ways that was exemplary and satisfied the criteria. It was, as Stake (1995) suggests, important to maximize what can be learned about a phenomenon. Three of the four teachers in the study expressed interest in participating in future research I conducted in schools, after
my employment in the NSW DEC concluded. One teacher, previously unknown to me, was recruited when it was clear she matched the criteria for the purposive sample.

**Technology Integration Is Not Easy**

I want to state upfront that technology integration is not easy; good and consistent access to technology, especially Wi-Fi, is very difficult for some schools, for some teachers and for some students. Access is highly dependent on the location and what resources are readily available. According to a new survey of teachers by the Pew Research Center’s *Internet and American Life Project* (2013), a significant gap remains in access to the internet between richer and poorer students. Not only do poorer schools lack the technology that richer schools utilize, poorer students are also far less likely to have access to such technology at home. Half of all teachers of students in upper-income families have access to the internet at home; that number drops to just 20% for middle-income students and to 3% for poor students. More than 90% of teachers said the internet has a major impact on their ability to access content, resources and materials for teaching, and nearly 60% said it has a major impact on their interactions with students. Access is getting better in many places, and that applies across the globe, but we are still not there yet. Teachers will not waste valuable class time if students’ learning is at stake, so the technology needs to be readily accessible and it must work well every time, not just some of the time.

In my role as a senior education officer in the NSW DEC from 2002–2009, I had the opportunity to work alongside hundreds of teachers engaged in technology projects in early years, elementary, middle years and high schools (Hunter, 2007a, 2007b; Hunter, 2011; Mitchell, Hunter & Mockler, 2010). Observations at the time showed that many teachers did not concentrate on technology integration from a pedagogical point of view. The problem was not that teachers did not want to or could not integrate technology, their perceptions stemmed from views that technology was an ‘add-on’ in the classroom and their task in the learning processes of students was to focus on content. I remember one teacher emphatically stating to me that “technology tools are used for word processing literacy tasks, or for dropping data into excel spreadsheets” (Hunter, 2011, p. 68). Professional development for teachers in technology was often in the form of one-off workshops, information newsletters or skills-based courses, which have been described as ‘one size fits all’ approaches. These work on the assumption that all teachers are at the same level of technology skill. Many teachers didn’t find the ‘hardware’ easy to use, and there was often an emphasis on implementation and curriculum resource production. Teachers often did not seem well-equipped to embrace the technology tools appearing in schools.
Technology Integration: Do It or Lose It?

My interpretations of the technology education landscape in the early 2000s aligned with the reading I was doing, in particular the work of Mishra and Koehler (2006), and their multifaceted, seven-component framework of TPACK (originally referred to as TPCK—in 2008 the name changed to its current TPACK form). It was relatively unknown in the Australian context at the time. It became increasingly obvious from what I was observing in school classrooms that TPACK had great heuristic value in technology research and it might just be the lever to foster new directions for understanding how teachers could conceptualize these knowledge systems. The TPACK framework built upon the well-known curriculum and pedagogy work of Shulman (1986, 1987) and was a highly useful lens through which to develop an understanding of how teachers could conceive their knowledge of technology integration. Equally important in the framework were the interactions between these bodies of knowledge. Mishra and Koehler (2006) used the “knowledge as design” work of Perkins (1986) to further support the idea of knowledge as a tool that is adapted to a purpose. Although TPACK was not completely new in 2006, it quickly became well-known. There were other scholars (Bruce, 1993; Papert, 1980) who argued that knowledge about technology was not context-free, and good teaching required an understanding of how technology related to pedagogy and content. TPACK represented a type of knowledge that was central to teachers’ work with technology.

At the time, my observations of teachers’ classrooms confirmed the perspective of Mishra and Koehler (2009), who claimed that “there was no single technological solution that applies for every teacher, every course, or every view of teaching” (p. 66). If technology was to be integrated effectively into classroom practice, then it needed to consider all three elements of content, pedagogy and technology—not in isolation, but in complex, vibrant operational relationships that defined teaching practice. At the same moment, other academics working in education and considered leaders in the technology field in Australia speculated that traditional methods of technology training being used in schools were ill-suited and would not support or produce the deep understanding that could assist teachers to become highly intelligent users of technology for integration in learning and teaching (Freebody, Muspratt & McRae, 2008; Hedberg, 2006; Oliver et al., 2007).

It became clear to me in technology integration presentations I was conducting in schools in 2008–2009, that there was strong interest in a TPACK approach by many teachers. Some teachers already used TPACK; although they didn’t necessarily call it this, nor did they really have a specific language for their practice, or what they were doing. However, on closer observation, that is what they were doing in their increasingly technology-rich classrooms.

It is the pedagogical aspect of how technology enhances learning experiences that most interests me. I don’t consider myself a ‘techie.’ Moreover, after 25 years of working in school classrooms, in universities and a long stint in education policy
advise, curriculum development and teacher professional development that included large-scale technology implementation programs, I offer these case studies of practice to support filling a gap in the education literature, but also to provide a fresh vision of what classrooms can look like at this exciting time in education history.

Who Will the Book Appeal To?

I imagine that readers of this book are pre-service and in-service teachers who would like to better understand what it takes to create an effective approach to technology integration. What does technology integration look like in action when it is done really well? How can the spaces where all students like to learn be common in more schools? What is interesting in this book is that not all of the schools in the case studies presented were well resourced. All of the classrooms are in government schools. One school, in fact was located in one of the poorest and ethnically diverse communities in a large, metropolitan city. And, of course the book will appeal to teacher educators in university settings who are seeking more details of new theoretical models for technology integration built from contemporary case studies of practice—vital in the preparation of competent pre-service teachers about to step into schools.

The case studies are written to enable sharing and use in undergraduate and postgraduate teacher education courses. Details in each case study aim to give examples of what technology integration looks like in action in the classrooms of particular teachers. I use the case studies as professional dialogue starters in workshops. In whole and smaller group formats, HPC workshops examine aspects of one or more of the case studies and provide opportunities for teachers to think about how to apply the model in practice. The case studies may be used either as a complete suite, on their own, or as springboards for planning and programming. The case studies comply with sets of teaching standards in education jurisdictions for teachers at all levels of accomplishment. For example, in Australia, the new Australian Institute for Teaching and School Leadership (AITSL) has set technology (referred to as Information and Communication Technologies) in Standards 2 and 4 of the Australian Professional Teaching Standards. In the new Australian curriculum documents, technology is conceived in a separate ‘Technologies Framework’ for all students from Kindergarten to Year 10. In the USA, the Common Core State Standards has ‘Education Technology’ presented throughout its policy documents, and the National Board for Professional Teaching Standards has knowledge of technology and how to use it implicit in its certification expectations.

So What for the Future?

Education policy compliance involving teaching standards or certification was not the reason for the book’s inception. Instead, it was the identified need for case studies to fill gaps in the education literatures. Until now, there were few,
if any, case studies of what well-integrated technology looks like in practice in schools. Calls for such case studies were made loud and clear for some time by various education scholars (Ertmer, Ottenbreit-Leftwich & York, 2006; Finger et al., 2007; Schrum, 2011). Choosing a group of exemplar teachers and examining what they do assists the development of deeper knowledge of technology integration in classroom settings for all teachers. It is something to mimic, aspire to, think about, try or experiment with in terms of one’s own practice.

Many texts on technology integration in classrooms don’t specify particular details of a teacher’s approach, and whilst I appreciate that the book does not have video material to support the written content, I argue that what is detailed here may not have been achieved with the same degree of authenticity with the presence of recording devices. Although it could be disputed that the effect of the intrusion of media for data collection purposes does diminish over time, reliance on the written word is subjective. The case studies were member-checked by the teachers for their veracity, and every effort was made to accurately portray what they did. Their voice is heard in the substantial quotes included in each case study. The voices of students were heard through focus groups and a process of member-checking to ensure that what they thought about technology in the classroom was captured with precision.

In the HPC case studies, there is considerable room for interpreting what is presented, and as such, they force the reader to imagine the scene, or alternatively, to think about what else might have been possible, or more effective, from the teacher’s or the student’s point of view. It is hoped that the case studies in this book will make a difference to learning and teaching in schools over time. The argument for implementing the HPC model in schools right now is powerful. Unless education leaders, teachers, students and parents work together to create significant and imaginative learning spaces in schools using theory, creativity, public learning, life preparation and contextual accommodations, then education, for students, risks becoming a parallel universe to life outside.

You may want to read the book straight through. Or, you may want to go immediately to the case studies and use them yourself or with the teachers you work with. I believe they will inspire new thinking about technology integration to enhance what it is feasible to create in classrooms. I hope that over time HPC becomes commonplace in all schools. At the end of each chapter, I have added a section titled Professional Conversation. This section forms a series of provocations on What is fresh? The provocations serve as starting points for reflection and discussion about classroom practices. Use them to reflect on your own classroom, or with the school executive and teachers you work alongside or when leading professional development sessions. Each chapter in the book to some degree does stand alone and the content is set out below for reader ease; note that at the commencement of each chapter, there is also a short abstract. The case studies begin with a ‘creative memo’ that in some small way honors the
commitment to creativity in each of the teacher’s practices. Furthermore, it is helpful at this point to know a little bit about what is in each chapter:

In Chapter 1, I provide a broad overview of research in technology integration and the wider sociopolitical education environment in Australia, the USA, the United Kingdom, Singapore and South Korea. These policy contexts distinguish relevant technology agendas in recent curriculum development, classroom practice and school education reform.

Chapter 2 examines the frameworks of TPACK and SAMR and how they complement a new model of technology integration, *High Possibility Classrooms* developed out of research in particular teachers’ classrooms. The model with its five conceptions and 22 themes of pedagogical strategies and student learning processes specifies a group of teachers Action Knowledge (AK).

The first case study is presented in Chapter 3. It is Gabby, the early year’s teacher whose focus is making learning public through giving students opportunities for performance. She uses active engagement to foster better quality outcomes and encourages the continuous co-creation of products, peer support and modeled and guided practice where there is attention to differentiation and negotiation of learning. This is a classroom where play and fun are central.

Gina, the elementary teacher in the second case study in Chapter 4, teaches her own class, and supports teachers across the school district to more effectively integrate technology. Reliance is placed on theory built from constructivist learning principles and she emphasizes establishing a questioning culture among students. She fosters creativity in her own practice, as well as the students, by making handmade picture books to spark their learning interests and to give them opportunities to create products, like films and animations, to demonstrate powerful learning.

In Chapter 5, Nina’s classroom in the middle school features a one-to-one laptop program where the teacher’s praxis used project-based learning in a scaffold called QUEST. Nina relentlessly probes and questions students while they learn. Values of joy, celebration and preparation for life were evident and such values are congruent with understanding more deeply what creativity can mean in learning. Nina calls for a redefinition of the ‘game of education’ in schools.

Kitty’s classrooms are located in a high school. This case study in Chapter 6 is highly useful too, and it is her Visual Arts background that fostered students’ sense of the aesthetic when they made their learning public using technology. Kitty prepared students for life, and technology integration was central to achieving that education goal. In a disadvantaged school, students had few outside resources, so what they learned and experimented with at school was critical.

In Chapter 7, a close examination of *High Possibility Classrooms* and how educators can use the model in practice is provided. Each of the conceptions of theory, creativity, public learning, life preparation and contextual accommodations are detailed alongside the 22 underpinning themes of pedagogical strategies
and student learning processes. Dynamic relationships exist between technology, pedagogy and content; the interactions between knowledge components shape practice in context and form what I argue is Action Knowledge or AK.

And in the final discussion in Chapter 8, the important ‘so what’ question is addressed through considerations of how HPC must be used to shape learning and teaching right now. The case studies of classrooms like those of Gabby, Gina, Nina and Kitty draw attention to important promises and the future for technology integration to ‘re-tool education in schools.’

Note

1. Miss Havisham is a key character in the Charles Dickens novel Great Expectations. She is a wealthy, single woman who lives in her shabby mansion with her adopted daughter, Estella.

References


It is the pedagogy that matters. Don’t get carried away with thinking that you have to know how every computer or every software program works.

*School principal speaking to teachers at a staff development meeting in Sydney*

This common axiom is echoed at staff meetings when school leaders reiterate to teachers that they must make more effort to integrate technology into learning for students. The classrooms featured in the case studies in this book were not ordinary spaces but places where extraordinary technology integration was taking place; the students loved learning in these classrooms and they didn’t want to leave when the bell rang. The teachers, both consciously and unconsciously, integrated the elements of technology, pedagogy and content effectively every time they taught. What these teachers did was flexibly navigate all three elements, and the complex interactions between them, in specific contexts. Often perceived as a complex, active problem, the teachers designed curricular solutions to fit their unique learners and their goals of creativity in particular teaching situations. Advancing knowledge of technology integration in the classroom where students are empowered just might be the lever for a *fresh* approach for teachers to consider when they integrate technology in learning.

It is useful to think about technology integration as an everyday activity for most teachers in schools, but for some it is not. Should this situation still be the case? Seymour Papert, pioneer of computing in education for children, identified more than two decades ago that schools must manage and provide access to technology—notwithstanding, this is still not happening in all classrooms in all schools. You sense my impatience. Industrial models of schooling are not appropriate for learning in the 21st century. Context determines what happens or does
not happen in education in schools. Framing education contexts in an international milieu is necessary prior to drilling down to the detail of individual teachers in individual schools. So, what are the competing contexts globally for technology integration in schools? And, how does context impact the kind of learning that occurs in classrooms? In this chapter, I visit the contexts of technology integration in school education in Australia, the USA, and the United Kingdom and in the East Asian countries of Singapore and South Korea. The discussion is shaped within the wider sociopolitical education contexts of key policies and education reports in those countries that lead to consideration of key technology issues and debates. In particular, I focus on technology integration approaches used by teachers in classrooms, how social networking tools are being conceived for learning and I scrutinize the popular catch cry of 21st-century learning and the role of technology integration in student achievement. The final issue I touch on in this chapter is some recent research on professional development in technology integration for pre-service and in-service teachers. Let’s begin with a brief examination of the education context of Australia.

**In Australia**

Education scholars argue that one of the central goals of public education is the transmission of knowledge (Dewey, 1938; Gudmundsdottir, 1990; Hirsch, 1996; Shulman, 1987). Within this mandate, schools in Australia are charged with responsibility for facilitating access to technology for learning, promoting technology awareness, improving students’ technology skills and understanding as well as fostering safe and sensible use of online environments for learning at home and at school (Garrett, 2012; NSW DET, 2009; Rudd, Smith & Conroy, 2007).

Each state and territory in Australia has its own education bureaucracy and all schools inside these structures are deemed either ‘government’ or ‘non-government.’ As such, education policy agendas are determined at the national level, but administered on a state or territory basis, giving rise quite frequently to different curriculum and distinctive classroom practices. A process of creating a common Australian curriculum commenced in 2008. However, after a change of government in late 2013, the content and emphasis of this national curriculum was called into question.

In January 2014, the new education Minister, The Hon. Christopher Pyne MP, requested a review of the curriculum by two education specialists. How this will unfold remains to be seen. Hundreds of educators, including classroom teachers, teacher educators, school principals and members of the public have raised concerns about the review in three distinct areas: first, is the review being framed only in terms of its ‘political or partisan bias?’; second, is such a review timely and appropriate given the work already commenced in most of the curriculum areas?, and third, is the ‘experience or lack thereof’ of the two
people who constitute the review panel in education’s best interests? Following on from the review was an Issues Paper circulated by the Teacher Education Ministerial Advisory Group (TEMAG, 2014) that sought feedback from those in the business of teacher preparation (mainly universities in this instance) on teacher quality, school autonomy, engaging parents in education and strengthening the curriculum.

This latest skirmish in Australia is a feature typical of politically-based tussles in the school education landscape just as it is in other countries, but how it has played out in regard to technology integration and the teaching of technology skills and knowledge acquisition for Australian students can be traced back over many years.

The Ministerial Council on Education, Employment, Training and Youth Affairs ICT in Schools Taskforce (MCEETYA, 2005, 2006, 2008b) published the first major reports on teaching and learning using technology in Australian schools. These sources quoted the National Goals of Schooling in the 21st Century (MCEETYA, 1999) as a key witness for schools to give priority to students learning with technology: “when students leave school they will be confident, creative and productive users of new technologies” (p. 8). It was the Melbourne Declaration on the Educational Goals for Young Australians (MCEETYA, 2008b) that first recognized the need, and that furthermore, “practical knowledge and skills development in areas such as ICT and design and technology are central to Australia’s skilled economy and will provide crucial pathways to post-school success” (p. 12).

In the state of New South Wales (NSW), where the study of this book was conducted, the Department of Education and Communities (NSW DEC) has implemented various strategic plans for technology integration in schools. These plans included technology projects, professional development for teachers and the first rollout of computers into schools. Intertwined with significant technology hardware investment, in 2006, the NSW Board of Studies authorized a computer skills test for all students in Year 10 (two years before their final year of high school). Furthermore, the 2007 NSW election commitment—$158 million—for Connected Classrooms was the largest budget allocation for an education program in technology in Australian education history. The program increased available bandwidth to schools, installed 2,400 interactive classrooms (classrooms with interactive whiteboard and video conference facilities) and teachers and students gained access to new Web 2.0 applications.

In 2008, the Digital Education Revolution (DER) and the National Secondary Schools Computer Fund distributed 200,000 laptops to students in Years 9–12 at 500 secondary school sites. The project, valued at $446 million, concluded in December 2012 and no further funding was provided. Many schools both ‘private’ and ‘public’ are pursing bring your own device (BYOD) options. Historically, the technology focus for public schools was on hardware implementation, complemented by large-scale curriculum resource production and some technology skills-based professional development (Howard, Thurtell & Gigliotti,
The role of pedagogy and content in student learning combined with the teacher’s technology skill and ability has gradually become more important.

In the Melbourne Declaration goals, there was a policy concentration on school partnerships, quality teaching, school leadership and world-class curriculum, improving outcomes for disadvantaged young people including transparency and accountability (MCEETYA, 2008a, 2008b). No specific mention of the role of technology or technology integration was made, although it could be assumed technology integration was wrapped up in delivery of key education strategies and initiatives identified and developed at the same time. The shift in education policy to focus on issues of performativity was noticeable during this time and reflected international, education policy trends (Ball, 2008; DfE, 2010; Lingard, Creagh & Vass, 2012; US Department of Education, 2010b; Ward & Parr, 2011).

Research on the effects of technology integration on learners in the Organization for Economic Cooperation and Development (OECD) countries was identified as scant, and hesitation about emerging technology environments was evident in New Millennium Learners (OECD, 2008). The report found gaps in empirical findings of the value of technology in learning:

There is an urgent need to know more about these effects, but it would be misused if it only served to draw attention to a fictitious image of empowering effects of technologies on all children and youngsters equally.

(p. 20)

The view reflected findings from a review of literature commissioned by the Australian Information and Communications Technology in Education Committee around that time that identified how teachers rarely changed the way they taught when they used technology.

Technology in schools was not being used to foster higher order thinking, analysis, synthesis or creativity in learning. In a framework released later in 2008, ten elements of quality schooling were identified. Among those elements that targeted technology were “personalizing and extending learning; connecting learning beyond the school; developing, measuring and monitoring digital literacies; providing, accessing and managing teaching and learning resources; and the provision of reliable infrastructure” (MCEETYA, 2008b, p. 4). Scattered among the elements were others that focused on “enabling leadership, professional learning, improving assessment and reporting, accessing and utilising student information and business processes” (p. 4). The list of elements suggested that perhaps technology integration in Australia was not as important in schools, although it was being given equal attention in policy documentation.

Not long afterwards, the need for a stronger role for technology integration was cited in a new education policy. The Department of Education, Employment and Workplace Relations (2008) turned the focus on schools to provide
“sustainable and meaningful changes to teaching and learning in Australian schools that are vital for education, training and work in a digital world” (p. 1). Since this new policy, building technology capacity for teachers and students in Australian schools has continued to gather momentum:

The Federal government has invested over $2.4 billion to support effective integration of information and communication technology (ICT) in Australian schools in line with broader education initiatives, including the new Australian Curriculum.

(ACARA, 2012, p. 45)

Technology competence has emerged as an important focus in documentation for the new Australian Curriculum and includes an overarching concern for the development of technology capabilities in students. The rollout of hardware into schools across Australia had a flow-on effect, with importance being placed on the growth of students’ technology capabilities through the curriculum. This action was most visible in national curriculum documentation from ACARA (2013), which was found in the General Capabilities in the Australian Curriculum, when the following definition was presented: “capability involves students learning to make the most of digital technologies available to them, adapting to new ways of doing things as technologies evolve and limiting the risks to themselves and others in a digital environment” (p. 49).

Notions of safety and risk to students from technology were seen as important. More urgent were significant variations in students’ technology literacy found in numeracy assessments across the country where poorer results were associated with “socioeconomic background, Indigenous status and geographic location” (COAG, 2008, p. 45). This was a pivotal moment, with all states and territories in Australia accepting more responsibility for technology integration in schools, and this move was reflected in education reports, research and teaching standards frameworks.

Central to state priorities in these jurisdictions was $16 million from the ICT Innovation Fund that supported four initiatives: the first was Teaching Teachers for the Future (TTF) project, aimed at building technology capacity among pre-service teachers in universities; the second was a development of ICT in everyday learning in an online teachers’ toolkit; the third was pathways for learning anywhere, anytime involving a network for educators; and the fourth was leading technology learning in technology-enabled schools to create a technical framework for sharing, discovery and use of content in different e-learning environments to support the Australian Curriculum (DEEWR, 2012).

Evaluations and research on DEEWR initiatives began to emerge (Albion, 2012a, 2012b; Jamieson-Proctor et al., 2012). In one study (Finger et al., 2013), data from pre-service teachers in 39 higher education institutions in a TTF TPACK survey reported “measurable growth in confidence of initial teacher
education students to use ICT as a teacher” and also “measurable growth in their confidence to facilitate students’ use of ICT as future teachers” (p. 23). Positive effects of growth in confidence are mirrored in an evaluation report that showed NSW teachers starting to use laptops two to four times per week with students in classrooms. Furthermore, “increased usages were found in English and Human Society & Its Environment” (Howard et al., 2012. p. 48). Parents believed laptops made a difference to their child’s learning and teachers cited the importance of school leadership in enhancing positive beliefs about using laptops in teaching. These are positive developments. Professional bodies also play a vital role in technology integration in Australian education contexts. For instance, the Australasian Society for Computers in Learning in Tertiary Education (ASCILITE) supports research into the use of technologies for teaching and learning, and in schools, the Australian Council for Computers in Education (ACCE) conducts professional development in technology.

While it is clear from recent, Federal government initiatives that Australian students must be better equipped with technology skills, and technology is having a positive impact on education in schools, it has not yet resulted in the education transformation some educators envisaged (Goldman & Lucas, 2012; Herrington & Kervin, 2007; Schrum, 2011). Often, countries like Australia look to the USA for education direction and so it is to that context the conversation now turns.

In the USA

Policy contexts in the USA distinguish relevant technology agendas in recent curriculum development, classroom practices and school education reform. For example, the No Child Left Behind (NCLB) Act of 2001, well known in education circles, was legislated to support standards-based education reform on the premise that high standards and the establishment of measurable goals improved individual outcomes for students in education settings (Hanushek & Rivkin, 2012). Now, well over a decade later, whether NCLB has achieved its original aim is the subject of ongoing debate (Darling-Hammond, 2010; Linn et al., 2012; Marx & Harris, 2012; Ravitch, 2010). Education Acts, like NCLB, set a powerful focus for government policy agendas.

In another blueprint for education reform, Race to the Top (US Department of Education, 2010a), the spotlight was on tests and accountability which arguably led many teachers in schools to “teach to the test” (American Federation of Teachers, 2012; Darling-Hammond, 2005; Strauss, 2012; Wurdinger, 2012). Testing regimes in USA policy context are important. When the education focus shifted to these concerns, there was less time for schools to prioritize technology integration in classrooms, and technology research in schools had a diminished role in school reform in general (Schrum & Levin, 2009; Ward & Parr, 2011).
However, diminution of the importance of technology integration in education was not apparent in the five essentials of learning in a plan identified in *Transforming American Education: Learning Powered by Technology* (U.S. Department of Education, 2010b). It stated that “the gap in technology understanding influences program and curriculum development, funding and purchasing decisions about educational and information technology in schools, and pre-service and in-service professional learning” (p. 10). The report recommended that teachers empower and engage in learning that embraced technology. Here, the importance of technology integration was placed alongside assessment, teaching, infrastructure and productivity. Such moves create tensions for schools and teachers, in terms of expectations about where to place the learning focus, and therefore issues of policy enactment arise (Ball, 2012; Goldman & Lucas, 2012; Jukes, McCain, & Crockett 2010).

One technology integration initiative that arose out of *Transforming American Education: Learning Powered by Technology* was STEM (Science, Technology, Engineering and Mathematics) and, in more recent times, STEAM (including the Arts), and the other was the Teacher Education Initiative (TEI) (Dilworth et al., 2012; Holman, 2010; Roschelle, 2010). The first initiative required teaching STEM content to students in schools to promote deeper understanding of complex ideas and engagement in solving complex problems. Focusing on content in STEM subjects was seen as an important lever for economic productivity, and governments around the world became concerned that students were not learning this content nor making these occupations post-school career choices. At the same time, TEI, the second initiative, is part of the National Technology Leadership Coalition’s (NTLC) collaboration with Microsoft. TEI workshops are being held around the world, and most recently in Dubai, China and Australia. This work builds on *Preparing Tomorrow’s Teachers to Use Technology* (PT3) and previous *Partners in Learning* (PiL) initiatives, and forms part of a ten-year, $500 million global initiative designed to support teachers’ use of technology in K–12 schools (Dilworth et al., 2012).

Technology-focused studies from public policy organizations and research hubs (Ito et al., 2013; Jerald, 2009; Pellegrino & Hilton, 2012), as well as technology social enterprises like Knowledge Works (combining New Tech Network, ED works and Strive) and The George Lucas Foundation (*Edutopia*) push imagination and possibility for what schools must look like into the future. Studies on websites like *Edutopia* are a case in point. The site details reports of technology integration targeting student-created media, online learning and project-based approaches to learning. The study *Connected Learning*, published by the Digital Media and Learning Research Hub, developed a model that focused on the links between “peer culture, interests and academic subjects to better support interest-driven and meaningful learning that takes advantage of the democratizing potential of digital networks and online resources” (Ito et al., 2013, p. 87).
Research on deeper learning and 21st-century skills is quite sparse in relative terms and how learning is transferred between disciplines and contexts is not yet fully understood (Pellegrino & Hilton, 2012). Some new understandings link to ideas of “learning to learn” and “creativity” in assessment frameworks comprising of dimensions of affective, cognitive and meta-cognitive skills (Jerald, 2009). Important work is being done by the Deep-Play Research Group at Michigan State University where there is a concentration on design, cognition and creativity through a trans-disciplinary lens; such work focuses on creativity and thinking in STEM disciplines, computational thinking, the architecture of learning environments as well as defining and measuring creativity (Henriksen et al. 2014; Mishra et al., 2013).  

Research from Harvard University’s The Good Project is another example of an innovative project that is designed to better understand the nature of citizenship, work and play. Various projects within this initiative demonstrate that success or otherwise has major implications in how young people respond to the changing world in schools, at home and in social environments. Such research, together with findings from models of “good play,” determined that there are unique affordances in new digital media environments. Affordances relate to technical and new media literacy “as well as cognitive and moral development and values, online and offline peer culture, and ethical supports, including the absence or presence of adult mentors and relevant education curricula” (James, 2009, p. 8).

Key technology integration enterprises like EDUCAUSE, International Society for Technology in Education (ISTE) and Society for Information Technology and Teacher Education produce salient research in their many publications. It is important to acknowledge the role of EDUCAUSE for instance, and its place in the close examination of technology in the higher education section. Often research from these contexts, such as BYOD, has important repercussions for learning in schools (Grajek & Pirani, 2012). The peak body, ISTE, sweeps under its purview research leadership through the work of CARET (Centre for Applied Education Research in Technology) and the National Educational Technology Standards.

In 2014, the White House signaled a clear commitment to innovation in its endorsement of the Maker Movement and hosted a Maker Faire on June 18. The Maker Movement’s mandate is all about highlighting the role ‘making’ can inspire in young people to be more entrepreneurial and excel in STEM education. Typical interests of a maker culture include pursuits such as electronics, robotics, 3D printing as well as more traditional activities like film making, metal working, wood working, calligraphy and traditional arts and crafts. It emphasizes learning through doing (constructivism) in a social environment and is consistent with Piagetian theories; Martinez and Stager (2013) continue to remind us of how important it is to provide students with a learning environment grounded in action, and making and tinkering fits within that discussion.
When such endorsement from the highest levels of government springs in more innovative directions, it is difficult to reconcile why so much of USA education policy and reports target testing regimes and accountability. This stance creates resourcing, curriculum and pedagogical concerns for teachers, for communities and for school leaders. Broader issues of the creation of engaging learning environments that students require to move out into the world beyond school are often lost to the mantra of more prescriptive models of teaching where technology integration is missing, or at best, given a passing glance. The Common Core is an example of an education initiative that details what K–12 students should know in English, Language Arts and Mathematics at the end of each grade. Of the 50 states and the District of Columbia, 44 are members of the Common Core State Standards Initiative, with the states of Texas, Virginia, Alaska, Nebraska, Minnesota and Indiana opting out or adopting only part of the initiative at a state level. Like education policy and technology reports in the USA, the United Kingdom is focused on a mantra of encouragement for education leaders, teachers and standards to drive school improvement.

In the UK

In *The Importance of Teaching*, it was argued that “schools will be freed from centralized bureaucracy and government interference, in return for greater accountability to parents and local communities” (DfE, 2010, p. 8). Emphasis was placed in the report on successful school systems “in Alberta, Hong Kong, Finland and Singapore that closed the gap of student achievement” (p. 6). It is crucial to mention these jurisdictions here in education policy terms; the agenda outlined in *The Importance of Teaching* competed with a focus on technology integration in schools (Ball, 2008; DfE, 2010, 2012). There was a commonality in the language used in similar reports from the USA (US Department of Education, 2010a) and Australia (MCEETYA, 2008a, 2008b). The government agency that supported the role of technology integration in education to change teachers’ classroom practices was the British Educational Communications and Technology Agency (known as ‘BECTA’). Until 2011, this organization led the national drive to ensure that the effective and innovative use of technology in learning was a priority in education. In his closing address at its final meeting, the Rt. Hon. Michael Gove MP (2010) said:

Closing the agency was not an easy decision for Government to take, but a necessary one in helping make savings across Government through our wider program of reform. The challenge will be to draw on the knowledge and skills that BECTA has embedded in schools and enable teachers and school leaders to have the flexibility to make their own choices.

(p. 1)
Five years later, it is yet unknown how the choices referred to are unfolding. The move was significant because it hailed the beginning of technology integration decision making at the local level. Historically, much of the technology-related research had been done by education researchers in universities (Thomson, Hall, Jones & Sefton-Green, 2012) and three other bureaus: London Knowledge Lab, Futurelab—which is now the National Foundation for Education Research (NFER)—and the international NGO, Creativity, Culture and Education (CCE).

One report commissioned by NESTA was Decoding Learning: The Proof, Promise and Potential of Digital Education (Luckin et al., 2012). Eight new approaches to learning were proven to be effective in analysis of data from 210 technology innovations. According to its findings, better technology integration involved learning from experts, learning with others, learning through making, learning through exploring, learning through inquiry, learning through practicing, learning from assessment and learning in and across settings based on analysis of learners’ actions, and the way technology was resourced and structured in schools (Luckin et al., 2012). These research outcomes resonated with past Futurelab projects, for example, on thinking and knowing (Vass, 2008), as well as some current projects on the right for young people to have a well-rounded, or whole education (Dunford, 2012).

Technology integration was a focus in research that measured digital literacy interventions in nine British schools with 12 teachers. Findings from this study demonstrated that there were important school-based practices that developed the expansion of subject knowledge in classrooms. These practices included, for example, more choice for student-fostered independence and collaboration, and importantly, the teachers’ pedagogical processes focused on developing these ends. It was also shown that students with lower academic abilities had greater opportunity to develop their subject knowledge. Integral to these learning methods were more effective approaches to STEM to transform learning and teaching and to inspire students to use their technical and creative ingenuity to address urgent social challenges in their communities and around the world.

Creative projects involving partnerships with schools and creative practitioners from outside the school are the focus of recent CCE reports. Studies from these partnerships programs are useful in seeing the contextual picture of technology integration. The report Creative Partnerships: Changing Young Lives (2012) found creativity in schools’ organization and teaching practices led to ‘hybridity’ in teachers’ creative pedagogical practices. This notion refers to greater permeability to let the outside world in with technology and family partnerships. Evaluations of large partnerships programs with 4,000 schools in England found “the programs gave students more mobility and time-flexibility to establish a space within the school world in which alternative ways of being and relating could be practiced” (CCE, 2009, p. 18). Signature Pedagogies (Thomson et al., 2012), in a
partnerships report on 12 Midlands schools, found a repertoire of 19 pedagogical practices distinctive to creative practitioners’ teaching and they included:

Provocation, the use of artifacts, moving out of the classroom, making an occasion, use of ‘the texts of our lives’, the self as a teaching resource, costume, use of the body, different classroom discourse patterns, the creation of a rich narrative environment, the use of professional norms, alignment with disciplinary expectations, the valorization of collective endeavour, managing behaviors differently, the use of routine, flexibility in pacing, the use of open-ended challenge, building commitment to the community and permission to play.

Research from innovation units in universities, such as from CARET at Cambridge University, found that the design of social media tools had implications for the way that technology was used by young people (James et al., 2010). Across various reports and projects, there are commonalities in the need for better integration of technology developed around making, exploring, creativity, subject knowledge and inquiry-based approaches. This requirement often competes with discourses around school improvement. Partnerships in schools with creative practitioners are one way to support a fusion in teachers’ pedagogical practices that can open up more creative possibilities for technology integration in classrooms.

Zhao (2012) invites teachers and school systems to examine and seize opportunities for using globalization to improve education rather than using global competitiveness purely in terms of test scores on international assessments. Such measures are driving many education systems down the wrong path of education change to what he refers to as the “global homogenization” of learning. Sometimes, the move to make better schools does and will not necessarily lead to better education for young people; “what is needed in the future is the enhancement of what comes with us human[s]” (p. 256). With this mind, it is time to examine some of the high performing countries on international education tests and see how Singapore and South Korean policies explain the role of technology integration in schools.

**East Asia: The Cases of Singapore and South Korea**

**In Singapore**

Singapore has implemented technology in its education system since 1997. A three-step Masterplan initiative began with *Masterplan One* from 1997–2002. Its goal was to allow students computer usage for 30% of their curriculum time in fully networked schools with a computer to pupil ratio of 1:2. In *Masterplan Two* (2003–2008), technology integration was aimed at motivating teachers to
use technology effectively in teaching and learning. Currently, *Masterplan Three* (2009–2014) is built on the first two Masterplans, but aims to be more transformative. Its main focus is to equip students with critical competencies to succeed in a knowledge economy. Dr. Pak Tee Ng is the Associate Dean of Leadership Learning, and the Office of Graduate Studies and Professional Learning, as well as the Head and Associate Professor of the Policy and Leadership Studies Academic Group at the National Institute of Education at Nanyang Technological University, Singapore. In a recent interview, he said this: “One of the advantages of technology is that it can expand access to education. Through technology, students can access online course materials anytime and anywhere, learning at their own pace” (Rubin, 2013).

What is also featured in such comments is an acknowledgement that it is not the hardware that countries like Singapore are interested in; the emphasis must be on how technology can transform learning and ‘bring it to a higher level.’ Dr. Ng also highlighted the importance of not using technology just for the sake of using it; when inappropriately used, technology can be a distraction rather than a help. What remains clear is that in countries like Singapore, who have traditionally relied upon highly teacher-centered models of learning, educators are now seeking to question those approaches with a view that technology integration, when effectively done, must move away from traditional or past teaching practices to more student-centered models. Many schools in Singapore have implemented Learning Management Systems such as Blackboard, WebCT and Moodle, but rhetoric abounds that there must greater interest in pedagogy as opposed to the tools themselves. While on the one hand encouraging experimentation, Departments of Education in Singapore continue to take a balanced and judicious approach in this area, paying attention not just to the tools, but also to capacity building among educators for change, suggesting that the use of technology and changes in curriculum design need to move in tandem.

In an enlightening account, Hogan (2014) argues that over time, Singapore has developed a powerful set of institutional arrangements that mold its instructional regime. It is an education system which is centralized (despite significant decentralization of authority in recent years), integrated, coherent and well-funded. It is also relatively flexible and expert-led. In addition, Hogan continues:

> Singapore’s institutional arrangements are characterized by a prescribed national curriculum. National high stakes examinations at the end of primary and secondary schooling stream students according to their exam performance and, crucially, prompt teachers to emphasize coverage of the curriculum and teaching to the test. The alignment of curriculum, assessment and instruction is exceptionally strong.

*(p. 1)*

Furthermore, the Asian financial crisis of the late 1990s challenged policy makers to take a long, hard look at the education system that they developed,
and ever since, they have been acutely aware that the pedagogical model that had propelled Singapore to the top of international leagues tables is not appropriately designed to prepare young people for the complex demands of globalization and 21st-century knowledge economies. Hogan (2014) suggests that by the mid-2000s, Singapore’s government had more or less identified the kind of pedagogical framework it wanted to work towards. The framework titled *Teach Less Learn More: Have we achieved it?* urges teachers to focus on the ‘quality’ of learning and the incorporation of technology into classrooms and not just the ‘quantity’ of learning and exam preparation. Therefore, like governments around the world, one central challenge confronting the Ministry of Education in Singapore is to resolve what it regards as good and responsible teaching. The ministry is determined to embed pedagogy capable of meeting the demands of 21st-century institutional environments and, in particular, developing student capacity to engage in complex knowledge work within and across subject domains. The way it will do it suggests approaching technology integration on its own terms in ways that achieve a sustainable balance of knowledge transmission and knowledge-building pedagogies that don’t seriously compromise the overall performativity of the system. In a further critique of Singapore’s education system, Hogan (2014) adds:

> It is already clear that the government is willing to tweak once sacred cows, including the national high stakes exams and streaming systems. However, it has yet to tackle the perverse effects of streaming on classroom composition and student achievement that continues to overwhelm instructional effects in statistical modelling of student achievement.

*(p. 1)*

Government controls have increased in complexity, and the existing policy-making conceptual heuristics in accounting for center-periphery relationships appear inadequate according to the recent work of Tan and Dimmock (2014). They argue that more direct government control is being replaced by “steering through paternalism from close proximity,” reflecting a more subtle, center-periphery relationship in an Asian education context (p. 746). This reflects a softening of control and it wasn’t that long ago that Zhao (2012) drew attention to Singapore journalist Alexi Ong’s comments when he referenced cofounder of Apple Steve Wozniak stating that in highly structured societies like Singapore, finding creative people “is difficult” and in speaking this truth, he acknowledged that “the education system is to blame” (p. 104). Singapore may do well in global tests like PISA and TIMSS, but this achievement has not and will not translate into the production of new ideas or a highly creative populace.

The essential challenge facing Western education jurisdictions, I argue, is not so much to mimic East Asian instructional regimes, but to develop a more balanced pedagogy that focuses not just on knowledge transmission and exam performance, but on teaching that requires students to engage in subject-specific
knowledge and understanding, problem solving, creative thinking, collaboration, making, inquiry and questioning, but also uses the power of technology to build passion for ongoing learning that will carry young people though their lives. What occurs in education in school classrooms in Singapore is not too different to South Korea.

**In South Korea**

The South Korean civil engineer Kim Ung-Yong, former prodigy child, can be found in the *Guinness Book of World Records* under the Highest IQ section with a score of 2101 (Glenday, 2013). The importance of IQ scores has always occupied education in South Korea, and for many years, it too has been ranked in second place several times in global tests following countries like Hong Kong and Singapore. Without doubt, the civil engineer’s score was accorded success at least partially by the South Korean schooling system.

In 2005, South Korea started distributing and utilizing ICT, and many education policies and strategies implemented the government’s top-down approach. Technology use in the learning process is no exception. A new movement for the adjustment of technology in education was initiated in the 1980s, and was ultimately implemented in an initiative called the *Plan for the Renovation of Education* proposed by the Education Renovation Committee in 1995. The South Korean Ministry of Education developed the five-year Masterplan for technology use in education. It began in 2010 and is now in its fourth stage. The aims and visions are to strengthen the future competitiveness of education, science and technology, and coping with rapid changes in society.

Recently, the Ministry announced an advanced plan for SMART Education. The main goal of implementing the program is to distribute tablets, smart phones and computers to students, as well as digitalize the entire school curriculum by 2015. The plan aims to reflect the modern changes of the 21st century, and as such, the plan wants to focus on not only a more efficient, but a more creative education in South Korea through the use of technology. At the same time, it seeks to bridge the education divide. In other words, what is perceived as a gap in teaching standards will mean SMART Education is now available to everyone to address this need. South Korea aspires to be named the educational hub of Southeast Asia (Grzybowski, 2013). Its schooling system is no longer just a strategy, but has become formal policy after being embraced and adapted by the government.

In a report to the Brookings Institute, Campbell (2012) suggests that one of the quickest ways for the country to establish stronger international networks is to tap into what South Korea perceives as a ‘global brain pool.’ Koreans also understand the need to build a greater stock of technological knowledge to stem the challenges of China, and if South Korea can channel China’s strengths in production and growing technological capacity, it will complement their abilities.
Like Singapore, South Korea needs to inject more creative or innovative thinking into science and technological education, recognizing that a highly educated labor force should enable it to be better equipped to apply technical knowledge to production problems. The school system and therefore the education of young people are seen as key to the country’s successful economic development.

Furthermore, in summarizing strengths and weaknesses of the schooling system, Gupta and colleagues (2013) hail factors like the highest literacy rate in OECD countries, strong support for science technology and innovation and a manufacturing base that allows for rapid incremental innovation. While on the other hand, its lack of natural resources is problematic, as is its education system that is heavily based on memorization; also detrimental is the significant gender bias in the workforce, as well as its low acceptance of outsiders in corporate culture. Paradoxically, there is seen to be great opportunity for the current education system towards learning from ‘outsiders’ and high numbers of ethnic Koreans who return from USA education experiences and who are molded by ideas of greater entrepreneurship for their home country.

It is a fascinating and ever-changing picture when consideration of diverse contexts of technology in education in Australia, USA, UK, Singapore and South Korean schools are set alongside particular technology issues and debates impacting classrooms in the case studies featured in this book.

**Issues and Debates**

Five major issues and debates are critical in setting the context for the case studies presented in the four proceeding chapters of the book. The first issue focuses on key technology integration approaches used by the teachers. The second shows how social networking tools are being conceived for learning in such classrooms. The third involves scrutinizing the popular catch cry of 21st-century learning. The fourth looks at specific research on the role of technology integration and student achievement. The final issue targets recent research on professional development in technology integration for pre-service and in-service teachers.

**Technology Integration Approaches**

The first section of technology integration approaches used in the case study classrooms is divided into two areas: one-to-one (1:1) computing, interactive whiteboards and mobile learning and the learning benefits of project-based learning (PBL) approaches.

**What’s in a Name: 1:1 Computing or Personal Laptops?**

When Papert wrote the seminal edition of *Mindstorms* (1980), he reported that children learned to use computers in masterful ways and that learning to use
computers changes the way children learned everything else. Since then, many studies (Dunlevy, Dextert & Heinecke, 2007; Toy, 2008; Zucker & Hug, 2007) have uncovered positive effects of learning with one laptop for each student in classrooms. One of the main obstacles to implementing this teaching possibility was what it would mean for pedagogy and teachers’ lack of understanding of how laptops were, or could be, used as learning tools. Teachers started to adjust their practice with some teaching in much more student-centered ways. Furthermore, other more recent research (Larkin & Finger, 2011) on laptops in classrooms in a one-to-two ratio (i.e. one laptop between two students) challenged the assumption that one-to-one was better. In an Australian evaluation of laptops, teachers’ knowledge of technology integration had improved when one-to-one laptops were used in classrooms, but less usage of laptops was reported by mathematics and Personal Development Health and Physical Education teachers (Howard et al., 2012). Another technology tool that requires specific scrutiny, in terms of its place in the classrooms of teachers in this book, is the interactive whiteboard. Is it friend or foe, and does it now occupy a position in classrooms that is more dormant than active?

**Interactive Whiteboards: A Tool for the Teacher or for Students?**

Interactive whiteboard installation in schools across Australia is now ubiquitous and the phenomenon reflects international patterns (Hunter, 2011; Schuck & Kearney, 2007). Understanding how interactive whiteboards aid learning is still not well understood, and few studies (Higgins, Beauchamp & Miller, 2007; Kennewell et al., 2008) have managed to confirm or deny the technology’s learning impact (Jang & Tsai, 2012; Jewitt, Moss & Cardini, 2007; Northcote et al., 2010). The technology was valued positively as an organizational tool in research that found it encouraged teacher-student interactivity (Winzenried, Dalgarno & Tinkler, 2010). Notwithstanding, often its use can be too teacher directed with little work that incorporates student-centred uses. Benefits of self-efficacy and perceived value to teachers in classroom learning were associated with higher levels of interactive whiteboard training and support. It is quite clear that more attention to teacher professional development is required for better technology integration of specific content. Mobile learning devices, particularly laptops, are another technology often used by teachers in the cases in this book, and it is possible to suggest that in some recent research, the theoretical basis for the technological, pedagogical and content impacts are starting to be better understood.

**Mobile Learning, Also Called Learning With Technology When Not at a Fixed Location**

Authenticity, collaboration and personalization are three central features of a pedagogical framework that was tested in two projects (Kearney et al., 2012)
aimed at critiquing pedagogy in a range of mobile learning scenarios with pre-service teachers. Important sociocultural perspectives were found, including unique teaching challenges in emerging mobile environments. These have implications for the ways experienced teachers design learning experiences for students and the resources they allocate to them. This advice is heeded in other research (Bennett, 2011; Melhuish & Falloon, 2010) on affordances and limitations of the iPad in the wider context of emergent mobile learning theory. While technology may aid learning in education contexts, the way it ends up being used cannot be determined until it is used by real students in real settings. In their critical review of iPads in learning, Melhuish and Falloon (2010) placed importance on ensuring teachers created learning experiences that were flexible and co-constructive in their approach. The iPad was not designed to solve learning problems in education. Apps and the role they play on mobile devices are important in teachers’ pedagogical decision making. The notion of BYOD used increasingly by schools means there is an element of choice in what technology to bring to class, and technology policies in education jurisdiction are beginning to embrace the idea. The ready access to personal learning devices, in the context of project-based learning approaches, creates powerful student engagement in classrooms.

**Project-Based Learning Approaches**

Students learn more deeply when they can apply classroom knowledge. This suggestion and other benefits were revealed in a comprehensive review of hundreds of innovative classroom practices that investigated project-based, inquiry-based and cooperative learning approaches (Barron & Darling Hammond, 2008). What was essential in these studies was that teachers provided students with support and assessment as projects unfolded. Active learning practices were found to have more significant impacts on student performance than any other variable, including student background and prior achievement. The George Lucas Educational Foundation (GLEF), in one of its current initiatives (a program called Knowledge in Action), designs and manages a collaborative group of learning scientists, curriculum experts, teacher leaders and GLEF research staff. The project is applying a rigorous project-based learning approach to the design of college preparatory courses, so students can participate in authentic tasks that provide an experiential platform for learning that prepares them for college and future careers. When students are taught how to learn, as well as what to learn (and often it’s that central idea of meta-cognition—learning how to learn how to learn), then they are likely to be more successful in terms of education. Social networking tools played a role in project-based learning approaches used by teachers in this book, and it is to this second issue our attention is now drawn.

The second section of technology integration approaches examines teachers and social networking, 21st-century learning, student achievement and professional development for teachers.
**Teachers and Social Networking Tools for Learning**

“We are a nation of bloggers” stated two USA-based technology researchers in education (Solomon & Schrum, 2007, p. 14). And really, the same could be said of blogging activity in the UK, in Australia and many East Asian countries. School blogs in some classrooms are highly useful constructivist tools for learning (Churchill, 2009; Kist, 2010; Richardson, 2010). Other research (Hunter, 2010) in two classrooms showed how one teacher’s use of blogs supported activism and engagement in school life, and the other used a series of blogs for learning. The first blog in the series was private and students could make entries on a ship’s log in a study of explorers; a second was used for parents to view what their child learned in the classroom, and a third blog facilitated interaction between classrooms in different countries. Teachers liked using blogs for many reasons, including hearing from quiet students, enhancing written output from all students and encouraging independent work and parent-school partnerships. The use of blogs for learning in classrooms forces many teachers to take pedagogical risks. In exploring social networking tools like blogs, the term 21st-century learning is often heard and as such deserves closer scrutiny.

**21st-century Learning: Is It Fact or Fiction?**

Some years ago, a call was made for education leaders to dig deeper than the “flashy phrases” and “poorly defined buzzwords” that tended to characterize “21st century skills or 21st century learning” (Jerald, 2009, p. 2). Ideas of teachers and students needing particular skill sets are built on the premise that the world has changed and, therefore, acquiring and applying new knowledge with dexterity in problem solving, communication, teamwork, technology use and innovation are necessary. The shift to a 21st-century knowledge age was central to such ideas and some defined “a balance of what is needed and valued in work, where learning and life in lifelong learning is here to stay” (Trilling & Fadel, 2009, p. 19). The vision of 21st-century schools arose out of the plan *Transforming American Education: Learning Powered by Technology* (US Department of Education, 2010b). School leaders were expected to enact change, and technology, with ‘enhanced pipes and wires’ acting as the drivers. Simply asking teachers to address a long list of inadequately defined skills was not sufficient, and in one framework alone (Jerald, 2009) 22 separate subskills were deemed necessary to succeed in the 21st century.

So, what kind of skills and what kinds of knowledge are required? Attention was drawn to content knowledge and applying knowledge to solve real world problems, as preferable to the thinking knowledge of disciplines. Arguably, skills like problem solving should not be taught in isolation. Skills set out in the *Partnership for 21st Century Skills* (2011) framework were endorsed by professional
organizations and government entities. In the USA, these were propelled by three considerations:

The US is losing its position as a world leader in education, schools have been slow to integrate technology and pre-service education and professional development are not supplying teachers with the knowledge and skills needed to provide the type of education currently demanded.

(Joyce & Calhoun, 2010, p. 51)

Around this time, a sense of global urgency around technology integration in schools was also felt in Australian and UK education jurisdictions. Other literature (Hattie, 2009; Wagner, 2008; Zhao, 2009) reinforced the notion that 21st-century skills were contestable, and therefore it was the role of teachers in their contexts to define what technology developments were essential. It is not perhaps an either/or debate for technology in schools, but more the case of ‘what 21st-century skills’ and ‘what 21st-century curriculum.’ Reservations around technology integration and its impact on student achievement are another contentious debate that may account for the slow rate of technology adoption in some schools. Raised by teachers in the case studies in this book, the controversial issue of technology integration and student achievement is the focus of the next section.

**Technology Integration and Student Achievement**

A few years ago on the home page of the *Edutopia* website, there was this statement:

A growing body of evidence supports the contention that collaborative learning methods and leadership aimed at improving schools through technology planning impacts student achievement and academic performance in content learning, higher-order thinking and problem solving skills and preparation for the workforce.  

Not all education documentation holds the same unequivocal view. There was contention in some education research (Means, 2010; Schrum, 2011) that teachers’ practices need to be investigated in conjunction with studies of technology effects on student learning. Many studies centered on how technology was used for performance assessments of students in portfolios, online tests and digital proficiency (Howell, 2012; Pellegrino & Quellmalz, 2010). There were two studies that demonstrated strong links with technology integration approaches and student achievement involved Quest Atlantis and research on teachers’ use of reading and mathematics software in classrooms.  

The first study involved Year 6 students using such software; these student showed larger gains in understandings and achievement than those in classes that used expository texts to learn
the same skills (Hickey, Ingram-Goble & Jameson, 2009). The other study was of teachers in 14 schools (Means, 2010) who were given new software products; this study found that implementation practices mattered, and the differences in school results arose out of consistent instructional vision, principal support, teacher collaboration, technical support, formal and informal training and access to a help-desk/email/website.

There are challenges for education research in this area. Some scholars (Jordan & Dinh, 2012; Schrum, 2011) have already identified some causal factors such as unrealistic expectations for technology-based reform, lack of consensus on research questions and methodologies and a diminished role in general of research in education reform. Professional development of teachers in technology integration is consistently raised as an important issue in debates on improving student achievement in schools (Ertmer & Ottenbriet-Leftwich, 2010). Matters for professional development for pre-service and in-service teachers in technology integration are touched on in the following section.

**Professional Development for Pre-Service and In-Service Teachers**

At times, technology integration in education means ‘hardware rollout,’ with little or no funding allocation for teacher professional learning. Research in this area shows common themes and it is useful to appraise a few significant examples. In a study (Baldwin, 2011) that used an online survey of teachers of Year 9–12 students, it was demonstrated that a greater amount of professional development did increase both readiness and implementation levels. In addition, professional development models that included instructor-organized sessions and individualized learning or working with an academic partner had a positive and significant relationship with readiness and implementation levels (Mitchell et al., 2010; Whalan, 2012). Such work confirmed what Hughes (2005) had found in case study research that revealed positive effects when teachers shared their knowledge and questions, connected their professional learning to the contexts of teaching in their subject area and actively engaged with other teachers and an academic partner.

In a study of 15 mathematics and biology teachers, the TPACK framework was highly useful in teacher development projects (McGrath, Karabas & Willis, 2011). Also identified in the study were important knowledge domains outside of TPACK, for example, “logistics and collaboration, diffusion of learning and differentiated instruction” (p. 22). It was hardly surprising that if teachers were required to be transformative around their technology use in classrooms, then examining what informs, develops and propels their professional knowledge when leveraging technology during instructional practice was crucial.
Professional Conversation—*Fresh Points to Consider*

In summary, education contexts in Australia, the USA and the UK are stepping up to create powerful learning spaces centered on students’ use of technology in schools, and the education policy reflects these considerations. In countries like Singapore and South Korea, there is pride in education achievements in standardized tests. However, there is also recognition that ‘old learning models’ based on memorization and fact regurgitation are not enough to create the kind of global citizens needed for future success in the world. Recent education research on major issues and debates in technology integration targets use of laptops, interactive whiteboards, mobile learning and constructive approaches to the inclusion of blogs in classroom practice. Other research also shows that understanding what 21st-century skills actually mean for teachers and schools are more effective when based on contextual considerations. Student achievement and its links to technology integration are strong in some schools and when teachers use games, like those of Quest Atlantis, for learning and understanding concepts and expository texts, their results can improve. Professional development to support technology integration learning in schools is often scant; but, when it does occur, if teachers share their knowledge, ask questions, reflect and practice what they are learning in their content area, then it is preferable. When opportunities are provided for *in situ* mentoring with a technology leader in a co-teaching relationship in the classroom or with an academic partner expert in technology integration, confidence levels in less ‘tech savvy’ teachers increases.

**Discussion Pointers**

As a whole group or in pairs, discuss these questions and take photographs using your mobile phone of signage/objects/body postures that are metaphors for one or more answers to the following provocations:

1. How does education policy in the country where you live mirror or dispute the policy positions described in the education contexts in this chapter?
2. Explain how laptops, or the interactive whiteboard, or other mobile devices have been used pedagogically by you to drive learning in a particular content area you teach?
3. PBL or project-based learning is current in schools right now. Detail what it means to you with examples from practice or how you plan to use it in future.
4. Do you subscribe to the notion of *21st-century learning*? Discuss.
5. What is most needed in professional development for pre-service and in-service teachers in technology integration? Or, as Sylvia Martinez would say, “students are 98% of the solution.” What did she mean? Do you agree?
Notes

2. London Knowledge Lab is a unique collaboration between two prominent centers of research—the Institute of Education and Birkbeck. The Lab brings together computer and social scientists from a very broad range of fields, including education, sociology and social media. The National Endowment for Science Technology and the Arts (NESTA) commissioned LKL to examine how technology has been used in UK education systems and whether there were lessons that could be learned from around the world.
3. Futurelab was selected to lead a group of experts to build a global network of consortia to develop more effective approaches to STEM education.
4. CCE is a UK-based charity where the focus is on the creativity of young people in and out of formal education: http://www.creativitycultureeducation.org/
5. The teachers in the study gave tentative definitions, some suggested it was about having technology skills to teach literacy and for others it meant whether students actively and critically engaged with multi-modal forms of technology and media—they used the term multi-literacies (Hague, 2010).
6. In SMART “S” stands for “self-directed”; “M” means keeping the children and youth “motivated,” mostly by including fun in the learning and teaching methods; “A” is for having a capacity for “adaptation”; “R” stands for the resources and rich assets of information that are required to gain high knowledge scores; “T” is for the technology being embedded.
7. Statistics show that 98% of Korean households use the Internet on a daily basis, two-thirds of them use smartphones. Of this 50-million-citizen nation, 5% is declared to be addicted to using smartphones as they use them at least 8 hours every day (Grzybowski, 2013, p. 4).
9. Quest Atlantis is now being maintained as part of the Atlantis Remixed Project. It is an international learning and teaching project that uses 3D, multi-user environments to immerse children ages 9–16 in educational tasks. Retrieved from http://atlantisremixed.org/

References


When teachers participate in a High Possibility Classrooms (HPC) workshop they hear me ask these questions: ‘Where is the pedagogy? What is the content? How is your choice or the students’ choice of particular technology tools going to enhance learning?’

I am always interested that such questions surprise some teachers. Frequently, their thinking about pedagogy, content and technology has not been prioritized. Such questions remain unimportant, and their sole focus is on the technology selected and how it works. While this is of consideration, the pedagogical and content concerns of learning are significant. In this chapter, I introduce the HPC model and its context and demonstrate how it builds on the TPACK framework. Criticism of technology integration in schools is often couched in terms of its scant theoretical base. The TPACK framework developed by Mishra and Koehler (2006) was a game changer. There are few theoretical models to date that have impacted education in such a useful and timely manner; TPACK gives teachers a language to talk about practice in classrooms. It is not perfect, indeed, there has been critique of TPACK, but what is clear is the huge impact it has had on scholarship. Few theoretical models in education in recent times have generated hundreds of studies, which resulted in thousands of journal articles, a few books and several hundred dissertations.

I begin by examining TPACK and then focus briefly on another technology model known as the SAMR model, which was developed by Ruben Puentedura (2006). Full discussion of the HPC model is constrained until the reader is familiar with the case studies in the four following chapters. This sequence lays the necessary groundwork for Chapter 7 that details the model’s functionalities and core argument for its adoption in contemporary classrooms.
What Is Known About Teachers’ Knowledge of Technology Integration?

In Chapter 1, I discussed global contexts of technology integration in school education. The discussion was shaped within the wider sociopolitical contexts of key education policies and reports within Australia, the USA, the UK, Singapore and South Korea. This understanding led to consideration of key technology issues and debates that focused on technology integration approaches used by teachers in the case studies, including social networking tools, the catch cry of 21st-century learning and the role of technology integration and student achievement, as well as recent research on professional development in technology integration for pre-service and in-service teachers. And now I discuss the background and significance of TPACK.

The framework of TPACK developed by Mishra and Koehler (2006) emerged over the last decade and changed from TPCK, to its current TPACK form a couple years later (Thompson & Mishra, 2007–2008). The framework built on Shulman’s (1986, 1987) conception of pedagogical content knowledge (PCK) by explicitly integrating the component of technological knowledge. How teachers teach subject matter was an overarching concern of Grossman (1990), whose ideas on PCK keenly supported Shulman’s argument. Shulman (1987) defined seven categories of teacher knowledge, of which PCK is the most distinguished as it identifies the distinctive bodies of knowledge for teaching and represents the blending of content and pedagogy. The central role of subject matter or the role of content specialists in classroom learning was added to by Pierson (2001) in an articulation of technology knowledge (TK). This articulation arose from a study of in-service teachers who, although identified as “exemplary technology users who knew content, had limited skills in integrating technology with content” (p. 143). The Pierson study (2001) was significant, as it added TK to Shulman’s PCK and illustrated that there were different definitions of what it meant to integrate technology into classroom practice.

The influence of technology in pedagogical decision making by teachers was examined in an important study (Applefield, Huber & Moallem, 2000) in which a traditional classroom lesson and a constructivist design of the same lesson were described and analyzed. Six constructivist principles of learning are cited: raising questions; challenging ideas and experiences by generating inner cognitive conflict or disequilibrium; reflection through journal writing, drawing, modeling and discussion; opportunities for dialogue; students communicating their ideas, defending and justifying them and students working with big ideas, which are the central organizing principles that have the power to generalize across experiences and disciplines. The list added: “clear content goals designed around an authentic learning task, question or problem” (p. 50). What followed were several studies that suggested similar conceptions of more content-specific orientation to technology integration (Angeli & Valanides, 2008; Koehler & Mishra, 2005; Lee & Gaffney, 2008; Margerum-Leys & Marx, 2004).
Just prior to the publication of these studies, effective ways to improve teachers’ technology skills and pedagogical practices were identified by Mouza (2003) in spite of earlier research from a study by Pierson (2001) that “stressed the importance of the development of pedagogies associated with technology and its actual integration in classrooms” (Hervey, 2011, p. 14). This understanding was acknowledged in Hervey’s study of experienced teachers in one-to-one (1:1) laptop settings where it was pointed out that: “It was Koehler, Mishra & Yahya (2007), who really articulated that there were complex interrelationships between users, tools and instructional practices” (Hervey, 2011, p. 15).

Furthermore, research at the time was starting to identify how effectively teachers could be prepared for teaching in technology-rich contexts. The need for specific professional development to support teachers’ technology use at schools was identified. It is interesting to note that the ‘right kind’ of professional technology support for teachers is still contested in many schools and education jurisdictions. Defining exactly what constitutes effective technology professional development is problematic, as technology use by its very nature means everyone is at a different developmental stage. Other ways to think about beginning and implementing technology for useful, professional development for teachers are suggested in the section Professional Conversation at the conclusion of each case study, as well as in the final chapter, which discusses whether or not it’s possible for all teachers to create High Possibility Classrooms.

The TPACK framework gained widespread popularity in 2006 after Mishra and Koehler’s seminal paper was published. The paper outlined the framework and articulated the relationship between content, pedagogy and technology both in isolation and in pairs of content knowledge (CK), pedagogical knowledge (PK) and technology knowledge (TK). This move evolved into pedagogical content knowledge (PCK), technological content knowledge (TCK) and technological pedagogical knowledge (TPK) and all three came together as technological pedagogical content knowledge (TPCK): “This was similar to the move made by Shulman in which he considered the relationship between content and pedagogy and labelled it pedagogical content knowledge . . . we introduce two new pairs and one new triad” (Mishra & Koehler, 2006, p. 1026). As seen in Figure 2.1.

The seven components and their relationships are:

1. Content knowledge (CK): this is knowledge of the actual subject matter that is to be learned or taught. Knowledge and the nature of inquiry differ greatly between fields and it is important that teachers understand the deeper knowledge components of the discipline they teach.

2. Pedagogical knowledge (PK): this is deep knowledge about the processes and practices or methods of teaching and learning and it encompasses educational purposes, values and aims.

3. Pedagogical content knowledge (PCK): this is similar to Shulman’s (1986, 1987) idea of pedagogy that is applicable to the teaching of specific content.
This knowledge includes knowing what teaching approaches fit the content, and, likewise, knowing how elements of the content can be arranged for better teaching.

4. Technology knowledge (TK): this is knowledge about standard technologies, such as books, chalk and blackboard, and more advanced technologies, such as the Internet and digital video. This involves the skills required to operate particular technologies.

5. Technological content knowledge (TCK): this is knowledge about the manner in which technology and content are reciprocally related. Although technology constrains the kinds of representations possible, newer technologies often afford newer and more varied representations and greater flexibility in navigating across these representations.

6. Technological pedagogical knowledge (TPK): this is knowledge of the existence, components and capabilities of various technologies as they are used in teaching and learning settings, and conversely knowing how teaching might change as the result of using particular technologies.
7. Technological pedagogical content knowledge (TPCK): Note the “A” forming TPACK was added after this seminal publication. This is an emergent form of knowledge that goes beyond all three components (content, pedagogy and technology). This knowledge is different from knowledge of a disciplinary or technology expert and also from the general pedagogical knowledge shared by teachers across disciplines.

(Note: this is a brief summary of the framework components which includes verbatim material from Mishra & Koehler, 2006, pp. 1026–1031.)

In the text of the American Association of Colleges for Teacher Education’s *Handbook of Technological Pedagogical Content Knowledge (TPCK) for Educators*, there are studies of TPACK in specific subject areas, including literacy education, English teaching, Social Studies, Mathematics, the Arts, Science, Technology and Physical Education (AACTE, 2008). It includes suggestions for action, with an afterword from the AACTE Committee on Innovation and Technology at the time calling for “a new direction for technology integration in teacher education” (AACTE, 2008, p. 289). This cry was heard by educators around the world and was a major catalyst for the Teaching Teachers for the Future (TTF) project, which includes academics in teacher education faculties in universities globally (Romeo, Lloyd & Downes, 2013). Alongside these developments were studies that continued to show technology integration could have a significant effect on teaching and learning (Barron, Kemker, Harmes & Kalydjian, 2003; Ertmer & Quinn, 2007). The momentum around TPACK has continued to build, in spite of critiques of both PCK (Cochran, DeRuiter & King, 1993; van Driel, Verloop & De Vos, 1998) and TPACK (Graham, 2011; Kereluik, Mishra & Koehler, 2010).

The way TPACK has evolved is significant and leads examination of key movements in the framework’s development in the next section of the chapter.

**Key Movements in TPACK**

There are six key movements that are relevant to this book in terms of the framework’s evolution from 2008 until the present time. Some are not widespread movements and might be better referred to as ‘interpretations’ by individuals or small groups of scholars. The core body of TPACK research focuses on either survey-based or case study research with pre-service and experienced teachers. The first movement was a name change. This review examines suggestions that the initial framework was ‘fuzzy’ and difficult to identify in practice. The second movement included studies of TPACK in practice, in online contexts and with graduate students. The third evolution is an interpretation of TPACK and involved the integration of ideas around play. The fourth development is a movement that focused on self-efficacy, one-to-one computing and TPACK. The fifth, an interpretation, was a concentration on self-directed learning and TPACK, and the sixth is a key movement and reviews plans for TPACK in 2014 and beyond.
Change of Name

TPACK was called “TPCK” in the literature until 2008, when some educators in the research community proposed using the more easily spoken term, TPACK. This name was widely accepted and was referred to as “forming an integrated whole, a ‘Total PACKage’” (Thompson & Mishra, 2007–2008, p. 38). At that time, ongoing clarification of the concept of TPCK using only three of the constructs, TCK, TPK and TPACK, was presented (Cox, 2008). Thus, as pointed out by Hervey (2011), “TPACK includes all three knowledge areas of content, pedagogy and technology, and when in concert with the use of content-specific strategies, sets itself apart from TPK, which employs general pedagogical strategies, and TCK, which is independent of pedagogy” (p. 19). In a later work, Cox and Graham (2009) stated that teacher selection of technology should be based on the imperatives of a particular content area. Evidence in the study was from two cases, a scientist and a history teacher, using observations and interviews that suggested that the boundaries between TPACK are ‘fuzzy’ and sometimes instances of TPACK are difficult to identify. Cox and Graham (2009) concluded that appreciating exactly what TPACK looked like “slides along as new technologies emerge” and “more in depth case study research of practicing teachers was necessary to shed light on these understandings” (p. 64).

At the time, an invitation for more study of the TPACK framework by researchers was offered by Koehler and Mishra (2009):

Options for looking at a complex phenomenon like technology integration in ways are amenable to analysis and development. Moreover, TPACK allows teachers, researchers and teacher educators to move beyond oversimplified approaches that treat technology as an “add-on” instead to focus again, and in a more ecological way, upon the connections among technology, content and pedagogy as they play out in classroom contexts.

Research underpinning the four cases in this book responds to calls by Koehler and Mishra (2009), Cox and Graham (2009) and Jordan and Dinh (2012) for more studies of TPACK practiced in classrooms. So, how does TPACK look in practice in online contexts with graduate students?

TPACK in Practice in Particular Contexts

Questions around the existence of TPACK in practice have continued in spite of earlier clarification using other knowledge terminology. New work, a quantitative survey of online teachers, contended that “TPACK experienced the same difficulty as Shulman’s old conception of PCK” (Archambault & Barnett, 2010, p. 1660). In particular, the survey highlighted that measuring the domains of
TPACK was convoluted and complicated, and that there might be more accurate ways to describe teachers’ content, pedagogical and technological knowledge. It is perhaps the case that the nature of online teaching in the Archambault and Barnett (2010) study required new-found or different constructs, and that for face-to-face classroom teaching, TPACK was still considered to be highly valuable.

Close observation of the TPACK framework in the context of what teams of graduate students developed in microblogging, visual search engines and music DJ software was undertaken (Mishra & Koehler, 2009). These instances demonstrated the repurposing of technology for an educational end. The examples made the case that creative input from teachers was required to subvert or redesign what was produced in order to fit an educational purpose and this could not be done without “deep, complex, fluid and flexible knowledge of the technology, the content to be covered and an appropriate pedagogy” (p. 18).

Much of the research found that providing opportunities for teachers in schools to witness how the integration of technology benefitted students, and finding time to play with technology, were essential. Ideas of play and TPACK are examined in the next section.

**Play, Content and TPACK**

The notion of play crept into TPACK work and formed one of “seven transdisciplinary habits of mind” (Mishra, Koehler & Henriksen, 2011, p. 22). This interpretation extended the original framework and arose in response to “misconceptions that TPACK was only about integration of newer technologies and offered little guidance about what to teach, what pedagogical approaches were useful and what kinds of technologies are worth using in teaching” (p. 5). There was concern at the time that content was being ignored, or only being conceptualized in traditional ways. Ideas of creativity in learning content were being called for by many researchers, including Howard Gardner. Content was starting to be conceived as domain-general and domain-specific and there was some sort of transactional relationship between the two domains.

In order to keep pace with changes in disciplinary knowledge, it was deemed advisable to move across disciplines and to cross-pollinate ideas from one field to another. The “seven habits of mind” were a response to this observed need for greater creativity and were cited as being about “transformative” and “transdisciplinary learning”; they included: “cognitive tools of perceiving, patterning, abstracting, embodied thinking, modelling, deep play or transformational play and synthesizing” (Mishra, Koehler & Henriksen, 2011, pp. 25–26). The work built on conceptual ideas developed earlier by Robert and Michele Root-Bernstein (1996, 1999) where the “cognitive tools” were described as universal in their application. After all, this still left room for teachers to repurpose existing technology for pedagogical purposes. The combination of trans-disciplinary cognitive tools and technology enabled students to learn the domain and therefore
examine how they themselves learned. The notion of “deep-play” received more attention. Examples of deep-play assignments using an instructional approach, through micro- and macrodesign projects with 46 design students, showed how “to scaffold students’ growth and development of TPACK” (Koehler et al., 2011, p. 155). Play led to considerations of self-efficacy underpinned by TPACK and its value in one-to-one classroom settings.

**Knowledge, Self-Efficacy, 1:1 Classrooms and TPACK**

Knowledge growth in teaching with technology is identified as necessary in supporting teachers’ learning trajectories. The expansion of a more robust and mature TPACK framework sustained teaching with current and emerging technologies, but also “meant greater effort in thinking about planning, implementing and evaluating their knowledge” (Niess, 2008, p. 299). This development led to ideas about TPACK and self-efficacy. Findings in an exploratory study (Abbitt, 2011) of pre-service teachers about technology integration illustrated the changing nature of the complex relationship between knowledge and self-efficacy beliefs. Other research (Harris et al., 2012; Hofer & Harris, 2012) reinforced the usefulness of the TPACK framework, not only for pre-service teachers’ pedagogical development, but for all teachers.

A study of professional knowledge and instructional practice in 1:1 classrooms with experienced teachers acknowledged the role of technology in the TPACK framework in helping to differentiate learning for students (Hervey, 2011). Examples in the case studies in this book show the evolution of teachers’ TPK as a key driver for meeting the learning needs of students. The assertion fitted with an earlier study; teachers in 1:1 classrooms must not only understand content and use effective pedagogy, but also know how to use technology (Zucker & Hug, 2007). Sets of supportive conditions (for example leadership, professional development and collaboration at the school level) were determined as instrumental in developing teachers’ TPACK in such environments (Hervey, 2011). This conclusion built on what had been known for some time in broader education literature that creativity and placing students at the center of teaching practice were significant factors in technology integration (Craft, 2000; Craft, 2006; Gibson & Ewing, 2011; Papert, 1980; Zhao, 2012). Often concerns targeted the role of self-directed learning.

**Self-Directed Learning and TPACK**

In recent publications with the Deep-Play Research Group at Michigan State University (Henriksen & Mishra, 2014; Mishra, Fahnoe & Henriksen, 2013; Mishra & Henriksen, 2012a, 2012b), the TPACK framework continues to feature the phrase “trans-disciplinary creativity.” The term is described as emanating from two myths: one highlighted reconnecting technology and creativity through in-discipline learning, using examples drawn from mathematics to
illustrate the development of students as creative, divergent thinkers; the second myth accommodated deep disciplinary knowledge and the ability to move across disciplines. The notion of “trans-disciplined learning” on the other hand honors creativity in discipline or context, while “understanding that at the same time learning and gathering ideas by crossing over into others” (Mishra, Henriksen & the Deep-Play Research Group, 2012b, p. 20).

The focus of TPACK interpretation has shifted in recent times to suggestions of a skills framework that can be used by teachers for lessons and learning experiences. In this framework, learners must be able to see connections and synthesize information both within and across disciplines (Mishra, Fahnoe, Henriksen & the Deep-Play Research Group, 2013). What is noteworthy is that in new work (Mishra et al., 2013) references are made to the work of Zhao (2009, 2012) and other project-based learning approaches (Chen, 2010). These later ideas have sparked interest in self-directed learning by the Deep-Play Research Group in a middle school classroom with a team of teachers who are ‘TPACK savvy’ (Mishra et al., 2013). The call is also made for educators in today’s classrooms to “see themselves as architects and designers of learning environments that allow students to develop the kind of mental disciplines to think outside of the disciplines” (p. 12). The continuing influence of TPACK is apparent.

**TPACK Now**

The TPACK Special Interest Group strand is strong at the annual Society for Information Technology & Teacher Education (SITE) and the International Society for Technology in Education (ISTE) conferences in the USA, and the latest TPACK initiative to support teacher educators is the development of a series of modules for content areas. These modules will have supportive teaching cases for each content area and are being developed in collaboration with classroom teachers. It is anticipated that this package of professional materials will form the basis of a Practitioner's Guide to TPACK. The sense of urgency continues to grow for changes in technology integration in classrooms in schools to better reflect 21st-century contexts. Popular in East Asian countries, TPACK has recently made a foray into China, and in Australia, TPACK featured in the Teaching Teachers for the Future project (2008–2012) when the federal government supported implementation of a national education policy and the professional development of pre-service and in-service teachers under its Information and Communication Technology Innovation Fund.

In summary, the development of TPACK features movements and more minor interpretations that began with Pierson (2001) and Shulman’s (1986, 1987) original ideas around PCK, to a change of name, to research using TPACK in online contexts and moving to interpretations involving play and TPACK. Related developments in self-efficacy and self-directed learning have also been found to be important in how TPACK is constructed. The construct of a new model (SAMR) that enhances technology integration has attracted attention in
recent times, and consideration of this model is necessary prior to understanding how the HPC model builds on the valuable work of TPACK. There are frequent inclusions of TPACK in representations of SAMR in Ruben Puentedura’s (2006) work and it is to that model that the discussion now turns.

**SAMR and What We Know About It**

In a post on a popular Australian blogger’s site, educator Darcy Moore says “SAMR is a particularly good model for supporting pedagogy in technology integration.” The four-step model developed by Ruben Puentedura (2006) moves from enhancement to transformation and is focused on explaining how teachers can consider technology integration in classroom learning. The acronym stands for **Substitution** at the first level where new tech replaces old tech, with no functional change; at the second step, **Augmentation** is when tech acts as a direct tool substitute with functional improvement; at a third point **Modification** allows for tech to significantly redesign tasks and in the fourth stage, **Redefinition** is where tech allows for the creation of new tasks that would previously have been inconceivable. See Figure 2.2. The model resonates with many teachers and aims to enable them to design, develop, and integrate digital learning experiences that utilize technology to transform learning experiences, and in turn, it seeks to lead students to high levels of achievement.

**FIGURE 2.2** The SAMR model (Puenteudra, 2006)
The intention for the model echoes the learning assessment ideas of Black and William (2009):

Practice in a classroom is formative to the extent that evidence about student achievement is elicited, interpreted, and used by teachers, learners, or their peers, to make decisions about the next steps in instruction that are likely to be better, or better founded, than the decisions they would have taken in the absence of the evidence that was elicited.

(p. 26)

For example, this idea can be illustrated in a school’s decision to purchase iPads. If the purpose of purchasing iPads is to redefine and transform teaching, teachers should be aiming to design teaching and learning experiences that address the Modification and Redefinition levels of the model. If tasks are planned at the lower two enhancement levels, where the technology is simply replacing existing practices with minimal or no improvement, then perhaps the cost of the devices and the work involved in the required technical support may not be justified. There is also a risk that without professional development, teachers may incorporate the devices in ways that may reduce the effectiveness of the learning experience.

Teachers need to both create tasks that target the higher-order cognitive skills, as well as design tasks that have a significant impact on student outcomes. This suggestion is made in reference to Papert’s work on the four expectations. When teachers add in Bloom’s Revised Taxonomy on higher-order cognitive skill sets, then the transformation at the very top level of SAMR is more likely. Shrock (2013) explains how this might work:

I feel teachers need to both create tasks that target higher-order cognitive skills (Bloom’s) as well as design tasks that have a significant impact on student outcomes (SAMR). Educators will argue they have seen redefinition tasks that only target the remembering level or have a creative assessment that is only at the augmentation level. Of course that is true, but I believe we should be planning for technology tasks, activities, and assessments that include both the higher levels of Bloom’s Revised Taxonomy and the transformation area of SAMR model.

(p. 1)

The SAMR model connects meshes with some of the conceptions and themes in the *High Possibility Classrooms* model demonstrating practice at the Redefinition level.

**High Possibility Classroom Model: A Fresh Vision**

Research (Hunter, 2013) over a sustained period of time identified particular conceptions of technology integration in four teachers’ classrooms that demonstrated
when themes from the HPC model are included in a lesson or a series of lessons, or in programming a unit of work, then possibilities exist for more effective technology integration. The *High Possibility Classrooms* model, or HPC as it is known, has five conceptions and 22 themes of pedagogical strategies and student learning processes that dominate particular ‘tech-savvy’ teachers’ practices. The central message from the case studies in this book is this: What can I as a teacher learn from these examples in order to shape and re-shape my own technology integration practices? Evidence-based scaffolds or models like HPC are important in building teacher pedagogy. This equates to concerns for quality teaching in classrooms in all schools. ‘Quality teaching’ is a repeated mantra across learning and education policy contexts globally. HPC offers a significant conduit to make that plea a reality.

Construction of learning using the conceptions and themes in the HPC model supports teachers to understand how to do this, and when it’s rehearsed through action learning approaches (for example, using practices detailed in a set of rich case studies), then improvements in practice are more likely. A teacher’s pedagogy is critical in improving student learning outcomes (Hattie, 2009; Hayes et al., 2006; Sahlberg, 2011; Munns et al., 2013). The four teachers who form the case studies in this book are Gabby, Gina, Nina and Kitty. They teach in early years, elementary, middle years and high school contexts. Each chapter gives a full account of how the teachers’ knowledge of technology integration drives both teacher and student actions in the classroom.

HPC is a model that explains particular classroom teachers’ practices in action. It is a model of practice knowledge or Action Knowledge (AK) that arises when more than seven components of TPACK are present in a learning context and it serves to explain the processes and strategies teachers must use if they are to create imaginative and engaged learning spaces in schools. The component of AK can be added to content, technological and pedagogical knowledge. AK appears in Figure 2.3 on the TPACK framework. This component hovers over the existing framework and is surrounded by context, such as the school, the classroom or the student learning space.

**Significance of the HPC Conceptions and Themes**

The HPC model emerged from research and analysis of data in teachers’ classrooms; it is significant for three reasons. The first reason is that when four case studies of exemplary teachers’ knowledge of technology integration are presented as a series of full descriptions, they serve as exemplars of what is possible to achieve using technology in today’s classrooms. The second reason is the case studies responded to persistent calls for more examples of teachers’ practices in technology integration in both Australian and international education contexts. Previous studies of technology integration have, for the main part, revolved around studies of graduate or experienced teachers’ contexts using particular
FIGURE 2.3 TPACK framework showing Action Knowledge (AK) hovering over the main TPACK components

technology devices, like laptops. The third reason is that the study findings fill a gap in the research literatures and in what is known about knowledge of technology integration in practice from teachers’ perspectives. Therefore, together, the study’s distinctive examination of practice formed out of a group of exemplary teachers’ knowledge of technology integration in Australian classrooms gives critical, fresh insights to what is now known.

From cumulative data analysis in the research, five conceptions of exemplary teachers’ knowledge of technology integration were constructed. The key conceptions are:

- theory;
- creativity;
- public learning;
- life preparation; and
- contextual accommodations.

The conceptions are shown in Figure 2.4 and collectively form the HPC model situated in the learning context.

Of the five conceptions, theory-driven technology practice was the conception most common to all teachers, and within each of the four remaining conceptions, there were important similarities and differences. The case studies in this book show that high-level, theory-driven technology practice can counteract pressures teachers may feel to ‘simply to teach to the test.’ Across some education research literature (Gardner, 2012; Hargreaves, 2011; Ward & Parr, 2011), there are frequent provocations for teachers to resist performative cultures
of standardized tests that thinly veil learning in schools in narrow terms, and evidence is provided that such ‘testing regimes’ will not fulfill what students need in order to lead successful adult lives into the future. The four teachers featured in the case studies take the view that technology integration is about opening up creativity and encouraging students to take risks with their learning.

The future of education in such classrooms is much more about visions of students as empowered learners, and the teachers’ seamless integration of technology is the critical driver that enacts student autonomy. This kind of vision for classrooms has implications for current, education policy agendas in schools. Such agendas in Australia, the USA and the UK are constrained by a dual focus on i) accountability and testing, and ii) exclamations for more creativity and project-based approaches to learning in schools. This phenomenon is emerging in education policy documents in Singapore and South Korea. In countries like Australia, it already exists in three states—NSW, Victoria and Queensland—and all have used education funding from the Federal Government to drive important technology integration initiatives from which positive results are beginning to emerge. Such findings contrasted with earlier discourses about safety and risk in key policy documents in the Australian Curriculum. Furthermore, the language in the new curriculum documents couches technology in terms
of general capabilities such as “applying social and ethical protocols and practices, investigating, creating, communicating, managing and operating ICT” (ACARA, 2013, p. 53). Such ideas better reflect current practice in schools. New education research (Munns, Sawyer & Cole, 2013) in Australian classrooms articulates case studies of teachers who consciously plan creatively, and make spaces for all students’ creative engagement and imagination in learning. Actions in these teachers’ classrooms were surrounded by expectations of high intellectual quality in students’ achievements. Such themes are also reported in salient projects from the UK (CCE, 2012; Luckin et al., 2012; Thomson et al., 2012) and the USA (Dilworth et al., 2012; Ito et al., 2013; James, 2009; Jenkins, 2011). Let’s begin our understanding of how the HPC model contributes to education because of its value as a theoretical model of technology integration.

Theory Matters in a HPC Classroom

Crucial in the case studies is theory-driven technology practice. This conception was underpinned by seven pedagogical themes, namely: construction of learning, purposeful teaching, focused planning, enriched subject matter, promotion of reflective learning, shifts in conversations and thinking and authentic student engagement. Implications for each of the themes are discussed in turn.

In the first theme, when teachers’ practice is ‘constructed’ in more student-centered and less didactic ways, it gives students the necessary freedom to personalize their learning and determine problems or questions that they want to explore. This kind of teaching is still led by the requisite curriculum content and the idea that inquiry-based approaches are ideal structures for learning. Many teachers find challenging the idea of students being more self-directed, as it draws into question the teacher’s role. Some teachers feel they do not have the necessary skills or leadership support to ‘loosen the reins’ on their teaching practice and maintain a focus on learning.

This first theme of ‘construction of learning’ in the theory conception carried over into the second theme of ‘purposeful teaching.’ If teachers practice using technology by linking it to what students do in the classroom, then it can validate and better match the learning or the pedagogical purpose of lessons and activities. For example, students might need more time to write, present and record responses on digital microphones or set up a presentation in a Notebook file. A clear pedagogical approach builds both teacher and student familiarity around a defined purpose for technology integration in the classroom.

The third theme of ‘focused planning’ means having a repertoire of ways of working when students use technology in the classroom. When teachers use simple pedagogical techniques (explained further in the case study of Kitty), for example, the ‘3 x 3’ or the ‘red slip,’ or tools like blogs and wikis, they scaffold the learning plan for lessons. The plan becomes explicit and provides a reference
point for students to stay on task. Blog platforms facilitate students knowing what the teacher has planned in a topic or unit of work and how the learning will unfold. Learning becomes less ambiguous to students and the structure of a blog can provide a means to communicate learning beyond the classroom walls—to parents and carers, for example.

Another implication for practice emerges from the fourth theme and presages better understanding of core concepts in disciplines for students. If teachers combine discipline or curriculum knowledge with project-based approaches, then students have more opportunities to ‘enrich their knowledge of subject matter’ and develop their thinking skills.

In the fifth theme, ‘reflective learning’ implies more deliberate moments for students to think about learning because of personal access to technology. The faster pace of learning in classrooms when technology is utilized highlights the importance of providing opportunities for students to quickly record and then reflect on what they learn.

The ‘shifts in conversations and thinking’ in the sixth theme means teachers paying more attention to the questions they ask students in classrooms. While not necessarily a new idea, when combined with ready access to mobile devices, resolution to questions can be provided efficiently using devices like iPhones, laptops or iPads. Having at least one mobile device in the classroom operated by the teacher or students helps to create an engaged learning culture of ‘I’m not sure . . . so let’s find out’ and fosters the idea of a ‘community of learners’ all students learning together in more distributed ways.

The seventh theme, ‘authentic student engagement,’ involves the role of technology in forming an invisible connection to the digital world through concrete experiences. For example, you learn about filmmaking by becoming a filmmaker. Or, you learn about blogs by becoming a blogger. All schools might consider offering digital filmmaking projects where creative practitioners or artists in residence provide expertise.

Creativity

In the second conception of the HPC model, creativity through technology integration is sustained by five themes: the first theme is about boosting creativity, the second targets how creativity enables opportunities for production, the third is unleashing playful moments, the fourth is supporting values and the fifth theme is differentiating learning. Each of the themes has particular implications and these are detailed below.

Technology integration ‘boosts creativity,’ and this inventiveness comes through hands-on activities and the overt articulation of tapping into students’ imagination. This outcome might come through direct engagement with digital technologies, or it might mean working with more traditional technologies such as string, paper and cardboard. Less emphasis is placed on every student
doing the same thing at the same time from the same template. Instead, individuality is nurtured and the mess of variety that comes as part of the process is welcomed.

Creativity taps into a second theme: ‘production.’ This theme means providing students with more occasions to produce or make something imaginative as a response to content stimuli. If students have responses to learning that are not prescribed or set by the teacher, and can make or produce their own creation, it activates original ideas and imagination (Luckin et al., 2012). Opportunities for open-ended responses to learning experiences mean students have freedom to create and produce something that is more meaningful to them to demonstrate their learning.

The third theme of ‘unleashing playful moments’ implies that teachers, too, can play in their classrooms. Filming, making and creating are ways to open up thinking, and to ‘walk in the shoes of learners’ and be reconnected to the young person’s world.

Closely tied to play is the fourth pedagogical theme of ‘values,’ particularly in terms of joy and celebration. It entails making time to articulate to students that learning matters at school and ‘in this classroom.’ Commenting on, or celebrating, what students create by recording, scanning, or displaying work that is produced is central. Sending home digital copies or work in e-portfolios to parents and carers enhances learning connections for students.

The fifth theme, ‘differentiating learning,’ involves possibilities for students to work at their own pace on a task—or on different tasks—and then to move onto deeper or extension work if the task is completed before the allocated class time. This means teachers can step back, let go and see their students, for example, have multiple pieces of work in progress at the one time, and then choose to publish just one to ‘final copy’ standard.

**Making Learning Public**

The third conception, public learning through technology, is supported by themes of scaffolding performance and enhancing outcomes. What students produce in their classrooms can be enlivened by technology, and this entails ‘scaffolding performance’ through recording, filming and podcasting the learning and playing it back to a real audience on an interactive whiteboard, an iPad or on a screen using a digital projector. Setting tasks for students that are completed using simple applications on mobile devices, which can then be easily shown to the class, can create riveting viewing and learning for students.

Many students like to see themselves perform and learn through the production process. ‘Enhanced outcomes’ in public learning also comes as a consequence of knowing that someone, most likely their peers, will be watching what is presented. The implication for students is ‘I will do my best work, or better work, because it’s on display.’ In this sense, the digital medium seems to be more powerful than the painting hung on the classroom wall.
Life Preparation

The fourth conception, life preparation using technology, is supported by four themes: operationalizing the real world, giving voice, ownership and responsibility and the revelation of effectiveness in terms of self-regulation and self-efficacy.

‘Operationalizing the real world’ means that technology is normalized and its presence in the classroom is equivalent to the past ubiquity of the chalk box for teachers or coloring pencils for students. The reasoning is that technology is everywhere and its presence in the classroom should be no different. The second theme of ‘giving voice’ implies that teachers need to provide opportunities for students to experiment with technology, and communicate their ideas online, work in community and in teams online and view what others produce online. The third element has ramifications for student learning by encouraging students to ‘take ownership’ and step outside their comfort zones whilst within the safety of classroom contexts. For example, the belief might be ‘I may not want to answer a question in class but I can write the answer online where I have time to correct and perfect my final copy.’ The final theme of ‘effectiveness’ implies that there is an important role for technology to support students in regulating what and how they learn by giving them more opportunities to develop self-efficacy in order to improve self-concept and achievement (Hattie, 2009). The notion here is that if students can leave school as empowered learners, they can take their place as global citizens who are prepared for life and are ready to participate in society.

Contextual Accommodations

The final conception, contextual accommodations using technology, is maintained by four pedagogical themes: the personal and professional, changes to time, nurturing community and defining the game. The first theme implies a need for more teachers to embrace technology and spend time at home and at school ‘playing around’ with it. The extension of ‘personal use’ has the potential to crossover into better ‘professional use.’ Examples of these extensions and possible transitions include seeing what the iPhone can do, or understanding how certain applications on the iPad are useful for learning; for example, it might be uploading photographs, at home and at school, or contributing to social media via news feeds, chat, blog and wiki spaces.

In reality, few schools to date have embraced longer blocks of learning time, which is the inherent implication of the second theme, ‘time’. Research shows that when schools dispense with short learning timeframes, students have enhanced opportunities to get into flow. If teachers ‘nurture community,’ whether it is tech-savvy parents or outside colleagues through online professional learning networks, it has the potential to grow technology practice in meaningful ways.

Prior to seeing how these conceptions are enacted in practice in the four case studies in the proceeding chapters, consider the reflection points in the professional conversation.
Professional Conversation—*Fresh* Points to Consider

In summary, the HPC model with its five conceptions and 22 themes of pedagogical strategies and student learning processes is a model of Action Knowledge (AK), or knowledge of practice, and as such, it serves in a very real way to further enhance the TPACK framework. TPACK has moved through a series of developments and phases and therein lies its appeal to many educators. The HPC model developed from new research is highly useful and it supports teachers’ actions to better appreciate effective technology integration in learning for students in schools. Further application of the HPC model to student learning in tertiary contexts is also feasible. Being familiar with the HPC conceptions and themes, I argue, sensitizes the reader to what lies ahead in the case studies in the following chapters, and allows for easier reading of how practices of the teachers fit together in Chapter 7 when the full picture of the HPC model is revealed.

Discussion Pointers

As a whole group or in pairs, discuss these questions and work towards enhancing what you know about theories of technology integration:

1. Explain what you know about TPACK using the format of an acrostic poem.
2. What does the SAMR model mean to you? Think of or create examples from real or imagined classrooms that explain your attempts to move technology integration practice from Substitution, to Modification, to Augmentation and finally to Redefinition.
3. HPC has five conceptions. Is it Action Knowledge in your view? What do ideas about theory, creativity, life preparation, public learning and contextual accommodations mean to you in your context or in your future teaching practices in classrooms?
4. Think about your own practice and begin to ‘backward map’ using visual representations of how each HPC conception might be further enhanced by what you plan to do in the classroom for students’ learning.
5. Use a HPC approach to design one lesson plan in a subject you teach.

Notes

1. Darcy Moore’s blog is accessed at http://www.darcymoore.net/?s=samr
2. Measuring the four expectations from Papert (1976) are:
   Expectation 1: suitably designed formative/summative assessment rubrics will show improvement when compared to traditional instruction.
   Expectation 2: students will show more instances of work at progressively higher levels of Bloom’s Taxonomy.
Expectation 3: student work will demonstrate more—and more varied—critical thinking cognitive skills, particularly in areas related to the examination of their own thinking processes.

Expectation 4: student daily life will reflect the introduction of the technology. This includes (but is not limited to) directly observable aspects such as reduction in student attrition, increase in engagement with civic processes in their community, and engagement with communities beyond their own.

3. SAMR has drawn attention recently in terms of a lack of a research base; its antecedents resemble earlier work done by Maddux et al. (1992) in the Type I & II model that approximates two broad areas of SAMR. In tracing previous work, SAMR draws on at least four other technology education scholars early work, and some of that consideration can be followed at http://edfutures.net/SAMR.

References


A story with music to start the week . . .

Red velvet curtains on the Punch n’ Judy booth in the corner of the classroom first caught my eye.¹ This structure was quite large and looked like it had lost its way from a fairground. Its presence seemed out of place in this space of high-tech resources, where an interactive whiteboard occupied center-stage. Several of the walls displayed colorful, scanned, child-made puppets and at the far end of the classroom hung a sophisticated “wow–word” poster.² Around one corner of the room, tucked out of sight, was a mathematical city made of angles and numbered cardboard sheets. Scattered on top of cupboards surrounding the wet area were imaginative recycled objects made into musical instruments and storybook sculptures. As I gazed at one structure, I asked myself, is that really the pantry in the Gingerbread House?

Students arrived at the door of the classroom within minutes of me placing my notebook and camera on a low desk. Overflowing bags were hung on pegs outside. It was obvious they all knew the routine. Each student walked inside and settled on the floor in front of Gabby. No teacher desk in the room, just a pink chair in front of the interactive whiteboard. The class roll was marked on the interactive whiteboard and all noise settled. I was introduced to the class and it was explained that I would be in the classroom for the rest of the week. A few students questioned me about what I would do.

Today there was also another ‘guest’ in the classroom, Charles the music teacher—not really a ‘guest’ as he was well known to the students—only today wasn’t the usual day for music. There had been a change of plan. I could easily tell the students really liked it when Gabby and Charles taught
together. These two also seemed to enjoy the chance to team-teach during the regular music lessons each week. Gabby had planned the lesson, and in later reflection, she shared that music was not her strength. She was happy to draw on the talents of colleagues like Charles. This was a literacy lesson and Gabby wanted the students to learn a short piece of music to accompany the narration of a forest scene for their ‘storybook houses.’ A Notebook appeared on the interactive whiteboard with musical notes and quavers. This tune of ‘evocative spooky music’ was one that each group could use as accompaniment for their narration. Charles taught the students to count the beat and to keep in time with the written music. They soon joined in. The whole class tapped out the beat, using an array of musical instruments made from recycled kitchen objects.

Gabby and Charles performed a narration for the class and each group followed in turn. One pair of students performed the role of the ‘lost children in the forest,’ accompanied by dialogue and music tapped out by the rest of their group. In the background, displayed on the interactive whiteboard was the ‘storybook house’; all of the images were uploaded by the students during the previous lesson. Each group watched one another and commented on what happened next. As suggestions arose, Gabby recorded ideas, using the Record function on the interactive whiteboard and a handheld microphone. When each group stepped up to the interactive whiteboard for their recording, you could see them palpably ‘puff up’ prior to giving their rendition. “Highly imaginative, redolent, mature language,” I thought to myself. “It’s extraordinary to hear Stage 1 students use language like ‘flamboyant’ to describe the wolf in the forest, while another student described a ‘quaint cottage’ and others used phrases like ‘pale and peaky’ to describe poor Gretel’s demeanor.”

When Gabby played the narrations back later, the students liked hearing their voices—this public aspect of learning caused them to pause and think carefully about what they wanted to say prior to pressing the Record button. I could not help but wonder—an ambitious lesson and only my first day in this classroom.

The ‘creative memo’ A story with music to start the week . . . was written while observing Gabby in action. It captures the experience of a typical day in her classroom. Gabby is an experienced early years teacher at Cumera School. Her students produce scanned puppets, make spelling films, use digital games and podcasts and also create Notebooks in the lesson creation software. They use a range of technologies to do this work including flip cameras, digital microphones, iPhones and iPads, digital scanners, several desktop computers and an interactive whiteboard (IWB).

In this chapter, I present details of Gabby’s professional background, the school, the classroom, the representations of her perceptions of technology integration
through the lens of TPACK, and the main conceptions of HPC that underpin her knowledge of technology integration. This is necessary in order to understand the implications of the HPC model in creating quality learning spaces in schools that place importance on pedagogy in technology integration.

I begin the case study by examining how classroom learning is made public through performance, and then move to understanding how active engagement, better quality outcomes and audience are important. In this early year's classroom, creativity involved the continuous co-creation of products, peer support and modeled and guided practice. The third conception of Gabby’s practice focused on differentiation and negotiation and featured themes of experimentation, ‘going with the flow’ and ‘unfinishedness.’ Play and fun, in the fourth conception, concentrated on story-telling, dressing up and mathematical thinking, and, finally, in the remaining conception of contextual accommodations, the extended learning time to support developing students’ imagination was crucial.

At the end of the chapter, there is an opportunity to hold a professional conversation using a series of questions about the case in What is fresh? Now, it is time to consider Gabby’s professional background.

**Professional Background**

Gabby’s foray into teaching via adult education commenced more than 20 years ago with Teaching English as a Second Language (TESOL) to migrant students. She moved into early years teaching 13 years later, and since that time has been at Cumera. She considers herself a specialist Kindergarten to Year 2 (K–2) teacher and teaches composite classes in her role as team leader for Year 2. Regarded as the technology leader in the school, Gabby first used interactive whiteboard technology more than eight years ago: “I see my technology leadership role as a great way to influence people and what they do in their classroom . . . I like to get people motivated to think about their teaching.”

Her professional learning growth and support in technology comes from outside the school, primarily from a specialist technology innovation center attached to a nearby university. One of Gabby’s former colleagues, who used interactive whiteboards in UK schools when they were first introduced, initiated her foray into the possibilities of technology in learning. She says: “I watched her and was in awe of her skill. I then spent hours practicing and making things.” Frequently, international educators come to Gabby’s classroom to observe what she does with technology and she is also in demand to lecture to postgraduate students in teacher education faculties. She is a frequent iPhone and laptop user in her personal life; nonetheless, she doesn’t use social media such as Twitter or Facebook. Most out-of-school time is spent learning the art of storytelling with a professional storyteller and in her words: “preparing Notebook files and editing movies made in class if there were parts unfinished.” In the following section, the broader context of the school is made clear.
The School

Cumera is situated near a well-known Australian beach in a large, coastal city and offers tuition to approximately 755 students between Kindergarten and Year 6 (early to final years of elementary school). The coastal suburb’s socioeconomic background is described as “mainly middle class,” with the majority of families in the surrounding community owning their own small businesses. Less than 20% of the students at Cumera come from families who have a language background other than English. The school was involved in a learning alliance of project-based initiatives established a number of years ago involving local elementary schools, and it works in close collaboration with a nearby high school, as well as academic colleagues from one of the city’s largest universities. There are 38 full-time teachers, most of whom are female. The school has specialist programs in drama, critical literacy and environmental sustainability.

All classrooms have an interactive whiteboard and this feature of the school was used to promote its place as a center of learning innovation. It was one of the first schools in Australia to embrace this particular technology, and this gives rise to its recognition as a ‘lighthouse school’ and a leader in integration of interactive technology into teaching practice. Since then, the school has hosted more than 500 teachers in technology-focused, professional learning sessions. There is an abundance of technology resources throughout most learning spaces that are also in the process of being renewed as much of the hardware is outdated.

With a highly focused approach to literacy and the creative arts, the school excels in drama and the inclusion of drama in learning. Cumera is extremely proud of its extensive resources in reading and math and the established gardens and playground areas for outdoor learning. These were built by teachers, students and families from the wider school community. The school provides many opportunities for students to participate in extracurricular activities such as chess, languages, music, band and sport; these are offered by outside providers on the school premises. Sport is promoted and there is good access to extensive playing fields, with many teachers in the school being expert coaches. An atmosphere of community and support between students and staff is evident, and the foyer of the school displays an array of student work samples and sporting awards. The sense of the school’s highly supportive parent community flowed into the classroom.

The Classroom

Cumera received funds a few years ago from a large government initiative for construction of a two-story structure with six classrooms. This building includes Gabby’s new classroom, which has an adjacent quiet work room with six desktop computers. The classroom is spacious, colorful and child centered. The walls are adorned with student work that is original, non-stenciled and features recycled material, including the infamous Punch n’ Judy puppet theatre.
On most days, the classroom is interactive, with high levels of activity and conversation interspersed with periods of quiet writing time and listening to the performances of peers. This early years class of 24 students is grouped on the basis of ability and friendship. Gabby describes them as “generally happy, well behaved, respectful and confident. I have high expectations and they reach them.” In addition to their familiarity with a range of technology, it is apparent that the students like the ready access and visibility of technology. For example, one of the older students in the class says: “It’s really great to have an IWB in the classroom. We can look up stuff quickly, scan things and it doesn’t make us confused—when we can see things.” This aspect of the visual nature of technology is well documented and its consequent aid to engagement recognized (Schuck & Kearney, 2007). How Gabby perceives technology in an early years context is described below.

**Representation of Gabby’s Perceptions of Technology Integration Using the Lens of TPACK**

In Gabby’s classroom, there is a focus on learning in literacy and numeracy. This involves extended periods of time devoted to a single theme for the whole school term. This case features learning in the theme of ‘Fairy Tales.’ The theme integrates content from the education jurisdiction’s English, Mathematics and Creative and Performing Arts syllabus documents. Content knowledge (or CK) in English covers word blends, the rules of grammar and punctuation, as well as spelling and vocabulary. In Mathematics, measurement, area and numbers are the main topics. Pedagogical knowledge (or PK) is exhibited in the varied approaches to student learning that Gabby utilizes. These approaches include using technology as the basis, together with high levels of visible student activity, and detailed lesson preparation and assessment.

Content is embedded into both teacher and student Notebook files. Pedagogical content knowledge (or PCK) is tailored to her explicit knowledge of each child’s learning needs in all key learning areas. She knows their education background and how play and fun are central to advancing their knowledge of ‘Fairy Tales.’ Her technology knowledge (or TK) is fluent, and Gabby continually repurposes the available technology for learning in her classroom. The students are also skillful technology users—mainly because of Gabby’s ability to respond to their curiosity about how technology works—and she lets them practice when they ask questions about it. This comment by one of her student’s is typical: “Having the interactive whiteboard, cameras and scanners in our classroom show us our work and we can practice using it.” Technology like this allows seamless integration into learning for students and this hallmark of Gabby’s technological content knowledge (or TCK) is readily seen each day in her classroom. Student learning demonstrates deep understanding of content, and is displayed in rich digital stories and animated in elaborate Notebook files.
Gabby understands how teaching and learning changes when particular technologies like the interactive whiteboard and computers are used in the classroom, and she readily reconfigures technology for her own pedagogical purpose. Gabby is able to bring all seven knowledge components of TPACK together when she teaches and this case study now moves to detail how this knowledge of her practice builds on a firm TPACK base to articulate specific conceptions of the HPC model.

Main Conceptions of HPC in Practice

Conceptions of Gabby’s knowledge of technology integration fall into five distinct areas. Each conception comprises HPC pedagogical themes of diverse teaching strategies and student learning processes; they are:

1. Learning made public through performance: better quality outcomes, audience and active engagement;
2. Creativity: continuous co-creation of products, peer support and modeled and guided practice;
3. Differentiation and negotiation: experimentation, ‘going with the flow’ and ‘unfinishedness’;
4. Play and fun: dressing up, storytelling and mathematical thinking; and
5. Extended learning time: imagination and the length of session time.

Each conception in the case study is supported by comments from Gabby and her students, as well as examples of her classroom actions and the documents she uses in planning. The first conception, learning made public through performance, follows.

1. Learning Made Public Through Performance

Conceptions of knowledge of technology integration appear in several ways in Gabby’s classroom, in particular, when she consciously gives students opportunity to perform in front of peers. At times, this is in a dramatic fashion, using techniques like Reader’s Theatre where texts are recorded using portable digital microphones plugged into the interactive whiteboard. Students chronicle their own transcripts, spelling lists and dramatic acts, which are then played back later for peers, as well as for reflection and comment by the teacher. Gabby describes this as a move from: “Passive to active student learning processes.”

Using digital microphones and flip cameras lifts the level of thinking once the students know it’s being recorded. When something is recorded or filmed, participants often become active, getting out of the passive learning role. This can then be linked to repetition and to the students hearing their own voices or actions being played back and being critical of them.
Comments from students confirmed what Gabby said: “It’s great hearing our voices . . . you have to really think before you say something.” Performing in front of peers using technology serves as rich, extrinsic and intrinsic reinforcement in this classroom, and students never seem to tire of seeing either themselves or their peers performing. The conception of learning made public through performance is explored through three pedagogical themes: better quality outcomes, audience and active engagement.

### Better Quality Outcomes

Gabby maintains that when students use technology independently, it allows for repetition and problem solving. This action leads to better quality outcomes, because students’ learning is immediately publishable. Gabby continues:

> Technology enables students to add to, and improve their work; the drafting of work can always be added to, or changed, recorded over—we might all look at someone’s work and try to improve it by modifying the final copy.

The sense of immediacy, pace and improved thinking are also aspects of this pedagogical theme. Better quality outcomes in students’ work are possible because technology provides a clear, visual account. It gives accessible documentation of students’ learning and Gabby says: “I see what the students do, then what I do, and we can add to that in a new class.” This practice of building lessons and assessment documentation is a type of historical artifact, or a primary source material. Gabby shares what her students learn with her colleagues in fortnightly team meetings and at after-school, professional learning workshops. She observes: “It’s more about making sure that I’m continually trying to do different things, be innovative and give examples of effective technology integration.”

### Audience

The act of performing for an audience is an important catalyst for quality learning and is central to the conception of learning made public through performance; Gabby reflects:

> If students know there is an audience, then the quality of what they do improves—if it’s being captured then it’s better work; the technology acts as a type of audience—all because students use it to hear, display or modify what they have produced.

It is remarks about the “public displays of learning lifting student engagement” that are the most critical. Such behaviors are readily observed in Gabby’s
classroom when pairs of students, engrossed in arranging a new Notebook file, for example, explain their understanding of mathematical concepts, or when they assemble scanned images for extended narratives in group performances. One student expresses: “Doing the word blends in Notebook means we give other kids the chance to learn what we learn.”

Active Engagement

Engagement in learning is often so intense in the classroom that when the bell goes, Gabby has to ask most students to leave: “The bell has gone . . . go out and run around . . . it is play time now.” Eventually, students leave the classroom and then race back when the bell goes again to take up their work just as intently as when they had left. This sense of intensity continues in the classroom when she draws upon past work of students to reinforce the learning of particular concepts with new groups of students. She explains: “Notebook is useful because you can look back and reflect on what other students have done and add to it.” Gabby always informs her current class that what is recorded might be seen by the parents and students she teaches in the future. The information is frequently accompanied by this reminder to students: “The quality of what you do matters.” In the playground, it was noticeable that older students in the school ask Gabby if they can see the videos they made when they were in her class. When asked why this happens, she shared: “Students seem to have fond memories of what they did with me in the early years and regularly remark how they don’t do that type of work anymore . . . they miss it.”

Saved Notebook files are exemplars for scaffolding new syllabus topics and fresh assessment tasks. Gabby explains:

Content is never as good the second time round, and it has got to engage me. In addition to what they create, I also like to film students during performance; it allows me time to reflect on what they did, and I can use the recording when it comes to assessment time and show parents on parent-teacher night.

Technology provides unlimited possibilities for teachers like Gabby to maintain ‘living assessment recordings’ of what students do, and often digital portfolios are used by many schools to report to parents and other teachers about student learning. The experience of learning being made public (or public learning) through performance as a mechanism to lift the quality of student assessment links to Gabby’s belief that creativity is an important component of her knowledge of technology integration. This conception is explored next.
2. Creativity

In Gabby’s classroom, technology integration in learning involves students continuously creating products like short films and podcasts, as well as digital games and stories. This creative style of technology integration is central to her practice and it is the main pedagogical method she uses to engage students in learning. She acknowledges that: “Learning happens when students create things and this means they are deeply engaged.” Her classroom is a consistent scene of industrious design, where the co-creation of products means students often work in flexible ways on different tasks as individuals, in pairs or in groups. For example, in one corner, colorful puppets are being laminated while other students work on reused puppets to commence story writing. Another group continues to script drama performances, and several more make props in the form of beautifully painted storybook houses in the wet area. It is this artwork that acts as background on the interactive whiteboard. The scene is detailed in the opening vignette to this case study. The significance of the conception of creativity in technology integration is explored through the pedagogical themes of the continuous co-creation of products, peer support, and modeled and guided practice.

Continuous Co-Creation of Products

Many more traditional approaches to education overlook learning through ‘hands on’ activities. Although such approaches often require a deep practical knowledge of what the student is trying to create, it could also considerably alter their personal investment in learning. Ideas like this sit alongside leading European theories of learning as keys to the exploratory drive and play inherent in young children (Bruner, 1960; Piaget, 1954; Vygotsky, 1978, 1986). Gabby’s actions confirm that her emphasis is more towards ‘hands on learning’ approaches. The notion of co-creation stems from the idea of creation for one’s own purposes; some have called it a type of user-centered design. She says: “Creating products makes the learning tangible, the idea is learning is doing and doing is learning . . . student-created responses are the most important aspect[s] of pedagogical knowledge because it’s important to students.”

Her interactive whiteboard facilitates creativity and co-creation. This tool is used equally by herself and her students and when questioned about this, she agrees: “I use it [the interactive whiteboard] primarily for creation.” Other technology like microphones, scanners, flip cameras and computers all operate alongside her ‘technology system,’ and this system belongs to Gabby and her students. It is non-hierarchical. Often in school classrooms, the interactive whiteboard belongs to the teacher and it acts as a reinforcer of didactic and highly teacher-centered approaches to practice (Glover, Miller, Averis & Door, 2007). Such a scenario did not apply in Gabby’s classroom, although she is aware that
within her own school, some teachers use the interactive whiteboard in this way. There are colleagues that do not allow students to touch the board. In technology professional learning after school, Gabby works hard to change this approach by adopting what she refers to as: “teach, share and show.” She adds: “Others don’t get what I do—I feel a sense of pedagogical isolation—I need to be with other like-minded teachers.”

Technology is used to create beautiful products “where the aesthetic is valued” to demonstrate learning, and Gabby uses the students’ work and what they create for further learning: “When students create, there is an automatic buy-in and you see student learning being displayed.” This focus relies on their clear ability to successfully use technology. Students echo this purpose: “I like scanning our own stuff onto the computer, we also make cool games and we can photograph the amazing robots we make in art.” The creation of products correlates with being able to tap into the students’ ideas, their creativity and their thinking. Each morning, Gabby routinely reminds the class: “You must switch on your brains to get those creative juices flowing.”

**Peer Support**

Earlier in the year, Gabby taught her students how to operate various technology tools in the classroom. They use technology independently and are savvy, only on rare occasions calling for her assistance. Groups or pairs of students work with others of similar ability, and on other occasions, they work in heterogeneous groupings. Students know how to support one another if something doesn’t work: “I like to work in pairs because sometimes if you are stuck on something or the camera doesn’t work, it’s your partner who knows—not even the teacher knows.” Being a composite group means the younger students sometimes tend to work with older students. The school requires them to have separate spelling lists based on ability groups. However, the same students are seen working in heterogeneous math groups creating numeracy games on computers in the withdrawal room.

**Modeled and Guided Practice**

A few years ago, Gabby didn’t have any technology tools in her classroom while it was being renovated. After that year, she became more aware of the time it took to integrate technology into learning. Gabby often mentions this and the idea is congruent with her view that technology is also more about efficient teaching:

> It consumes my life but I don’t resent it and when technology isn’t present you actually get used to it . . . it’s less complicated teaching, but it’s also less creative and I get to tell the students what to do. But I didn’t like that year much and neither did my students.
This pedagogical theme is coupled to her belief and sense of responsibility that as a teacher, if you are going to use technology in the classroom, it has to work every time. She says: “You can’t risk kids’ learning if it doesn’t work and having a range of technology means something will always be working—if there are only laptops available then it’s more risky and you can waste valuable learning time.”

She deliberately models interesting language throughout the day in her choice of words to describe the weather, for example. This encouragement builds the students’ vocabulary and she urges students not to use “pedestrian” language. If they think of a *wow word*, they look it up in a thesaurus and then add it to their own digital text and the poster of *wow words* on the classroom wall. These words give access to all students to improve and extend writing. She responds: “When *wow words* are displayed every student has access to expanded vocabulary for writing.” One student echoes this sentiment suggesting that *wow words* are her favorite part of preparing a digital text:

> Doing *wow words* and being able to find out what words mean and the images that go with them, I found the word *embarrass*. In this system, a word is examined closely to understand what it is like, and examples are given of how it can be used in a story.

Another example of this pedagogical theme is observed in a narrative writing session that involves the continued theme of “Fairy Tales.” Pairs of students are preparing descriptions of the wolf’s fur being blown off. Banks of word blend games, created as Notebook files with audio recordings on the interactive whiteboard, are used by students to scaffold and guide their writing. They look at what other students have created prior to commencing their own texts. Gabby reasons this guidance in the following way: “I often model my own quirky examples, or they might look at what’s been done before. It assists guiding the content students create and the work samples they produce.” Emphasis is placed on differentiation and negotiation in the classroom, and this conception is described in the proceeding section.

### 3. Differentiation and Negotiation

In classrooms where teachers integrate technology effectively, students often work in ‘project mode’ to produce a product that fosters differentiation and negotiation in their learning. Such classrooms feature students working in groups, pairs or as individuals on topics that are important to them. Subject matter for products stem from within and sometimes beyond curriculum requirements. Although there is often a high degree of experimentation and choice in Gabby’s classroom, the students direct what is important to them about a topic. This teaching strategy acts to support differentiation of learning. An additional feature of this conception is the significance of students wanting answers to their own questions; this notion is explored through the pedagogical themes of experimentation of ‘going with the flow’ and ‘unfinishedness.’
Experimentation

When Gabby instigates a new topic from the syllabus, she scaffolds subject matter by showing examples of texts from hardcover books and Notebook files. When questioned about this action, she says:

Technology enables them to engage in individual research as a response to content . . . I like to give them time to experiment with a response to what we have talked about. They will often come back with something completely different.

Rather than think that this is a threat to her planning, she uses this as opportunity to lead student learning by what they value. Experimentation arises through allowing students to have time to respond to questions and ask about a topic or scenario. Experimentation is observed in one group’s creation of a knight’s galaxy castle, which is their version of a storybook house for the fairy tale narrative. The response is highly imaginative and is welcomed, yet it is quite different to what Gabby imagined the students might produce.

Going with the Flow

There is a strong research argument that ideas of experimentation are better enabled through technology integration (Csíkszentmihályi, 1990; Papert, 1980; Resnick, 2007). This notion underpinned Gabby’s belief that learning goals are not always immediate and ‘going with the flow’ is important; she acknowledges: “It bends and turns as time goes on, taking learning along different paths. I have a mental map of where I want to go but I don’t often know exactly where to next.” Promoting experimentation and ‘going with the flow’ is tied to her view that in other teachers’ classrooms, “beautiful generic things” are produced and that this outcome links to a particular vision of learning, one entailing “consistency of teacher judgment,” and one that she does not subscribe to:

If everyone produces the same item then it’s easier to gauge which product is better, but this is not what learning is. Learning should flow and teachers should go with the flow. Seeing what is important to each student is better revealed without everyone producing the same thing at the same time. If teachers control how students use technology and what they produce, they are acting as gatekeepers and that’s why I pulled away from encouraging teachers to use technology creatively . . . many didn’t know how to do it. . . . [The teachers] have to live with a sense of ‘unfinishedness’ when technology is integrated.
**Unfinishedness**

The idea of ‘unfinishedness’ arises from recognition that children work in discrete ways and at a different pace in technology-rich contexts. This is not about the provision of open-ended learning tasks. Gabby explains: “Students don’t have work in progress or final published work in my classroom, they have ‘unfinished’ work with technology, work that can be returned to later.” At times, this sense of ownership is observed in the classroom, and what she wants for her students is for them to see that their learning matters. An older student describes it this way: “We mostly do hard work in our class and Miss . . . wants us to be good learners.” Gabby believes this priority is achieved by giving students management of their learning direction and “letting go” when they use technology: “They know better than me, you need to give them control. If you let go around what they want to use it for—it’s better that way they can focus on what they want to produce.”

This belief is observed in action when pairs of younger students take turns recording the weekly spelling list as a podcast (or short movie) made with a flip camera. In this process, students read and record the spelling lists set by the school. They look up the meaning of words on the internet or in a dictionary and then they record themselves using the spelling word in an appropriate sentence. The work is saved as an audio or video file to be used by the rest of the class for the spelling assessment the following week. Students like this literacy method, and one says: “It’s really great because you can look up stuff, Google, dictionaries or even the thesaurus.” Not controlling the management of the learning direction by ‘letting go’ and fostering the sense of ‘unfinishedness’ is encouraged. This learning process is observed in other literacy strategies Gabby uses, for example, when students make and remake short videos to understand spelling rules. It is in this situation that students use flip cameras to make the innovative film *Bossy e.*

Gabby says: “This method leads to deeper understanding of concepts, as does recording spelling lists on the interactive whiteboard; as they record, they focus more and I can’t interrupt their learning either.”

This pedagogical theme also relates to ‘being in flow.’ Gabby acknowledges that when students are deeply involved in learning and they are planning, writing, recording and editing, she observes what they do and only intervenes if they ask for assistance. One older student describes: “We know what to do. If you can actually see it, it tells you more on the IWB screen than out of a book.” Another student from the younger group mentions the making of *Bossy e:* “When we use computers and the IWB, it doesn’t make us confused in spelling, it helps us remember stuff and you don’t have to keep it all in your mind.”

Powerful affordances of technology in education and its positive reinforcement of literacy learning in school classrooms are well documented (Hedberg & LeFoe, 2005; Kennewell et al., 2008). Gabby’s conception of differentiation and individuality in technology integration arises from letting go and accepting that
flow, experimentation and unfinished work are important pedagogical themes for her teaching. This is coupled to her firm beliefs in fun and play when developing effective technology integration in the classroom. This concept is explored in the following section of the case study.

4. Fun and Play

Learning in this classroom is all about having fun and unstructured time to play. Pedagogical approaches that emphasize preferences for exploration are inherent in how young children learn and lead to “extended playfulness as boundaries between work and play dissolve” (Craft, 2011, p. 86). Words like fun and play are conceptions of technology integration and repeatedly manifest themselves in the data of how Gabby expresses her passion for technology integration: “I actually get paid to do this job (of teaching).” She states that what she does is her hobby, too: “With my new students this year, the older ones in the group, I needed to put the fun back into them, but I make sure they know the difference between fun and silly.” This point is a huge challenge for some adults who work with young children. How do they “accept the possibility that playfulness and seriousness are two sides of the same coin rather than different currencies”? (Craft, 2011, p. 68). Fun and play are explored through the pedagogical themes of dressing up, storytelling and mathematical thinking.

Dressing up

Friday afternoon dress-ups, news circle storytelling and drama performances are manifestations of the importance of fun and play in Gabby’s classroom:

My prime role as an educator is one of giving students the chance to be creative and have fun. I often say to them, we have 24 brains in this classroom, let’s put them together and see what we come up with.

Such activities occur at other times. Nevertheless, Friday is the designated time in the week when students take what they have learned and make props, or dress up and perform, while others take turns to film the whole exercise. They watch their films over and over. Gabby likens this to when: “as a child, I would read the same book over and over, it’s no different.” Fun is palpable in this context and could readily fit the notion of ‘thick play’ as described by Mackey (2009). Gabby speaks at length about this pedagogical theme; here is some of what she says:

They create their own stories during this time. Sometimes it’s based on the news. You are not learning if you are not having fun or you’re not engaged, but it means my classroom is sometimes noisy and messy. Most
people say it’s too messy, too noisy, or too out of control and they couldn’t
do what I do.

Choosing to work with noise and mess and without a permanent desk in the
classroom means Gabby is highly mobile and that she works alongside students.
She has fun creating with them too: “The school does not foster this idea of
learning through play.” Such commentary acknowledges that what she does in
her classroom is different to other teachers and this is something else in her peda-
gogical approach that she thinks is not approved of by colleagues. At times, the
classroom is noisy, students are in task and there are very few behavior problems
as they engage in their work. Gabby thinks this teaching strategy is important
and she elaborates further:

When kids use technology it makes them happy and there are less behav-
ior problems. Each day is characterized by peaks of intense, noisy product
creation followed by troughs of quiet, focused learning time. The space is
active and productive; everyone plays—including the teacher.

**Storytelling**

Storytelling features in Gabby’s conversations around fun and play. She knows the
theoretical basis of its power to engage students in learning (Egan, 2005; Hertz-
berg, 2011). Attendance at storytelling workshops over several years facilitated her
decision to employ a storyteller as an artist-in-residence during the previous term
for the whole school. The storyteller spent most of the time in Gabby’s classroom.
One particular example demonstrates Gabby’s unique storytelling skill; it is an
activity built around the popular story of “Hansel and Gretel.” The story is told as
part of the work unit on fairy tales and involves an account of an old lady who the
local school children—including Gabby—believe lives in a haunted house. The
decrepit house is near the local beach where Gabby grew up. Students know the
location of the house and are mesmerized as she tells the story in graphic detail.
She explains her approach:

If telling the story does not engage students, I will change course. I am not
afraid to change direction. I know about storytelling as a mechanism for
engagement in learning, in theories of play and I like to practice that in my
classroom. It fosters formation of different opinions and ideas and I see the
evidence in their story writing. If my students are not engaged, or hooked,
then it’s my responsibility to get them back on track.

Support for the position of teachers taking responsibility for the engagement
of their students in learning is found in education research literature (Hayes,
Gabby’s Classroom: The Early Years

Mills, Christie & Lingard, 2006; Munns, Lawson, O’Brien & Johnson, 2006) and will be taken up further in the final chapter.

**Mathematical Thinking**

The idea of fun in learning is prevalent in other subjects in Gabby’s classroom. In Mathematics, for example, games developed by students in Notebook files, examined in data collected as part of the document data analysis, show a focus on engagement in mathematical thinking. There is a view in some education research that technology effectively captures mathematical concepts as it allows for repetition and problem solving in the classroom. This pedagogical theme is observed in action in a morning session one day when a younger student in the group is experiencing difficulty understanding the 100s concept in a Mathematics game. Students are devising the game to gain confidence in this concept. When it is clear that he is finding understanding 100s difficult, he leaves the group and says: “I need more practice.” He takes the Notebook file away on a portable USB and works on it in the adjoining computer room. Gabby notices what happens and later in the day, she subtly sets about supporting his understanding of the concept while students engage in another task:

> I was able to see he was off track; I used praise and reminded him of the great things he did in class last week. . . . I knew he knew he needed to brush up on his chart with a bit more practice. . . . Notebook files are useful for that.

Online games for Mathematics are another means to capture play and Gabby uses a range of games to teach and assess this subject matter. Again, such activity is threaded to her insight: “Games on the interactive whiteboard allow whole class and individual engagement in learning maths concepts, and I can pretest them too. I also like to film them doing maths assessment, it allows me to reflect.” An overarching philosophy of learning with technology links to Gabby’s awareness of the role of play and fun in fostering student imagination. This pedagogical theme, along with the length of session time, is present in the final conception of extended learning time.

**5. Extended Learning Time**

Time and lack of time are frequently cited in education research in schools as reasons for why teachers integrate, or choose not to, technology into classroom practice. It is worth noting that Gabby uses the analogy of “choosing the right dress to be worn for an important occasion” in the context of extended learning time. In commenting on her use and preparation of Notebook files and the time taken to prepare thoughtfully, she states the comparison this way: “You
choose something and make it your own. It’s got to be the right dress, it’s a big investment of time and you can’t rush [choosing] it. Some teachers leave at 3:30 and don’t work weekends, I do.” In this conception, extended learning time is connected to the pedagogical themes of imagination and the length of session time.

**Imagination**

This idea is prominent in Gabby’s perception that the creation of Notebook files is ‘therapeutic’ and that sometimes her own children at home are also involved: “I guess I like to use my imagination too and making Notebook files satisfies that aspect of my work.” Imagination fostered through play is described previously in the conception *Fun and Play*. Allowing enough time to use technology is the critical element that enables the development of imagination. This observation is discussed in recent education research, and Craft (2011) suggests that “high levels of participation in digital contexts by students and by teachers foster imagination” (p. 87). An argument is made by Craft (2011) and supported by the Cheskin Research (2002) that “playing with others and producing digital content gives voice to the imagination” (p. 88). When presented with this reflection of her pedagogy, Gabby says: “Giving students time with the chance to imagine and play, working through their eyes, is beautiful.” She concludes with a lengthy statement on this point:

If students learn the big ideas and express them using various technologies, it requires extended learning time. I like long sessions, so the kids can really show me what they can do . . . often they spend six weeks on a narrative . . . it makes a lot of sense and they get into the flow.

Writing initiated by hand serves as the basis for elaborate, imaginative digital texts for animated stories produced by the students in Notebook files. Often two or more of these are produced and presented to parents by the whole class each term.

**Length of Session Time**

There is an argument that teachers set up their classrooms based on what they perceive best enables the development of students’ imagination and often this means ‘getting into flow,’ and ‘getting into flow’ takes time (Csíkszentmihályi, 1990). Flow is achieved in Gabby’s classroom by students first drafting their work on paper. Writing three- or four-page narratives at a time is not uncommon. Gabby explains the importance of time:

I give my students longer blocks of learning time to write well, I don’t want to do a recount every Monday morning—I try to do a few quality
pieces of writing across the week. I give them a long time to write. I don’t want my students to do the timetabled 40 minute recount. We are not all meant to be doing the same things at the same time.

It takes time to know syllabus documents well and Gabby weaves this pedagogical theme into her beliefs around the importance of time in learning as she states: “To really know the subject matter well fits with the idea of inquiry-based constructivist teaching around a focus question and big ideas in a subject, and this approach takes time.” She gives an example of this pedagogical theme in her description of a recent Mathematics Day held at the local beach:

This was a whole day of Maths, featuring the creation of ‘maths mascots’ for measurement understanding and the construction of digital maths storybooks afterwards. It was project work that involved extended time . . . time for students to experience success.

It was clear that working effectively with technology requires flow and flow is not achieved without adequate time.

Professional Conversation—Fresh Points to Consider

In summary, this case study describes fresh ways to comprehend a teacher’s knowledge of technology integration in the classroom. The conceptions of public learning through performance, creativity, differentiation and negotiation, play and fun and extended learning time are within the reach of most teachers in schools who are seeking to effectively integrate technology in learning. Considering each pedagogical theme in Gabby’s conception of technology integration provides possibilities for what is sharable and points to how teachers might enact this knowledge. For example, important vehicles to create audiences for the students’ work are digital stories, Notebook software on the interactive whiteboard, and film products made using digital cameras, the iPhone or iPad. Such avenues for publication often involve production of a learning artifact that exhibits creativity drawn from the students’ imaginations. Extended time for learning sessions across content areas allows time for students to ‘get into flow’ and experiment with their ideas, especially when it comes to the role of online games in developing mathematical thinking. Going with the students’ sense of inquiry and pursuit of understanding at their pace suggests not every classroom task or activity begun may lead to immediate completion, and instead, students have multiple works ‘on the go’ at any one time. This is work that students own and can be returned to later.

Table 3.1 shows what emerged from the data collected in Gabby’s classroom.
TABLE 3.1 Key conceptions and themes in Gabby’s classroom

<table>
<thead>
<tr>
<th>Learning made public through performance</th>
<th>Gabby</th>
<th>Creativity</th>
<th>Differentiation and negotiation</th>
<th>Play and fun</th>
<th>Extended learning time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Better quality outcomes</td>
<td></td>
<td>Continuous co-creation of products</td>
<td>Experimentation</td>
<td>Dressing up</td>
<td>Imagination</td>
</tr>
<tr>
<td>Audience</td>
<td></td>
<td>Peer support</td>
<td>Going with the Flow</td>
<td>Storytelling</td>
<td>Length of session time</td>
</tr>
<tr>
<td>Active engagement</td>
<td></td>
<td>Modeled and guided practice</td>
<td>Unfinishedness</td>
<td>Mathematical thinking</td>
<td></td>
</tr>
</tbody>
</table>

Discussion Pointers

In a whole group or working in pairs, discuss the following questions and record your answers as a podcast on your mobile device:

1. How can you make your students’ learning more public?
2. What does creativity mean to you when technology is integrated?
3. Why would you use technology to differentiate and negotiate learning in the classroom?
4. What is one way to stretch students’ imagination using technology?
5. What experience have you had of ‘being in flow’? Your students?

Notes

1. This literacy lesson was based on “Into the forest” (Browne, 2004) and a Reader’s Theatre piece centered on the book “I Am So Handsome” (Ramos, 2007).
2. Wow words are new words; this idea was introduced to Gabby by another teacher at the school who had recently arrived from the UK. This is the link to materials the K–2 team at Cumera used: http://www.sparklebox.co.uk/literacy/vocabulary/wow-words.html#.T45nXLMzCRo
3. The interactive whiteboard uses lesson creation software referred to as SMART Notebook 11.
4. Reader’s Theatre is a dramatic presentation of a written work in script form.
5. Bossy e is a film made by the students about a spelling rule. As the ‘e’ changes, it changes the sound another vowel makes, for example ‘not’ changes to ‘note,’ a short sound changes to a long vowel sound.

References


FIGURE 4.1 Covers and pages of Gina’s picture books
The ‘creative memo’ in Figure 4.1 features photographic images of some of the ‘handmade’ picture books from Gina’s classroom. She writes and illustrates narratives for her students; they are significant in her knowledge of technology integration. Gina is a teacher and consultant in inner city elementary schools in a large metropolitan city in Australia. She was promoted as a consultant with a focus on pedagogy to a state education office, and it was from this position that she co-taught alongside teachers in a variety of elementary school locations. Prior to her entry to the teaching profession, Gina worked as a computer programmer in a well-known technology company. She returned to university study during this period of employment to gain the needed education qualifications to teach in schools. Gina writes computer code and is capable of fixing almost any hardware or software problem. Animation and using several laptops at once in the classroom are ‘trademarks’ of her technology use. She multitasks using an iPhone and iPad in the classroom, and she teaches students and teachers how to use several computer apps. Gina believes technology is central to learning, although she is aware that for some teachers, the mere use of the term causes an emotional reaction. She refers to various well-known international technology specialists to explain the importance of technology in school education:

Technology is a loaded term. To me it is just another tool. What matters is how it’s used for learning. As Chris Lehmann said a few years ago . . . technology needs to be like oxygen . . . ubiquitous, necessary and invisible. We need not to think about it. It just needs to be there.1

In the last chapter, I showed how High Possibility Classrooms (HPCs) look in action in Gabby’s early years classroom. I argued in the previous chapter that the veracity of the HPC model makes it accessible to practitioners in all stages of schooling. As a result of its conceptual structure around a series of pedagogical practices and students learning processes, the HPC model is a framework suitable for 21st-century schools.

In this chapter, I present details of Gina’s professional background, the school, the classroom, the representations of her perceptions of technology integration and the main conceptions of HPC that underpin her knowledge of technology integration. This is crucial in understanding how the first conception of purposeful teaching is active and made possible through meticulous planning and connections between language and conversation. Theory-driven technology practice is dominant in the second conception of Gina’s practice and involves constructivist teaching actions, teaching for quality and building a questioning environment. The third conception, creativity—featured themes of narratives in action, the creation of learning products and performance. The fourth conception of real-world application attended to preparation for life, student voice and ownership. The last conception of professional identity was supported by teacher roles and learning communities.
At the end of the chapter, there is an opportunity to hold a professional conversation around a series of provocations about Gina’s practice in *What is fresh?* It is time to examine her professional background.

**Professional Background**

Prior to promotion to consultant and then more recently to a principal’s position, Gina taught at Hickson School. It has a similar demographic background to Marcus, the main focus of the case study. At Hickson, Gina was in a teaching role as assistant principal, as well as supporting the school’s developing technology needs. The move from hardware orientation to the school’s focus on pedagogy is explained in these terms: “It was all about the mechanics of the machines at first, and then we finally thought about pedagogy.” Gina explains how she sourced grants for new laptops and trolleys, and then set about dismantling the computer lab:

I had to get rid of all the old and broken ones. This meant we had functioning computers, a few in every classroom. The focus was student engagement and raising the intellectual quality of lessons. I want to say the purpose wasn’t the technology, but the technology supported us to get higher intellectual quality into lessons and better student engagement. It was all that high affective, high cognitive and high operative stuff.²

Promotion by her employer is recognition of Gina’s outstanding technology, content and pedagogical knowledge. She acknowledges that the role enables her to have increased opportunity to influence other teachers, with an explicit aim of creating “better learning” for students in more schools:

As a classroom teacher you have control over the direct end product, that is, the students. Now I am supporting teachers to ensure their students are exposed to the Quality Teaching Framework. I’m one step removed . . . it’s a broader role . . . a professional learning role and technology gives me the lever to do this work.³

Employed as a software engineer for five years, Gina was fulfilling her parents’ desire to achieve what they thought was “a good job for a girl.” Her interest in technology was sparked by a mother who was highly mathematical and a father who fixed everything:

I was always out in the garage with my Dad building and re-making stuff. I used to break my dolls to see how they worked. I had a Lego Mechanics kit, I was nerdy and I liked my Walkman . . . I was the first kid in my school to have a computer.
From both parents, she gained her personal philosophy: “Questions are more important than answers.” This is an important pedagogical theme and is returned to later in the case. At home, she is an avid producer of family digital presentations. She does a lot of video editing and spends time fixing things for her children, and she makes special mention of a humorous incident of a “toy dog repair” for her young daughter. She likes connecting with teaching colleagues using social networking and utilizes a personal learning network (PLN), as well as other social media like Twitter. For relaxation, Gina plays video games that allow her to get into an imaginary role and extend the storyline.

In her final years of high school, Gina concentrated on achieving well in computer studies, and this set in motion plans to become a high school mathematics teacher. The plan did not eventuate. Instead, she worked in programming and building computer hardware after completing a Bachelor of Information Technology degree. This was the right choice at the time and aligned with her love of solving technical problems. Now, with the benefit of hindsight, she sees teaching as “a lot more fun.” Teaching qualifications eventually followed this first degree, and later, while teaching at Hickson, Gina completed a postgraduate diploma in gifted education.

Gina has eight years of teaching experience, mainly with elementary school students across all age groups. A great advocate of mobile technology in the classroom, she frequently asks students to look up answers to questions that arise while they are learning on her iPhone. Students comment on the practice and unanimously agree that “other teachers never do that.” She refers extensively to constructivist learning principles and to the work of ‘technology experts’ like Papert, Stager and Rushkoff. She is keen to demonstrate that her role as a consultant is “a good fit, although I am missing having a permanent class.” Gina’s preteaching background, extensive technology skills and the timing of her entry into the teaching profession coincided with a substantial technology investment by education jurisdictions in Australian schools. Her attributes are recognized by her education employer, hence the consultant role, and her contribution is highly valued by colleagues, students and parents in the schools where she works.

The School

Marcus School is in the inner-west of a large city. The site is new to Gina. Soon after she commenced the consultant position, Gina responded to the school’s request to work alongside a number of teachers in classrooms, to support their technology professional learning. Marcus offers tuition to approximately 270 students from the early years to the last year of elementary school. There are approximately 18 full-time teachers, most of whom are female, and the school has specialist relief from face-to-face teaching in Mathematics, Health and Physical Education and Music. Class sizes range from 21–30 students. Located in a medium- to high-density housing area, the school has students who live...
in a mixture of public, private and rental accommodation. The school’s statement of purpose, “We work as one to provide quality equitable education in an inclusive and supportive environment,” reflects its commitment to ensuring that all students have equal access to resources, and that “student welfare is a high priority.” Over 80% of the students have families with language backgrounds other than English, representing more than 43 language groups, while 9% of the students come from an Indigenous background. Every student is able to learn one of three community languages, and the “targeted educational program and restorative school culture promotes academic and social development at all levels.”

According to the school’s website, enrichment programs in English, Mathematics, Information Technology, Music, Science and Sport are designed to ensure every student accesses his/her personal talents, interests and potential. The learning support team coordinates programs for students in need of additional assistance, or extension in particular aspects of learning. The school also benefits from the support of an active Parents and Citizens Committee and the community center on site. Extra funds from the government have provided several new school buildings including a library, assembly hall and additional classrooms. There is a ‘connected classroom’ with videoconferencing, an intranet with resources and internet sites available to students from the many networked computers in the library, in computer labs and in classrooms. In numerous teaching spaces, there are interactive whiteboards, and there are plans to install them in all learning areas. A palpable atmosphere of community exists among students and staff, and each day, many parent helpers work alongside teachers in classrooms.

The Classroom/s

Gina teaches a class of 28 students at Marcus. In a Science unit, the construction of self-propelled model cars that are balloon or rubber band powered is underway. The usual classroom teacher, Christina, is the first person to request technology professional learning from Gina. Rationalizing why she requires support, Christina says: “I enjoy teaching Science less, in comparison to teaching other subjects, and I’d like some ideas on how technology can be integrated.” Gina states: “The way I teach this class is no different to how I would approach teaching any elementary class.” she teaches Science outcomes from the elementary syllabus, featuring various systems and sources of energy, using investigations that enable students to observe, question, predict, test, record and draw conclusions. Her lesson plans are detailed. The unit’s title is “Model Car Challenge—Alternative Energy,” and when asked questions about her comprehensive lesson plans, Gina offers this reasoning:

I always plan like this . . . with all the notes-to-self and detailed scripts. It helps me not to forget any important bits and to stay focused on the learning purpose. I have integrated tech in the unit the way I would normally
do it . . . as if I was teaching this to my own class. Once again the tech does not become the focus . . . learning is the focus.

Gina uses humor to establish rapport with this new group of students, and by the time she finishes teaching the unit, she is satisfied with the realization of her learning goals:

I think most of the students made a car that went and they started to use the metalanguage of the various forms of energy and systems. They understood that energy is never created or destroyed, it just changes form.

When questioning students in the class about their learning experiences, they offer many positive comments: “I liked looking inside the battery using the webcam,” “She’s very funny but we still learned so much” and “She made Science less boring . . . there was a lot of activity.”

She supports other teachers in locations not far from Marcus (Alice Elementary and Barkwood Community Schools), and these are included in the case as experiences of technology integration. The classrooms at these schools have smaller class sizes and are led by teachers who are taking the ‘first steps’ in technology integration. Each teacher has identified his or her need for support in using particular digital resources for literacy and numeracy. The following section details Gina’s perceptions of technology integration in light of the TPACK framework.

**Representations of Gina’s Perceptions of Technology Integration**

Gina was interested in the TPACK framework from the moment she heard about it: “TPACK is saying something complex in a simple way. I like its *simplicity*.” This sense of uncomplicated knowledge in her view of technology integration is evident in the reflexive dialogue in Chapter 2. Gina satisfies her thirst for content knowledge by “knowing my stuff.” Practical methods and practices of teaching are well understood, and observation of Gina in multiple sites demonstrates the adaptability of her pedagogical knowledge (or PK) to the context. When pedagogy and content knowledge link in Gina’s classroom, she describes that congruence in terms of: “Being an expert learner . . . I know something about curriculum, assessment and pedagogy . . . I would say these are characteristics of a teacher who is driven by values, attitudes and passion for teaching.” Gina uses her technology knowledge (or TK) to teach in highly imaginative and creative ways. When combined with deep knowledge of content (or CK), she utilizes technology to create a classroom context that students often don’t want to leave. They get ‘into flow’ and are engaged in what they are learning, and often seem oblivious to factors around time and repetition until the learning problems they
are working on are solved (PCK). The purpose of her technological pedagogical knowledge (or TPK) drives technology use. TPACK and how it combines in the classroom as observable classroom behaviors are on display every time Gina teaches. A mix of old and new technology enhances her unique approach to technology integration, and the main conceptions of this knowledge are specified in the case. Gina is able to bring all seven knowledge components of TPACK together when she teaches and this case study now moves to detail how this knowledge of her practice builds on a firm TPACK base to articulate specific conceptions of the HPC model.

**Main Conceptions of HPC in Practice**

Conceptions of Gina’s knowledge of technology integration fall into five distinct areas. Each conception comprises pedagogical themes of diverse teaching strategies and student learning processes; they are:

1. **Purposeful teaching:** purpose, planning and connections through language and conversation;
2. **Theory-driven practice:** constructivist teaching, teaching for quality and building a questioning environment;
3. **Creativity:** narratives in action, creating learning products and performance;
4. **Real-world application:** preparation for life, student voice and ownership; and
5. **Professional identity:** teacher roles and learning communities.

Each conception of her knowledge of technology integration is supported by comments from Gina and her students, as well as examples of her classroom actions and the documents she uses in planning. The first conception, purposeful teaching, is outlined next.

1. **Purposeful Teaching**

Purposeful teaching is a feature of Gina’s classroom and is used to guide students’ thinking. The importance of this attitude cannot be underestimated and she will often use the phrase: “It’s not just tech for tech’s sake.” She is able to stand back and talk about learning in domain-specific language. The conceptions of her knowledge of technology integration are underpinned by the pedagogical themes of purpose, planning and connections through language and conversation.

**Purpose**

Learning with clear intention is a personal philosophy that informs Gina’s choice of the right technology which fits the purpose. This perception extends to her
beliefs about technology and how the use of technology in the classroom must be thought through in advance:

"Teachers should use technology so long as it is purposeful. It is another resource in the classroom, and sometimes it is better if four or five students are working around one computer so they are talking and interacting. . . . they don't have to all be doing the same thing at the same time. . . . teachers have to get past the idea that they all need one [computer each]."

Gina likens the regime of the 1:1 classroom as akin to seating students in single desks; she asks these two questions: “When teachers use this approach to learning are we doing more of the same with different tools? [With] one student working on a laptop at their desk. . . . where’s the interaction?” These comments will be taken up further at the end of this chapter in *Professional conversation: fresh points to consider*. For Gina, purpose involves teachers knowing when to use technology and how to fit what they plan with an appropriate classroom tool. For example, a glue stick might be the right tool for cardboard construction, but alternatively, there are software programs that can be used for construction and these need to be selectively chosen. As Gina says: “You wouldn’t use PowerPoint to build a 3D sculpture.” This image links to her view of critical thinking and technology:

"It’s really good when we can use technology to learn. Sometimes it’s appropriate to use SketchUp to create an amazing house structure. Getting students to try to find answers to questions themselves, to think critically. Technology is a tool for learning how to learn and making sure we don’t knock this out of kids."

The “Model Car Challenge—Alternative Energy” lessons demonstrate this point. Students design their ‘clean energy car’ on paper and build the cars using cardboard containers, plastic bottle tops and other recycled materials. Cars are powered by rubber bands or balloons. Gina builds interest in the task with questions, hand-drawn diagrams, and a PowerPoint presentation of different energy efficient cars sourced from YouTube clips. She conducts an in-class experiment with vinegar and baking powder to demonstrate energy production to the whole class. The experiment simulates what happens inside a household battery. After the demonstration, she proceeds to dismantle the small battery-powered toy car wearing protective clothing. Gina uses a webcam to project what is inside the battery onto an interactive whiteboard. Students see what makes the toy work, and afterwards some students remark: “I really learned how a battery works by looking at the inside” and “I understood how it works when she [Gina] pulled the toy apart and I could see what was inside it. I saw it on the screen.”
Planning

Planning is central to creating good learning for students. This practice is not a ‘one-off’ or unique situation, and when asked about records and plans from teaching in other contexts, Gina responds: “It’s what I do. My plans are extremely detailed and time-consuming.” Guidance and planning for learning is an activity that stems from her view that teaching is bound by what is in syllabus documents, and she expresses her process in this way:

It’s governed a bit like the ‘rule of thirds’ . . . learning is not a free-for-all . . . if you are doing project-based work it’s not just picking anything to study, you are bound by official documents and you have to cover what the students have to learn.

Gina’s planning process is based upon prior reading of the topic ensuring that she is well versed in the accuracy of the subject matter, and here she explains her thinking:

Even when the knowledge is problematic . . . I see myself as a guide, or a planner on the side. You have got to know what you are talking about otherwise you may as well have untrained people doing the job.

In addition to plans on paper, or on her laptop, Gina likes to use mind maps to guide and connect content, and suggests that this gives students different ways to access information.

Connections Through Language and Conversation

The pedagogical theme of connections of language and conversation to content in syllabus outcomes is evident in both Gina’s planning documents and in her classroom teaching: “What I plan is [taken] from what the documents say I have to do.” Throughout the toy dismantling exercise, students build their scientific knowledge by making lists of topic words associated with her actions, for example: systems, energy crisis, potential energy, friction, solar, chemicals, electricity and magnesium.

Students were encouraged to keep track of new words and to make lists on paper pinned to the walls of the classroom. They began to use the new words in group conversation and while writing up their Science investigations in pairs. Gina reveals her belief that connections to discipline knowledge for students become more clearly understood when encouraging them to use specialist vocabulary, and how making lists of new words is one way to foster it. She says:

Students have to know the subject but I need to know it better. Some teachers see tech as a quick fix . . . it’s not a silver bullet. You have to know the words . . . the language, and you have to do a lot of thinking.
Students raise the subject of climate change in class discussions, and how in
their daily lives, they also contribute to pollution: “Batteries and what’s in bat-
teries contributes to landfill, and this in turn leaks into the water tables of cities,
causing pollution.” The importance of the world’s energy challenge is recog-
nized, and another student recalls his new knowledge:

I remember so many things . . . like how many batteries are used each year
in Australia . . . it was 345 million. I am going to use [batteries] less now.
They fill up rubbish dumps and white stuff comes out into the subsoil
which is bad for the environment.

Connections to Science through language and conversation are enhanced in
Gina’s classroom through her knowledge of technology integration and the way
theory drives her practice further.

2. Theory-Driven Practice

Theory drives Gina’s classroom practice. Overt articulation of education theory
from various sources supports her claims of its significance. In particular, the
theories of Dewey, Vygotsky, Bruner and Piaget are important. The postgraduate
Certificate in Gifted Education, which Gina completed soon after her teaching
career began, sustains her view of theory: “Education theory is pertinent, and
it has a role in differentiation and enabling all kids to access deeper and higher
order learning.” The clarity of her learning message is firmly based on theoreti-
cal beliefs about social constructivism, the emphasis on a pedagogical framework
like Quality Teaching (QT) and a particular questioning environment.

Constructivist Teaching

Gina models what she wants the students to do and consciously builds the envi-
ronment in the classroom in order for students to understand new concepts: “I
am not the knower. I use a constructivist approach. My students work in a learn-
ing community to build meaning of the world, out of the learning experiences
they engage in.” She adds to this view of constructivist learning, and also what
it’s not, in this way:

The students are engaged, they are on task, they are in task and they are, in
this case, learning Science for a purpose. The students in my class want to
come to school to learn . . . you don’t tell them . . . they have to experience
it . . . regurgitating facts is not learning . . . filling in black-line masters or
worksheets is not learning.

The pedagogical theme of constructivist teaching is prominent. For example,
when the battery is dismantled, students draw diagrams of their prototype car
and label its parts and energy sources. The diagrams serve as the basis for a movie made in a later lesson. Using ‘trial and error’ methods, students test wheel-type possibilities, chassis size and whether using a balloon or a rubber band will make the car move further. Gina sets parameters for them to achieve: “It is desirable for the car to travel more than three meters within a one meter track.” Road tests are carried out on a flat surface on nearby tables and each group measures, then records, the distance the car travels.

Students share the criteria they used to determine what makes a successful ‘clean energy’ car: “If the wheels are round and evenly spaced on the axle, the car goes much further” and “If we blow up the balloon really big . . . then it has more power . . . more energy to push it further along.” Students write up the process in workbooks and what is articulated by another student in the classroom triangulates with the lesson intention: “I had lots of ideas about how I could make a fast car with a balloon, but eventually I used some rubber bands to power the car and it went further.”

Teaching for Quality

Gina takes the notion of constructivist teaching and cross-checks her practice against the dimensions and elements of a particular pedagogical framework that teachers in this education jurisdiction have used for more than a decade. The pedagogical framework of Quality Teaching (QT) is based on the original work of ‘authentic instruction’ from the University of Wisconsin’s Center for Organization and Restructuring of Schools (Newmann et al., 1996), and more recently, the model of ‘productive pedagogies’ from Australian research known as the Queensland School Reform Longitudinal Study produced by the Queensland Department of Education and the University of Queensland (2002). Gina uses four questions from QT to inform her conception of technology integration:

What do I want the students to learn? Why will that learning matter to students? What do I want the students to produce? How well do I expect them to do it? I really believe you have to do all the QT stuff.

She reiterates the questions in the classroom and demonstrates how her learning plans connect to the students’ world so they are able to construct knowledge for themselves. For example, the big ideas of the unit link to the Science syllabus and the students’ knowledge of climate change and the world’s energy crisis. Technology underpinned by dimensions and elements of QT is a way of making effective learning possible in Gina’s classroom.

Building a Questioning Environment

The notion of consciously building a questioning environment and Gina’s repeated statements to students of “questions are more important than answers” were learned
early in her life. Not only is the belief continually articulated, “Ask me a billion questions,” Gina also fosters the students’ active involvement in questioning by asking questions while they work. She explains: “You have to create the right schemas in students’ minds.” At Marcus, while the students build their ‘clean energy’ cars, she initiates the task with a statement, and then follows it with two questions. For example: “Batteries are useful and we use 345 million of them each year. How many batteries might you have at your home in various devices? Is there a problem with that?” She answers students’ questions with other questions, for example:

Why couldn’t you use something else to power your remote-controlled car? How are we disposing of batteries at home? Where does this rubbish go? Can we use other energy sources to power our devices? What about power from the sun?

Gina insists that teachers need to ask the right questions to arouse students’ curiosity and starting off with an overarching inquiry question is essential:

Our job is not to produce people who know facts and figures. I have to get them to ask good questions that will solve the world’s problems. If they are not asking questions . . . they are not going to find the answers.

The example of “Ori’s Home” in one of her ‘handmade’ picture books stemmed from student curiosity. This text arose out of the study of rainforests in a class she taught at Hickson. One student was mesmerized by the ‘cuteness’ of a photo of an orangutan in nappies that they found on the internet. Gina used the photo as a trigger for a dilemma and a series of questions about deforestation, which were developed into the story of “Ori’s Home.” Many of the students’ questions are answered in the picture book:

The facts were that the orangutan (Ori) needed nappies after the death of its mother. The book promotes awareness of how rainforest destruction in many parts of the world is happening to make way for palm oil trees. Students hadn’t questioned why the poor thing had nappies. They asked me lots of questions as we began talking, and we looked up things on the web, and I made the book as a response.

The relentless questioning of students about their learning is observed at Marcus. Gina references this practice to Bloom’s taxonomy (Anderson & Krathwohl, 2001). In the classroom, she is observed praising one student for asking a good question. She then answers the student’s question with another question. Gina gives the student extra time to think, while other students try to speed up the response. She stops them, and asks them to respect that this student is thinking, and thinking takes time. Afterwards, Gina explains:
Bloom’s taxonomy is really useful here . . . these students are really starting to think more about their questions . . . now they are thinking a few steps ahead. I gave [Sally] more time to show that she could eventually come up with a thoughtful understanding.

This practice is confirmed by the student in question: “At first I didn’t know what to say . . . so many questions . . . but she really made me think. I got to the understanding without being told.” At the conclusion of the teaching period, students at Marcus show more thought in both the number and quality of questions they are asking in the classroom. The idea of questioning to develop thinking corresponds to Resnick’s Creative Thinking Spiral (2007–2008). This is a way to scaffold and model creative thinking, and is a conversation that is returned to at the end of the chapter.

3. Creativity

Gina was the recipient of a Microsoft Information and Communications Technology Scholarship in the first years of her first appointment at a school. This award gave her the opportunity to explore 21st-century learning in five schools in the USA and Canada. In the report of the study-tour scholarship, Gina cites creativity as the key for successful 21st-century futures. She adds: “Evolution in schools needs to come in four forms: creative curriculum, creative teachers, creative administration and creative classrooms.” Fostering opportunities for creativity appear limitless when technology is integrated into learning in Gina’s classroom. She frames discussion of how this idea links to how building new technologies manifests as “bias in software programs” and explains: “It is the way programs are designed that serves the producer’s purpose and that, generally, is not an education purpose.” If students are to be creators using existing technology and not consumers, the focus in schools according to Gina “should be on building new software.” It is her view that there are technology limitations in what students are currently given to work with in schools. This is a challenging idea that stems from her belief that elementary school students should know “the backend stuff,” in particular, computer language like html, and how to program computers. These ideas are discussed in more detail in the final chapter of the book. The conception of creation in Gina’s knowledge of technology integration is supported by her belief that “technology tools allow students to create” and “producing creative students is my number one goal as a teacher.” This aim is supported by the pedagogical themes of narratives in action, creating learning products and performance.

Narratives in Action

Gina’s ‘handmade’ books are examples of narratives in action. The stories are stimulated by syllabus outcomes and student questions, and then recounted
in picture book format to illustrate particular subject matter. For example: the “Egg-citing Egg Man” is a story about building a community, and how “Dr. Dumpty” was able to do that in his job in the circus. Gina explains that, in addition to the prescribed syllabus content, it is her role to make the narrative fit the learning outcomes: “Narrative is especially important when teaching students from non-English speaking backgrounds (NESB). They need to see the link between learning outcomes and language. Narratives are a good method of realizing that with NESB students because they relate to story.” The proportion of students from non-English speaking backgrounds was high at Gina’s previous school (Hickson), and this is where she believes she developed her storytelling skills. The pedagogical theme of narratives in action is explored further when Gina details her personal interest in computer games:

I like the really good ones, those with substantial stories, like the Lego stories, Age of Empires and Sim City. Extending the story is something I like to do . . . computer games blur the lines between home and school. You play characters in a game and can change into someone else.

She carries her gaming passion into the classroom when asking students to write: “the back story of a computer game to build literacy skills.” There is a deep process of narrative building when playing computer games and the experience of first-hand immersion in a scenario that is powerful: “I have seen kids at Hickson produce rich stories using computer games . . . they write really well . . . they seem to be more motivated by it. Technology is the hook.” Gina refers to academic James Gee, whose books include *What video games have to teach us about learning and literacy* (2003). She cites this work as a key reference point for her curiosity in new technology literacies. Students’ comments add support to Gina’s view of their significance, for example: “I really like playing computer games, they are really cool, they engage me . . . especially in Maths” and “My favorite game is this journalism game my sister has. I write stories, and I feel like a real journalist when I play the game . . . it helps me write and it also improves my spelling. I love it.”

**Creating Learning Products**

Video recording is at the top of Gina’s list of creation tools and she quotes “Flipping the Classroom” and the work of the Khan Academy as examples of why video is her favorite technology. Teachers in many parts of the world increasingly discuss how ‘flipping’ or the ‘flipped classroom’ transforms teaching practice. The idea has much in common with blended learning and is about teachers recording lessons live using screen capture software, and then posting the lessons online for students to access in their own time. For some teachers, it means they have more time in a 1:1 sense for students in the
classroom, while for others, it means they can’t just stand and talk for long periods of time, presenting endless content to students (Bergmann & Sams, 2012). Many teachers who have embraced the ‘flipped’ notion see themselves as learning coaches. Gina explains this preference: “Video recording is top of my register . . . it gives kids something to go back to . . . the idea of producing a video not just for the sake of themselves, but for other students . . . to a real audience.” Sometimes she records a short explanation of a concept that is shown in the classroom: “It’s a feature in my classroom. Recorded video material is made available for students to view in their own time, via the class blog or wiki.”

At the conclusion of the Science unit at Marcus, Gina shows students some video examples made by her class at Hickson. This group also made ‘clean energy’ cars and communicated their results in short video documentaries. Storyboarding and creating this type of response as a documentary commences during the final lesson at Marcus. Gina returns to the school and supports Christina, assisting groups of students in editing their final products over the following fortnight. Video production by students reinforces the significance that ‘what students create’ is what matters in learning. Students use flip cameras to photograph the cars they have made. They upload images onto computers, and commence writing scripts and recording voiceovers that are then edited into PowerPoint, ready for presentation to the whole class. Christina is excited by the prospect of capturing evidence of the Science unit: “It means that as a class we have a permanent record to return to, and parents can review what was done . . . we’ll all remember.” This pedagogical theme of creating products for learning is tied to audience, and the notion of technology making learning public is explored in the following section.

**Performance**

When learning is made public through performance, Gina observes a lift in the quality of the outcome. She says: “Happiness is when students hear their own voice; it lifts their performance and the quality of their writing. It’s also the idea of thinking and writing for a public purpose, but it always needs a context.” Students like to comment on other students’ work in a blog or wiki, and when using this medium often take more time to write, giving better quality responses because they are viewed by others, or made public.

Papert (1993) refers to turning the activity of writing, using devices that students like to use such as computers or digital cameras, into “hard fun” (p. 30). This occurs in Gina’s classroom when students storyboard, capture, write about and make videos of their work, as she explains:

If kids aren’t given opportunity to be creative and perform what they know, then how are they going to solve important problems? Victor Chang
[eminent Australian heart surgeon] made models and showed his peers when he was growing up—that creativity helped him become a pioneering doctor. These days we can add the video dimension and capture, and show, what is produced by students.

At Barkwood School, Gina, in her role as consultant, supports another elementary teacher to integrate technology while teaching a new unit of work on Australian bush animals. Gina and the teacher co-teach the lesson. Students use two collaborative technology apps to determine what they already know about the topic. The lesson demonstrates how apps designed to display ideas as online ‘sticky notes’ are useful, to add and grow knowledge in concert with peers in a classroom setting. Gina explains her approach and how this links to the value of technology in making learning public:

These apps encourage thinking, and I care about thinking and switching kids’ brains on so they can show their peers what they know. Using this type of app means students can see what others are thinking immediately, as they write up their thoughts on a digital wall on the laptop screen. This seems to trigger more really good ideas.

Simultaneously, as laptop ‘sticky notes’ are displayed on the interactive whiteboard, the teacher can gauge what the students know. Work from the lesson is saved for future reference.

4. Real-World Application

The notion of school and life being separate entities is not something Gina agrees with. If it evolves that way, then it’s proof that “learning is no longer important to students.” This sentiment captures the importance of Gina’s knowledge of technology integration and how it enables real-world application:

I consciously try to integrate knowledge, and various technology tools support me to do that. I must connect what they are learning to the real world as much as possible. The questions don’t stay in the books they read, or on the internet. I always ask “what did you learn?”

This conception is drawn together with the pedagogical themes of preparation for life, student voice and ownership.

Preparation for Life

Measurement systems that enhance education in schools are important and, in this education jurisdiction, standardized testing regimes dictate many assessment
practices in elementary classrooms. Gina ponders on whether her approach to education, which doesn’t involve exposing students to worksheet-based learning (or blackline masters) places her students at some disadvantage. This thought is articulated this way: “Should I give my students exposure to the ‘real world’ where worksheets and NAPLAN reign? Am I disadvantaging my kids because I don’t do that? Maybe they need practice?” In the report of her scholarship study tour, she mentions the example of King Middle School in Portland, Maine where “students use technology to support all their learning. The students are involved in rich, open-ended, real life ‘expeditions’ and are encouraged to take risks and imagine solutions to real life problems, and test their hypotheses” (NSW DET, 2007, p. 14). When questioned about this, she explains: “It stems from the line between school and real life being blurred and involves students as apprentice creators . . . citizens of the real world.” Since the introduction of ‘expeditionary learning’ at the school, King Middle School results on standardized test scores have shifted from being in the bottom third of the state to the top one-third of the state (NSW DET, 2007, p. 15). Gina believes examples of foundational approaches to learning like these are enabled through technology integration and, as such, promote deeper learning and preparation for life beyond school.

**Student Voice**

Accessing and valuing the voice of young people in what they are learning at school is being given precedence in education. It is technology and its ubiquitous availability in schools that Gina believes supports students to have a ‘voice’:

Technology gives reluctant learners a voice, the student who is not confident or who is not engaged can suddenly be good at something—when they develop their ideas, they can produce something using technology. It doesn’t always have to involve technology, but more often it does. The product can then be praised by the teacher.

Technology as a lever for ‘student voice’ was part of her fascination with Scratch and the establishment of a Scratch community at Hickson. Students learn important Science and engineering concepts using Scratch while they make something that is in their imagination a reality. Gina describes how students develop a personal interest in seeing their project become a reality, and the final products elicit feedback from peers and teachers. At Marcus, this idea is seen when two students confirm the teacher’s interest in what they produce, saying: “She likes our car and listens to why we chose a particular type of wheel” and “I have seen model cars like this in magazines but I didn’t think I could ever make one.” Gina says her approach to teaching is quite different: “I let go of control. Students have a voice in my classroom—the action of letting go empowers the students. I nurture them
and make sure they are on the right path.” Completion is important and encouraging students to persist and therefore complete work is valued.

**Ownership**

Students having control and ownership over their work is important in Gina’s classroom. This priority is linked to the pivotal role of technology and how ownership supports students to find their voice. She explains: “There are many positive things to be said about getting laptops into the hands of students.” Not only do technology devices reduce the logistical challenge of space in the classroom, they aid ownership and collaboration. She clarifies this effect: “It is so much easier to get into groups and work on a document collaboratively using Google docs with a portable laptop, as opposed to working around a desktop computer where one student is typing.” In another classroom at Barkwood Elementary School, where Gina supports a teacher with technology integration, the theme of ownership is observed in action when students commence using Claymation. One student says:

I feel like the work is mine when I can use what the teacher shows us . . . all the little animation clips. I really like it. [Gina] came to our class last week too. I want to make my own animation now.

There is an argument that if students have ownership over their work, then the work is meaningful to them and they are more likely to remember it (Richardson, 2008). In this classroom, students create mind maps after the animation discussion led by Gina, while another student makes notes in a word document. A student at a desktop computer is looking up a website, while two others work with Plasticine materials on a plastic mat on the classroom floor in preparation for storyboarding their movie. Gina argues her approach stems from a principle:

Learning at school must be challenging, interesting and personal . . . it gives students ownership. Technology gives them a chance to collaborate. Access and playing with lots of stuff allows their strengths to be valued.

**5. Professional Identity**

Gina’s initial role as a classroom teacher has evolved in a short period of time to include more professional responsibility. Her move from the classroom to the role of assistant principal, to consultant and to school principal is testament to her employer’s recognition of her considerable talent as an exemplary educator. She also expresses a desire to “return to the classroom” and her new position of teaching school principal will combine that wish with
responsibility for pedagogical leadership. These professional duties are conceptualized in Gina’s construction of technology integration as dependent on a professional identity built upon the pedagogical themes of teacher roles and learning communities.

**Teacher Roles**

Expanding the multiple roles that teachers naturally take on when teaching in a school provides opportunity for professional growth. The role of technology consultant gives Gina license to work alongside education colleagues beyond her own classroom:

> It is an explicit role. You see, when I move from one site to another, I respond to what each teacher prefers. At Barkwood, I had to set up an old computer with a screen. I was more of a ‘guide on the side’ in that classroom. In the second and third lessons using Popplet, and then Claymation at Alice Elementary, I was in the role of expert. The teachers wanted me to teach them how to use these tools, as well as their students.

The different approaches to technology professional support are highly dependent on context. Building professional relationships with each teacher is done without threat and with a sense of humor. Gina sees her approach in these terms: “I like working with teachers, you create rapport on the fly and gauge very quickly where they are at with technology integration.” She couples her hands-on role with a concern for the profession’s responsibility to accept technology in education settings, and continues:

> Teachers and schools should get over technology as a new thing, instead they should use it as a tool to integrate everything they do . . . it’s like having oil pastels in your classroom . . . just another option to support how students learn . . . it’s not the focus of learning.

There is some suggestion of her frustration with how slow education systems have been to require teachers to be ‘tech savvy’:

> I did my first technology presentation on podcasts to teachers in schools seven years ago. Now all these years later I am still being asked to do the same presentation. I get annoyed that there is too much talk, and that we still have to convince teachers that technology is worthwhile. It hasn’t moved very far . . . it’s still getting there.

The idea of modeling practice and shifting teachers’ ideas about classroom control is critical in her conception of how systems should support professional
learning for technology integration. Gina gives teachers many options on how to approach technology integration:

Teachers are very worried and have strong concerns. Perhaps there is a problem in their teaching practice to start with? I might start by asking them about how they believe they control students. Technology is blamed as the issue . . . maybe it requires teachers to be too liberal? They have to shift their sense of control.

Notions of having to know more than students dominate some teachers’ perceptions of what it means to teach (Dewey, 1938; Hayes et al., 2006). This is not Gina’s experience of technology integration:

Teachers do not need to know about every single tool available to them. They need to understand the concept of Web 2.0 and that there are a plethora of tools to access, such as blogs, wikis and podcasts at a minimum.

There is also value in turning students’ technology knowledge into a real strength in the classroom, and she says: “When teachers say they don’t use technology because students know more than them it’s a cop out. Teachers must help students make connections so that unconnected things link together.”

Learning Communities

Closely aligned to the theme of teacher roles in technology integration are learning communities. Gina describes her conception of the classroom as a learning community as: “A community of learners which includes the teacher.” She gives reasons for why technology conversation beyond process is important: “Teachers must be willing to learn and know how texts work in technology mediums, and know what makes an effective text. Technologies have literacies themselves, which will increasingly need to be addressed.” The reality of the consultancy position suggests there is still ground to be covered by Gina in finding effective means for technology-focused teacher professional learning. Often, the focus on technology tools and processes means there is less opportunity to talk intensely with teachers about learning and to affirm their professionalism within a context of continuous learning community. She laments: “I sometimes miss the deep discussion about what works that comes from ongoing contact with the one class, or the one group of teachers.”

Teachers in learning communities within some school structures have opportunities to play with technology and network with other technology users (Thomas & Brown, 2011). Gina, like many other teachers, regularly cultivates this need through a PLN using social media tools like Twitter. She argues: “Teachers should be able to play around with technology, have a PLN . . . technology knowledge must be supported and enhanced. Who do I go to if I can’t
do something? It gets a bit lonely sometimes. My PLN helps me a lot.” Not a new idea, the PLN in the technology context supports informal learning based around common technology ideas and interests.

The importance of a willingness to learn by both the individual teacher, and, more broadly, the education system, is a repeated theme in Gina’s conception of technology integration. Professional identity affirmed through support for teacher roles and learning communities are the preferred means to enhance teacher knowledge of technology integration. The concept of students learning in community in the classroom using technology, and therefore constituting their own learning community, is situated within Gina’s understanding of this pedagogical theme.

**Professional Conversation—Fresh Points to Consider**

In summary, this case study illustrates more fresh ways to understand another teacher’s knowledge of technology integration. The conceptions of purposeful teaching, theory-driven practice, creativity, real-world application and professional identity are phenomena that distinguish Gina’s practice. Each pedagogical theme in this conception of her knowledge of technology integration adds unique and some common understandings, and provides further possibilities for what can be shared in other teachers’ classrooms. Table 4.1 shows what emerged from the data collected in Gina’s classroom.

Establishing a clear purpose for including a particular technology in classroom learning precedes teacher planning, and allows for practice that opens up connections that a teacher is able to make through language and conversation. Furthermore, constructivist teaching based on education theory and teaching for quality, using a particular pedagogical framework where the focus is on building a questioning environment, assists students in Gina’s classroom to think about what they are learning. Students’ films made using computer hardware are key products that enable students and the teacher to publicly demonstrate learning. Creating narratives through construction of contextualized storybooks

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**TABLE 4.1** Key conceptions and themes in Gina’s classroom
and telling stories to understand subject matter content are common in both Gabby and Gina’s classrooms. If schools develop this teacher skill set and combine professional support in technology integration with teacher-partners who are technology savvy, as Gina was able to demonstrate in her consultancy role, then teachers will be inclined to take risks with technology integration in the classroom.

**Discussion Pointers**

In a whole group or working in pairs, discuss the following questions and record your answers as a podcast using your mobile device:

1. How does planning establish the purpose of learning in your classroom?
2. What are the key education theories that inform your practice?
3. Why are learning products important in effective technology integration?
4. How do you enable student voice to be a priority in your classroom?
5. Describe one learning community that you have established that was built around a ‘maker classroom’?

**Notes**

2. These are terms from the project of the Fair Go Team: School Is for Me: Pathways to Student Engagement. Sydney: Priority Schools Funding Program, NSW Department of Education and Training (Munns et al., 2006).
3. The Quality Teaching framework is a pedagogical model that would normally fit with constructivism. The discussion paper featuring dimensions and elements of the framework can be accessed at https://www.det.nsw.edu.au/proflearn/docs/pdf/qt_EPSColor.pdf
4. Popplet and Linoit are the apps used, one is for sharing ideas and the other is an online sticky note service.
5. NAPLAN refers to the Australian government’s National Assessment Plan for Literacy and Numeracy.
6. Claymation is one of many forms of stop motion animation.

**References**


With apologies to E. E. Cummings

You take your laptop with you (and place it on the desk)
I am never without mine (always in this classroom)
I work you work, my students; and what is done using QUEST we will
share together

Learning (for your learning is important)
I want to prepare you for life (for the world beyond school)
It's in this classroom that values are central
And whatever you do
make a difference

Here is the essence; technology means working with ideas
It's no secret (I wish more teachers would embrace it)
(here is the crux of the problem and the problem of the crux)
I cannot play the game, the game is not my game
it is over now

You take your laptop with you (and place it on the desk).

The ‘creative memo’ that begins this chapter is a poem adapted after the work of E. E. Cummings, a poem studied by the students in English in Nina’s classroom. It captures the learning space and her philosophy of technology integration. Nina teaches gifted and talented students in the middle years at Starton School. In her classroom, each student works on a laptop provided by the school, this gives students access to iMovie, Garageband, Audacity and a suite of Adobe software programs, and students also use digital cameras. A class wiki, iWeb and desktop sharing are the main organizational tools for teacher and student work files and communication.
In the last chapter, I showed how *High Possibility Classrooms* (HPCs) looked in the spaces of both teacher and consultant, Gina, in three elementary school classrooms. In Chapter 3, I argued in the case study of Gabby that the conceptions and underpinning themes of the HPC model enable effective technology integration to be taken up by teachers in spite of the strength or otherwise of their technology experiences if they focus on pedagogy.

In this chapter, I present details of Nina’s professional background, the school, the classroom, the representations of her perceptions of technology integration and the main conceptions of HPC that commence with a focus on praxis. Nina developed QUEST (an inquiry-based framework meaning Question Uncover Explain Share Together that arose from her own doctoral research). This student learning process fits within the theory conception in the HPC model. In the second conception, Nina emphasizes theory-based learning with a focus on active construction and relentless probing and questioning. Metacognitive learning using laptops supports her personal technology philosophy. The pace of learning in this classroom was significant and quite unusual, and it was this practice that carried her students to learn subject matter in a robust way. The third conception that informed Nina’s practice was creativity. Values of joy and celebration and preparation for life, and creating a community of learners were central to that notion. The fourth conception focused on shared ownership and self-regulation in learning, and the final conception of ‘redefining the game’ in this classroom was about personal context and conflicting system demands.

At the end of the chapter, there is an opportunity to hold a professional conversation around a series of provocations on Nina’s practices in *What is fresh?* It is Nina’s professional background that I now turn to.

### Professional Background

Nina set up the server in the school when she established the school’s first computer-mediated classroom. Her role as the current Year Coordinator means that she has responsibility for the choir, peer support and the Middle Years Experience, which focuses on technology and linkages to nearby high schools. From the moment she stepped into Starton School as a beginning teacher, Nina was recognized as a technology leader. With the support of her previous principal, she pioneered one the first one-to-one laptop classrooms in Australia. This approach attracted the attention of high level bureaucrats, Ministers of Education and the Australian media who continually visited her classroom over a two-year period. After this time, again with the encouragement of her school principal, Nina returned to full-time study and completed her PhD in education and learning design. Nina was re-employed at Starton three years later to implement her study findings. The question of ‘how children learn’ fascinated
her. Motivated to find an answer, she used her recent teaching experience as a catalyst for her doctoral study:

I realized I didn’t know how to answer the question when I finished my initial teacher education, but my PhD changed all that. I support Dewey’s vision of learning but he didn’t have a mechanism to bring about that vision . . . technology is the medium that can do that.

Of her own early schooling, Nina recalls a particularly influential elementary school teacher: “Miss Brown asked lots of good questions.” The questions, she says, made her feel valued and it was with this teacher she could share her world view:

I didn’t see what other kids saw, she valued me, she liked the world and so did I . . . we had these exercises where we had to cut up triangles of paper and mine was different to the other kids, but she validated my response.

Also influential was her childhood home environment, where computers were ever present. She is keen to point out that she doesn’t use much technology at home: “I’m pretty picky about technology. I don’t own a digital camera, nor do I use blogs, Twitter or Facebook and I don’t have the latest iPhone. I’m a people person outside school.” She sees technology as a part of her professional identity, and any support she required in ‘technology trouble-shooting’ comes from a computing colleague external to the school with whom she shares the same skill level. Teachers from her school draw heavily on Nina’s technology expertise, and she frequently makes herself available to assist colleagues. She expresses doubts in the support:

Teachers who choose not to use technology cause me distress . . . it’s our tool of trade. It’s not appropriate that [other teachers] dodge technology for so long. In medicine, and in law, people didn’t get a choice when hospitals and firms moved to new ways of managing files and doing their work . . . teachers risk being left behind if they don’t embrace technology.

The following section details the context of the case study.

The School

The school was established in 1961 and is located northwest of Sydney. Starton offers tuition to approximately 657 students from the beginning of school education to the end of the elementary years (or the first two middle years). There are approximately 31 full-time members of staff, most of whom are female, and the class sizes range between 21–30 students. The school is positioned in a leafy suburb where the socioeconomic background is “mainly middle class.” No student at
the school identifies as coming from an Indigenous background. However, 39% come from language backgrounds other than English, and most of these students speak Hebrew or Cantonese/Mandarin. Nina describes the school this way:

We’re in a well-off area . . . kids have lots of great opportunities outside of school. We have a large group of students from South Africa. On the whole, the kids do very well in things like NAPLAN and International Competitions and Assessments for School exams. We also had three kids go to national competitions for swimming, and between them they won 11 medals and broke 2 records. It’s a pretty special school I think.

The school’s education philosophy targets ‘gifted and talented’ students, as well as technology and cultural opportunities for all students. Nina plays a key role in teaching ‘gifted and talented’ students in the school. The school has a specialist enrichment program; the “Kingston Unit for Gifted and Talented Students” offers a four-year extension course for students in Mathematics, higher level thinking skills and problem solving, e-learning projects including Robotics and Animation and mentoring, utilizing experts in Engineering, Algebra, Law, Biogenetics and Astronomy.

Resources, programs and extracurricular cultural opportunities include the teaching of French, Italian, Mandarin and Hebrew, and school music programs, all of which draw enthusiastic parental support. A few years ago, the school received funds from a government initiative for the construction of a new library, an administration block and three additional classrooms. The school has a connected classroom with video conferencing and an intranet, with resources and sites available to students from the networked computers in the library and in classrooms. Most teachers’ classrooms, not including Nina’s, have an interactive whiteboard, and there are plans to install this technology in every classroom throughout the school.

There is an atmosphere of community and support between students and staff, and the motto displayed prominently in the school foyer is “Learn to live.” Students’ achievements and awards are also showcased, and outside, the well-tended school grounds include large playground spaces and a community garden. Nina states her views about the provision of rich learning opportunities in the school: “Music, sport, technology . . . they’re very lucky kids. There are wonderful excursions and camps, there is the gifted unit. The community is very involved and supportive—but they also expect remarkable things from their school.”

The Classroom

It is a 1:1 classroom, and the middle school laptop program adds to the variety of technology interactions that students at the school access from the start of schooling. The first computer-mediated classroom was established by Nina at
Starton more than a decade ago, and the school is a designated “Apple School of Excellence” because of its recognized technology focus. Her 28 students are in the second year of middle school, there are equal numbers of males and females, and most have been together since the early years. Nina talks about the importance of community in the school. She believes this phenomenon is supported by continuous class grouping of students right across the whole school and makes the following comment in reference to her previous class:

It’s interesting that they were in a class for four years in a row prior to coming to this class. Not many children spend so much time together. It builds a remarkable community. They’ve kept very close this year, even after starting high school. Four of them from last year have joined my robotics team, and come back to my classroom for meetings, and to work on programming.

Two boys in Nina’s class have just returned from competing in a prestigious Mathematics Olympiad for secondary students. They are ranked in the top 2% of the state, and “some of her students achieved 100% in the high school papers.” Nina adds: “The class has mainly ‘gifted’ students, most of who fall into the profoundly gifted range.” When students leave this school, the majority go to selective or independent schools in other parts of the city.

Each day Nina uses a large, pull-down projector screen as a pedagogical tool to display each student’s laptop screen using the remote desktop sharing function on her laptop. From this position, she can monitor from four to nine laptop screens at a time. The students share and swap ideas on what they are doing, and if the screen shows that they are off task, Nina brings the students back on task. When asked about this technology, one student explains: “The remote desktop is good because if someone is doing a particularly good piece of work the teacher can show that person’s work on the projector screen. It’s really helpful.” Another student recognizes its classroom management purpose: “It means we can be shown doing stuff . . . like sending photos and other distracting stuff, . . . stuff we are not meant to be doing.” In Nina’s mind, this function is part of her system. She says: “I am trying to create learning behaviors, and technology enables efficient learning—I have one system consisting of the remote desktop, the wiki pages and the iWeb.”

The comfortable carpeted classroom is dotted with small clusters of tables, and includes a withdrawal space with four desktop computers. Carefully arranged, long bench seats are placed around the perimeter of the room. These were purchased by Nina, and the students regularly use them for laptop work in preference to sitting at a desk. Also, Nina says: “I procured all 28 laptops from a nearby non-government school for $500.” She rarely sits at her ‘teacher desk’ which is furnished with a desktop computer, preferring to see that location as another shared space for students. The students like to work with computers in this
classroom, and a comment made by this student is typical: “Laptops enable us to do new stuff, like digital portfolios, web pages, podcasts, programming . . . it's really developed our interest in learning.” Another student confirms this:

At the start of the year we weren’t used to technology—it’s better now we can do more. Miss . . . has helped us become better and better . . . having a teacher who really knows how to use technology has extended our knowledge.

Nina moves around the classroom with her laptop perched on one hand, and regularly sits down to work with students, either on the benches or at a desk. It is quiet and highly work-focused each day. For two hours each week, Nina teaches with a specialized Mathematics teacher from a nearby high school. Lesson documentation shows coverage of specific parts of the secondary school Mathematics syllabuses, such as Mathematics patterns, investigations and creative responses to problem solving. Students have already moved beyond most of the state’s syllabus outcomes, and Nina extends her students using ideas from syllabus content from other school systems. Some examples of this include a range of UK English Tests, “Thinking Adventures,” “Kidspiration,” interactive online “Gizmos” in Mathematics and Science and “Positive Tracking.” Nina’s perceptions of technology integration are detailed in the following section in light of the TPACK framework.

**Representations of Nina’s Perceptions of Technology Integration**

The lessons in the case study focus on literacy, and this includes lessons on poetry and the novel, as well as numeracy, peer support and one physical education session. Of particular interest is the time devoted to QUEST, an acronym for an open-ended pedagogical sequence that stands for Question, Uncover, Explain (or Explore) and Share Together (the concept is fully explored in the chapter).

In essence, QUEST aligns closely to the TPACK framework as it integrates student exploration of subject matter based on questions that are guided and enhanced by further questions (or the PCK and the CK in TPACK). Subject matter is ‘checked’ by students, and may go beyond the teacher’s own subject-matter knowledge. Subject matter is efficiently researched using technology (in this instance guided by Nina’s TCK), and is then presented in the Share Together component by students, using laptops. The students’ technology skills are enriched by Nina’s extraordinary technology knowledge (or both TK and TPK): “I love the search aspect of technology, I like programming, and I like the back-end. I like understanding how it works.” This knowledge actively supports Nina’s conception of technology integration as the most efficient way to bring about unique learning affordances for students. The QUEST framework culminates
and embodies TPACK as an effective approach to technology learning by design. When given this proposition about similarities between QUEST and TPACK, Nina argues: “TPACK is a bit neutral, there are all the things that we as teachers bring to it . . . our particular values and our purpose. . . . I would describe TPACK as an orderly framework, it doesn’t acknowledge the unexpected.” This issue is taken up further in the final chapter of this book. Nina is able to bring all seven knowledge components of TPACK together when she teaches, and this case study now moves to detail how this knowledge of her practice builds on a firm, TPACK base to articulate specific conceptions of the HPC model. The main conceptions of Nina’s knowledge of technology integration are set out below.

### The Main Conceptions

In this middle year’s classroom, conceptions of technology integration fall into five distinct areas. Each conception comprises diverse teaching strategies and student learning processes. The five conceptions are:

1. **Praxis**: QUEST, theory-based with a focus on active construction and relentless probing and questioning;
2. **Metacognitive learning through technology**: technology philosophy, pace of learning and robust subject matter;
3. **Creativity**: values of joy and celebration and preparation for life;
4. **Community of learners**: shared ownership and self-regulation in learning; and
5. **Redefining the game**: personal context and conflicting system demands.

The following sections of the case study note each conception of technology integration and the pedagogical themes. The first conception, praxis, is outlined next with specific examples of how the conception reveals itself in practice.

### 1. Praxis

When teachers take a praxis approach to their teaching practice, it is very influential (Bernstein, 1983; Kemmis & Smith, 2008). Here, the distinction made by Carr and Kemmis (1986) and Kemmis and Smith (2008) is relevant for Nina’s classroom:

Praxis is not simply action based on reflection. It is action which embodies certain qualities. These include a commitment to human wellbeing and the search for truth, and respect for others. It is the action of people who are free, who are able to act for themselves. Moreover, praxis is always risky. It requires that a person “makes a wise and prudent practical judgement about how to act in this situation.”

(p. 190)
These highly complex ideas play out for students through frequent opportunities to act with freedom and autonomy in their daily classroom experiences. This praxis conception is supported by the pedagogical themes of QUEST, theory-based with a focus on active construction and relentless probing and questioning.

QUEST

In the classroom, QUEST is the framework that enacts praxis in Nina's conceptualization of technology integration. She explains it this way:

Q is the Question part . . . this acknowledges what you want to know about, what has caught your interest, what you would like to understand, and what you would like to know more about. U is for Uncover . . . this is about acknowledging that our community has insight into the subject being studied, there are things people have already found out, and students need to uncover what is already known, who has been involved and then uncover what they can look at . . . is there something more they can reveal and show? E is for Explain . . . [it] requires students to think about the subject in a clever and insightful way to explain and demonstrate what it is that they know and understand; and the S and T are for Share Together. This is when we sit down with all of the QUEST groups, and what has been learned is explained and shared with others. You can go on your own QUEST, but then the experience is shared together with peers. This is the heart of what I came to understand about the type of education children are entitled to.

Students use QUEST to study subjects they are interested in from recess until lunchtime each day for two to three weeks in three- to four-week cycles across the school term. QUEST ratifies “real learning for students.” Nina adds more detail: “I've tested my own theories about learning and I've found that my theories, my values, do not fit with the broader curriculum. I therefore use my own approach, and the PhD gave me a good foundation.”

Laptops are the most potent tools to carry out QUEST work, and provide students with necessary risk-taking opportunities in learning. Nina explains: “Computers enable powerful work with ideas. They mediate relationships, and the QUEST approach puts [the students] in precarious learning situations where they have to find solutions and solve problems.” In addition to the work of Dewey and Piaget, Nina is heavily influenced by the work of Papert. One chapter in her doctoral thesis is devoted to research design based on Papert’s five-step approach to education research, as the methodological foundation of investigation into how children learn. Students cover many different subjects using the QUEST framework and learn about subjects like: Dangerous additives: what do they put in our foods? Google vs Yahoo: which is better? And, Flowers: What gives them color? One student articulates this approach to learning, and what he
says supports Nina's intention: “We are free to do whatever we want. When we work in a group there are lots of viewpoints. QUEST lets us study any subject and uncover it.” Another student speaks about her QUEST on flowers, reinforcing what was said: “I love working this way . . . we mix up our groups, not just our friends, this time we might make a photo booth in *iMovie*.” Nina uses QUEST regardless of the nature of the student groups she teaches at Starton. She readily embraces Papert’s learning ideas and her classroom mirrors his vision.

**Theory-Based with a Focus on Active Construction**

Theory underpins QUEST, and drawing on notes from her doctoral thesis, Nina states: “Learning theory is a biologically based generative theory of learning that draws insight from neuroscience and evolutionary epistemology.” Such theory she says considers learning as evolved adaptation, and is derived from the work of Edelman (1992) and Plotkin (1994) who test ideas based on their value. This view of learning is detailed in the thesis, and she articulates its three central characteristics: “It is driven by values, it is a process of generating and testing those values, and lastly, it is developmental.” Nina compares and contrasts her approach to learning with the school’s approach and with that of her teaching colleagues. Her outlook is reflected here:

> Powerful research insights from the late twentieth and early twenty-first century have highlighted young children’s status as humanity’s pre-eminent learners as a result of their privileged position in their communities and the phenomenal early growth of their brains.

Nina’s view of learning theory drives her design of education contexts and pedagogies that accommodate the ways she believes children learn best. This links to her practice of constant probing and questioning.

**Relentless Probing and Questioning**

In the classroom, the sense of being “pre-eminent learners” is consistently revealed through the work of QUEST and the manner in which Nina continually questions students. She asks them to stop working, and then ‘throws out a challenge.’ This pedagogical theme is closely aligned to the QUEST framework and is observed on a daily basis. It is rationalized by Nina as another effective way to achieve technology integration and involves the use of “Thinking Adventures”:

> I enjoy them . . . I want the students to think about cause and effect for the immediate, the short term and the long term . . . what are the implications,
these daily ‘adventures’ challenge the mind and what other people might have thought about before.

Such tasks require students to consider complex questions or scenarios from different points of view and arrive at win/lose, compromise, cooperate or withdraw outcomes. Students quickly consider solutions that seem to best fit the situation, and they justify their choice in a group debriefing. Detailed in the following section is the important conception of learning how to learn more about learning.

2. Metacognitive Learning Through Technology

In his famous book *Future Shock*, futurist Alvin Toffler (1970) writes about how “the illiterate of the 21st Century will not be those who cannot read and write, but those who cannot learn, unlearn, and relearn” (p. 14). In Nina's classroom, this idea is advanced further. Knowledge of technology integration in this conception is substantiated by the pedagogical themes of technology philosophy, pace of learning and robust subject matter.

**Technology Philosophy**

Nina often refers to the work of two technology philosophers, Ihde (1990) and Bronowski (1974). Their insights lay open a way of recognizing and appreciating how people interact technologically with their environment. Adaptation and the potential of technology to mediate learning are reflected in shifts and changes in Nina's pedagogical style during each learning session. She rationalizes this behavior when it is drawn to her attention: “What I want to achieve with a particular group of students stems from modeling learning and being a good learner myself. I even say to my students . . . ‘watch me learn.’”

Some education research examines the notion of whether teachers in 21st-century classrooms should be ‘facilitators of learning,’ or ‘guides on the side.’ In earlier accounts, McWilliam (2009) cites the notion of “meddler in the middle” in technology contexts (p. 282). When questioned about this idea, Nina believes that she does not conform to any of the models, instead: “I see myself as mentoring the students through their own learning. . . . I am just a bit further along on my journey of learning.” This point was made in the context of teaching mainstream students, and how the ability of the class group didn’t alter her technology philosophy. In the classroom, there is the suggestion there are aspects of all three models in her behavior. Nonetheless, it is the students who articulate agreement in how they understand Nina’s technology philosophy:

Miss . . . will give us a base to work from, but there is room to figure out things for ourselves, and if someone in the class knows how to do
something they will put it on the wiki. If we don’t know how to do some-
thing Miss . . . will have a bit of a lesson and show us how something is
done and how awesome it is.

Nina’s perception of the ability of technology to pave the way for learning
stems from her belief that “teachers must give students a say in what they want
to focus on in their learning.” Nina says: “Technology is the mechanism. . . .
It’s the most powerful way to work with ideas.” She adds: “Technology enables
students to learn more because it’s efficient . . . it lets students learn more about
their learning . . . to really look at it . . . you can’t learn about learning without
learning about something.”

Nina appreciates that technology is for the individual, and links this to
notions of ownership and engagement in learning and to the idea of learning
being a “generative act” (Cosgrove & Schaverien, 1996, p. 113). Each student
working with a laptop is the means to achieve “more fluid technology integra-
tion.” Moreover, Nina is critical: “The interactive whiteboard stole the future of
what technology could be in schools, it just ‘technologized’ what many teachers
already did.” She remarks further: “This technology serves to reinforce didactic
pedagogy. It’s only a tool for the teacher.” The comments were made in refer-
ence to the significant commitment by her employer, the state department of
education, to support the implementation of interactive whiteboards in public
schools.

Pace of Learning

Recent education research confirms Nina’s concerns about interactive white-
boards and their role in modern classrooms as another form of a ‘high-powered
overhead projector’ (Schrum, 2011). Tied to Nina’s technology philosophy is
the perception that content is covered more efficiently when technology is inte-
grated. She explains: “The pace of learning must be monitored, never underes-
timate what you can get done in two minutes.” Most students in the class, when
asked about this, nod in agreement, and one boy states: “You get more work
done using a computer . . . it’s so much faster.”

Keeping up the pace, with frequent reminders of time, is a priority when
discussing ‘qualities of a good leader’ in a peer support session. Here, one student
is seen scribing whole class responses on a laptop, which are displayed simultane-
ously in the class wiki on the projector screen. Pairs of students use the responses
as the basis for creating a fully edited interview in a ten-minute time frame.
Most students complete the task, and the quality is impressive. Nina says during
the process, “good to go” and the students respond “all good” when they fin-
ish. Reminders of time and how much time is left in each learning session are
persistent classroom structures.
Robust Subject Matter

For many years, education research on “quality teaching” has suggested teachers need to know their subject matter well (Hayes et al., 2006; Newmann et al., 1996). This view of the importance of subject matter knowledge is prioritized in the TPACK framework of Mishra and Koehler (2006). Nina has a particular view of content integration, and she says: “I am not a fan of integration . . . subject matter should be thought about in terms of themes within subjects.” When students explore subjects using QUEST, they are not considered in an integrated perspective. This is congruent with Nina’s view about using technology to study ideas. She says: “It’s the most efficient way to do that exploration. They know how to learn but don’t necessarily understand why different methods of learning work for different subject matter.” Nina checks documentation prior to the start of the school day. When asked about this, she says:

I still make sure I tick all of the [syllabus] boxes. Content can be covered more deeply using technology, so that students relate to the subject in a very different way. In this way they learn more about their learning.

Technology enables flexible access to content, and teachers pick up substantial information as they need it. Nina views the laptop as her “modern-day storeroom.” She notes: “In the past, I would grab what is useful out of the storeroom or the textbook room. Now I grab content off the internet . . . off websites.” An example of the “storeroom” idea in action is observed on Remembrance Day when Nina talks to students about the significance of the day just prior to recess. As she speaks, she quickly pulls down the projector screen and accesses an internet link to watch the closing parts of the ceremony via livestream telecast from the Australian War Memorial in Canberra. Technology is immediate and available; previously, this activity would have involved looking up the library catalogue, finding suitable content, making a booking in the library and leaving the classroom. This is no longer the case.

Creativity in this classroom is a priority. The third conception is underpinned by pedagogical themes of the values of joy and celebration and preparation of students for life. Both themes are detailed in the next section of the case study.

3. Creativity

In this classroom, there is a total focus on learning. It is observed in what Nina plans and in what she articulates to students. Pedagogically, it involves modeling the roles and values of “good learning,” and this is about “being creative”:

I have noticed that I am different to other teachers. I seem to be very imaginative with technology . . . I see what is there and then I go, OK
Teachers like Nina repurpose technology for their own educational or pedagogical end to benefit student learning. Feedback on learning is continually given to students, and there is intensity about learning every moment of the day. It is valued and made visible in novel and poetry lessons and through work in QUEST in the Share Together component. Students produce and share their learning in podcasts, 3D games and sketches, movies, complex slide shows using Keynote, Scratch projects and digital stories. Nina states: “QUEST is about reporting on concepts creatively and then powerfully demonstrating what you have learned.” She reasons further: “I want to be creative and I want the students to totally let their imaginations go.” Increasingly, in some education literature, the significance of creativity is discussed “around an attention to a quality of personal ‘challenge’ for young learners and to the making of certain kinds of subjectivity” (Sefton-Green & Bresler, 2011, p. 1). Her concerns around creativity focus on: “Protecting students’ innate creativity and their learning ability from conforming to the school system’s values.”

In addition to QUEST, her classroom also features social studies project work in the form of Asia Pacific Projects (APPs). Examples of APPs focusing on countries in the Asia-Pacific Region are displayed on the classroom walls and include support materials developed by students in their iWeb pages. She explains: “It’s all about opportunities for students to produce work that will also set them up for life.” In the classroom, groups of students contribute to storyboarding, and then make a short film about ‘the school they would like to attend’ titled “Breaking the Silence.” It is shown at a major student-led conference with other schools from across the state. The conception of creativity in student-centered approaches to technology integration is supported by the pedagogical themes of the values of joy and celebration and preparation for life.

**Values of Joy and Celebration**

Nina takes time to explain her values to students prior to commencing particular tasks. When asked about this behavior, she says: “My focus is on a sense of celebration, excitement and joy. These are the most important values I hold, and I focus on my students being spectacular . . . I want them to know this.” This type of comment is not uncommon. For example, in the context of peer support training, she says to the class: “I value this task because it will give you time to think about what a good leader should be, and what values good leaders should possess . . . when you are working with the Year 1 students tomorrow.” This perception is reinforced again: “Teaching is about values, everything is about values, and you must honor and recognize how your students see the world. It’s my values that shape the learning process.”
The overt displays of joy in seeing students learn are highlighted in prolific exclamations throughout the day, as she regularly says to students: “How fabulous,” “What joy,” “what glorious super-child has done that” and “We must celebrate what you have learned.” Students in the classroom express ideas about values and the importance of the value placed on learning. They know that what Nina values is different to their learning experiences with other teachers. Comments from three students directly address this point: “Technology in [this] . . . class has really developed our interest in valuing learning,” “It’s made us interested in what we do” and “So different to other teachers . . . it’s a chance to explore different ways of learning and giving us a head start on how to learn with technology.” Nina confirms the students’ perception: “They value learning using technology in their classroom, they understand what they are using it for and any frustrations they experience are far outweighed by its positive effects.”

**Preparation for Life**

Nina is conscious of preparing students for life beyond middle school. She remarks: “It is my duty to monitor time in every lesson as part of preparing students for high school.” This belief was revealed in the classroom. When asked about this conscious strategy, she states:

> Often I get frustrated when one level of school (in this case the second years of middle school) is used as a stepping stone to the next level of schooling (high school). Different levels of school have their own intrinsic value and need to be true to themselves.

She adds further detail:

> Schools need to understand and teach students that life isn’t school . . . training in the school mode is not adequate training for life because life is not like the classroom setting. I want to challenge them, throw curve balls at them because that’s what life does. I don’t want them to be school learners and absorb that way of thinking . . . rigid, straightforward, non-creative.

Her students articulate their sense of how they were being prepared, and this view is representative: “At the start of the year we weren’t used to technology, we are better now, Miss . . . has helped us. She is preparing us for life beyond school . . . for high school . . . it really helps.” There was a sense that it was ‘OK not to know things in life,’ but that what is more important is how to find out.

**4. Community of Learners**

Conversations on the importance of building learning communities in classrooms are found in education research (Brophy, Alleman & Knighton, 2010).
There is a twist on the idea in this middle year’s class as building a community of learners is bolstered by 1:1 technology. Nina says the class resisted at first: “At the start of the year, they really struggled with my approach. Now we are a community, we do things all together and that changes my role as a teacher.” The conception of a community of learners is central to Nina’s knowledge of technology integration, and is underpinned by the two pedagogical themes of shared ownership and self-regulation in learning.

**Shared Ownership**

Technology integration, for Nina, is built on the premise of each student “working on a laptop, having good technology skills and accessing remote desktop sharing.” Nina confirms this perception and uses it as an opportunity to critique other technology tools:

> The laptop is about giving students ownership, in a very real way, of their own learning . . . the IWB on the other hand is still about the teacher. If I use the remote desktop, I can access what they are doing and they can access each other.

In the classroom, 1:1 technology clearly enables content to be shared, analyzed and responded to in community. QUEST is centered on individual, paired or group responses that are shared in community. One student’s view reflects a common perception: “I like QUESTing and then coming together as a class community . . . we have to find out stuff. It’s up to us to find out.” A few students also point out that computers could take away a sense of ownership: “We are asked to take responsibility, especially as we are going to high school but sometimes computers take the responsibility away from us.” Another student explains how this may occur: “There are lots and lots of temptations . . . so that’s distracting. You have to be really disciplined. Loading files takes time, sometimes it’s just easier to write on paper.” There is unanimous recognition that students like the variety of what they do more than anything else.

One observed symbol of shared ownership, which gives the distinct feeling that this class is still very young at heart, manifests in daily gatherings and discussions around a “Harry Potter Board.” This small, freestanding whiteboard is covered in spells and potion mixes written in black marker pen. Each day, groups of students discuss and change the magical combinations. It is a hive of activity, laughter and fun before school, at recess and at lunchtime.

**Self-Regulation in Learning**

Self-regulation is first mentioned in the context of when Nina speaks about her technology role in the school, and then in reference to the classroom layout. She explains: “I don’t have my own desk, I have a learning space with a table and a
computer, and students are free to use it. I would really like big tables in the whole room.” Long, bench spaces to carry out work are also observable manifestations:

I don’t set limits on what is my space, they use the benches, we share files on the server. I’m not the boss. Other teachers have trouble with this way of operating because it’s more equal. But I do play the teacher card when I need to . . . to set boundaries and limitations when the need arises.

The idea of the “small efforts of many rather than large efforts of the few” is a homily Nina often uses:

We are a community . . . we design ideas and we do things together. My classroom works very much from a model of distributed leadership in terms of ideas and learning, so the distinction between teacher and student in my classroom is non-hierarchical.

Students sit in various learning spaces in the classroom and often go outside to work. This student acknowledges: “We have a lot of freedom to choose where to work, I don’t feel restricted, it feels like a community.”

The perception of not having to know everything is important, and this notion is facilitated through encouraging students to take the lead. Nina says: “The teacher’s computer is the mothership, and then there is the whole fleet behind me on the same mission, but sometimes they are the ‘scouts out front’ beyond the mothership.” This idea is linked to Nina’s admission that in some subject areas she does not feel confident, and Science is a case in point:

Some of my students know more than me so I might use something like Gizmos. Students will ask me if they can’t do something before trying something else . . . I may not know . . . I say to them, keep going and don’t presume I can get you over that speed bump . . . I want you to get over it.

Gizmos and Science study arose in the context of favorite technology lessons with students. Notwithstanding, there is also frustration:

I think it's bad that we are always staring at the laptop screen and it would be more helpful if we did things outside, and in the Gizmos exercise I would have liked to have done the experiment in reality, rather than the computer doing everything.

This comment led to other cautionary remarks from students about the “amount of work we do in different subjects,” and that “Sometimes it is really hard to work out how to do something.” This appears quite problematic, and another student vocalizes her concern: “It’s difficult to keep track of everything, although the spotlight tool on Macs helps with locating missing work.” Nina is
mindful of what she expects of the class, and often during the day, she allows
them to give voice to their concerns: “You must honor and value how they see
the world. Some of the students are quite anxious about taking the lead and I
want them to know that it’s OK if you don’t know a lot about something.” In
the classroom, she listens to their grievances. She recognizes that even as ‘gifted
students,’ they have limitations, and perhaps are not quite ready to self-regulate
in the way she requires all of the time.

5. Redefining the Game

It became apparent that there is conflict between what Nina does in her classroom
and what the school and the education system at large requires. She expressed
the conflict in the following way: “I find tension between what I am required
to do and what I am doing in my classroom, but also a recognition that if you
want to bring about change you have to play the game.” This conception of
Nina’s knowledge of technology integration is about redefining the ‘education’
game and compromised pedagogical themes of personal context and conflicting
system demands.

Personal Context

Nina isn’t comfortable with the notion of being an identified ‘exemplary teacher.’
Instead, she says: “I see myself as a pioneer . . . you question, you challenge and
you change. It’s about pushing boundaries.” She adds further, explicit detail:

In many ways, I don’t fit the picture, which is, marking work and returning it to students. As a teacher your teaching approach is shaped by the values you have and your personal context . . . it’s your learning, your knowledge and your background.

Each day, Nina intently watches what students do as they complete various
tasks. She explains: “I am satisfied when I observe what they are doing, rather
than having to mark everything they do.” As mentioned earlier, Nina’s research
with elementary school children involved studying how they understand learn-
ing using a city-building simulation game. The doctoral thesis is titled “Children
as e-designers: How do they understand learning?” and the study findings are
the levers she uses to achieve learning in the classroom.

Conflicting System Demands

When teachers are employed in public schools in Australia, they agree to follow
mandated syllabus and system requirements, and in so doing, employ a variety of
rich, pedagogical strategies in classrooms. Nina uses her firm beliefs about learning to drive pedagogy. She speaks about what current school education systems require:

There is incongruence between what you are meant to cover and what I think students should be learning. . . . I get really sad, as even though we have brought about a lot of changes we are still not where I want to be.

This comment is supported by extensive commentary on concerns with existing models of schooling, and Nina says:

There is a problem if their brain gets stuck in the school model of thinking. I’m almost trying to protect their way of thinking in childhood, without it being hijacked by the school way of thinking. If we want students to be spectacular, we need them to think creatively.

She is confident in her approach to learning at all times, and states: “I don’t know if what I do is what other teachers are doing . . . it’s just that I couldn’t do what I do without the laptops.” She adds, “I think about learning, rather than formal lesson preparation.” Nina doesn’t belong to professional teaching associations and sees this as a kind of gesture, a “side activity, not the main game.” She sees problems with current school curriculum, pedagogy and assessment in that it “inhibits learning,” and because of her beliefs about its tight construction, she has a special pact with the new school principal. She describes the deal:

I have made an agreement to teach literacy and numeracy in the morning, then QUEST after recess each day. The afternoons are often sport or relief from face-to-face teaching sessions. The required curriculum is covered to make way for ‘real learning.’

The previous school principal “picked me for this school and he said you ‘go for it’ and I will back you and any complaints or issues . . . they have to get through me.” Nina’s commitment to bring about significant education reform is palpable. The notion of current school practices “hijacking learning” is raised again: “The problem is that the current model clashes with my values. Learning is hijacked by the superficial values of the school. The model is laid out for you.” There was deep desire from Nina about schools expecting teachers to use technology in particular ways: “There shouldn’t be a choice, other professions are expected to use digitized records or state of the art technology . . . like in hospitals for doctors and nurses . . . it should be part of how our profession operates too.”
Professional Conversation—Fresh Points to Consider

In summary, the case study of Nina enables fresh ways to scrutinize this teacher’s knowledge of technology integration through conceptions of praxis, metacognitive learning through technology, creativity, community of learners, and redefining the game.

Positive changes in teachers’ knowledge of technology integration will happen, according to Nina, “if teachers immerse themselves in the context.” When questioned, Nina sees that what she does may not be easily shared: “It will happen if trust is built within a particular context . . . this is the only way to really understand what is going on in my classroom.” Strong beliefs, combined with alignment of theory and pedagogical values in her conception of knowledge of technology integration, provide challenges for what might be replicable for other teachers. This notion also may not sit comfortably alongside how education systems sometimes envisage successful technology integration. Purposeful inquiry approaches—like that of QUEST, as an example of project-based learning—may enable teachers to access a structured process that allows students more freedom and self-regulation in determining what matters to them. Like Gabby and Gina, Nina’s technology knowledge enables opportunities for creativity in a range of task responses using both written, audio and film formats. Contextual accommodations uncovered in all of the classrooms of the teachers studied so far reveal personal, community and sometimes conflicting professional demands. Discussion of Nina’s vision for future classrooms is important and is further detailed in the final chapter of the book.

Table 5.1 shows what emerged from the data collected in Nina’s classroom.

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<th>Table 5.1: Key conceptions and themes in Nina’s classroom</th>
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<td><strong>Nina</strong></td>
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<td><strong>Praxis</strong></td>
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<td>QUEST</td>
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<td>Theory-based with a focus on active construction</td>
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<td>Relentless probing and questioning</td>
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Discussion Pointers

In pairs or as a whole group, discuss these questions and record your answers as a podcast using a mobile device:

1. What is praxis in your classroom?
2. Can you distil particular values that are embedded in your approach to technology integration?
3. Project-based learning approaches like QUEST provide particular learning opportunities for students. Describe one project students have embarked upon in your classroom.
4. How does film and video production operate in your classroom?
5. As a teacher, in what ways do you mediate the demands of your education jurisdiction?

Notes

1. The poems of E. E. Cummings were studied in the classroom. This version is an adaptation of the well-known poem “I carry your heart with me” (1952).
2. NAPLAN refers to the Australian government’s National Assessment Plan for Literacy and Numeracy.
3. In this education jurisdiction, gifted and talent students are identified according to the education policy accessed at https://www.det.nsw.edu.au/policies/curriculum/schools/gats/PD20040051.shtml?query=gat
   ‘Independent’ or ‘private’ schools are fee-paying schools which receive money from the Federal Government, and ‘selective’ schools are a stream within public education that requires entry via academic placement tests.
   “Kidspiration” is an online program, http://www.inspiration.com/Kidspiration. It is designed to support students to visually explore words, numbers and concepts. “Gizmos” are Mathematics and Science online games created by Cambrium Learning Group.
5. QUEST is an instructional approach where students deliver a coherent project to the whole class either as an independent or group study and it follows the five steps outlined in the chapter. It is a type of project-based learning built around a central question and is quite like the “genius hour” that some schools are using, http://www.geniushour.com/
6. This approach of Nina’s involves “selecting a theory of education, developing this theory’s consequences for the intellectual growth of children, implementing the conditions, equipping the research and running the experiment and determining its success or failure.”
7. Remembrance Day is held each year in Commonwealth countries on November 11. Schools in Australia mark the occasion at 11 am on this day by standing to attention in the classroom, or at an assembly, to pay respect to Australian soldiers killed in battle in WWI.

References


6

KITTY’S CLASSROOM

The High School

FIGURE 6.1 Kitty’s shooting protocol for film making
The ‘creative memo’ that characterizes Kitty’s personal and professional practices in technology integration is film. She is a filmmaker in her own right. The image in Figure 6.1 shows Kitty working with students in a digital media project where she teaches professional film protocols. She is a Visual Arts teacher at Farner High School in the southwestern suburbs of a major metropolitan city. Kitty teaches multistage digital media projects in the junior school, as well as senior high school students in elective Visual Arts. She was the Head Teacher of the Visual Arts until recently when she agreed to be the Head Teacher of Technology, with responsibility for working across the whole school, supporting teachers with technology integration in all subject areas. Students in the junior year at Farner have laptops funded by a government initiative. In the classroom, Kitty uses up to three computers at any one time, in addition to teacher and student-created blogs and wikis, various apps and an interactive whiteboard. Her students also access flip cameras, iPhones, iPads, Student Response Network that evolved out of an audience response network, online test generators, software programs and a full suite of the latest filmmaking equipment.

In the last chapter, I showed how the High Possibility Classrooms model is conceived around praxis, metacognitive learning, creativity, building a community of learners and redefining the game in the middle years context of a 1:1 classroom. Having documented the case study of Gina in the previous chapter, I came to the conclusion that the conceptions and underpinning themes of purposeful teaching, theory, creativity, real-world application and professional identity in the model enable successful technology integration in the elementary space.

In this chapter, I will present details of Kitty’s professional background, the school, the classroom, the representations of her perceptions of technology integration and the main conceptions of HPC that dominate her classroom. The first conception, knowledge of technology integration, was framed by planning and organization, self-regulation and differentiation, and the second conception targeted experiential learning where authentic experience and developing subject matter was essential. Here, the third conception, creativity, was defined by aesthetic significance and learning being made public. The fourth conception of preparation for a life of learning was about risk-taking and self-efficacy and the last conception of whole school culture meant professional responsibility and enacting a role.

At the end of the chapter, there is an opportunity to hold a professional learning conversation around a series of questions about Kitty’s practice in What is fresh? I’d like to begin with reviewing Kitty’s professional background.

**Professional Background**

Kitty has been teaching at the school for 21 years. She remarks, “I love teaching at Farner,” and adds:

There is great satisfaction in working in this environment. I could probably work in an easier school, a girls’ school, or one that is more comfortable,
but I need a lot of stimulation. Each year the students change, so your teaching approach is always going to be slightly different.

She is a qualified filmmaker and made her first film, “The Trombone,” at home on Super 8 film when she was 15. She describes how “In 1975, my family was the first in the street to own a color TV. It was this new technology that provoked my interest in the visual form of film.” Kitty left school before senior high school to start an independent film production company, which she ran for two years. Eventually deciding to complete her high school education, she formalized her filmmaking and gained education qualifications, enabling her to teach in schools.

Kitty believes she wasn’t well prepared for teaching: “I didn’t have training in all art media. I had to learn a lot in my first five years on the job.” She regularly enters major short film competitions and “my students do too, and sometimes we win.” The school is not an easy place to teach, and Kitty takes students whom other teachers “won’t teach.” Each week of the school term, several ‘extra’ students join Kitty’s classes. She accommodates these students in a generous, patient manner and when asked about this, she explains:

I concentrated early on in teaching students with behavioral difficulties. I did a postgraduate diploma. Maybe coming from a family of 16 children you develop a thick skin, and have to get on with everyone. I am pretty grounded in the person that I am.

For the past 20 years, she has run specialized training courses for teachers in video production at a major, urban university during the summer holidays. Kitty sits on syllabus committees and is a highly regarded speaker at high-profile art events in the state. At home, she has a production studio and darkroom and describes herself as: “An extensive user of social networking, including Twitter and Facebook.” She expresses her preference for mobile technologies as the most useful type of technology in addition to the video-recorder, microphone and still camera. Kitty adds: “The interactive whiteboard, on the other hand, is not my favorite technology, although I acknowledge elementary teachers do amazing things with them.” Farner was established in 1955 and has more than 1,100 students from the junior to senior years, and important details of the broader school context follow.

The School

The stated aim of the school is “to produce informed, confident and caring individuals.” The school encourages a wide variety of vocational educational programs and works closely with technical training organizations in the local community. Farner has an extensive program in literacy and numeracy support, with specialist executive teachers. Extra financial aid for the school is made possible under federal government initiatives because of its low socioeconomic status.
classification. This is compounded by the fact that the school serves students from “mainly migrant working classes,” where currently 92% come from LOTE or Language backgrounds Other Than English. Kitty explains:

Many of the students’ parents work in low skill labor markets or are unemployed. Because of their migrant backgrounds, previous qualifications often do not apply, and parents cannot always afford to re-train, or attend education facilities. Many do overnight shift work, which impacts upon the support for students within their family. Students are often the only English speaker in the family, and struggle to take responsibility for things, like posting the mail.

Farner has a well-established, intensive English center for more than 220 refugee students, who move into the main high school after graduation. The school's motto is to live is to learn, with its education philosophy strongly focused on pastoral care for refugee/migrant students from Syria, Afghanistan, Lebanon, Sudan, the South Pacific, Vietnam, China and Cambodia. The school’s CARE program targets “Community, Achievement, Respect, and the Environment and is focused on the need for each student to achieve their academic, sporting and social potential,” and this positive milieu is evident in its award and welfare systems.

Two years ago, the school launched “Focus on Reading.” The program, according to Kitty, arises from: “Analysis of NAPLAN results in the junior years, and our external mid and final certification examinations indicate that reading is the area of most need for our overall student cohort.” The school is also using government funding to directly improve the literacy, numeracy and technology skills of Farner students. Another initiative is the offer of a non-academic pathway for students not wishing to progress to tertiary study called “Work Skills.” More than 70 senior students are choosing this option and are studying courses in floristry, bricklaying or mechanics, for instance.

Across Farner, there is Wi-Fi access, and computer labs are located in each subject faculty, although the age and working order of the hardware varies. Kitty comments: “The old computers are not good enough, and don’t seduce teachers into wanting to use technology with students.” Faculty staffrooms often have only one computer on which teachers can work. Kitty says: “The school is considering an iPad trial, and executive staff is experimenting with a highly successful ‘Meet ‘n’ Greet’ activity at the commencement of each school day to further enthuse staff.” Farner received funds from another government initiative for new built spaces, including additional technology classrooms that are now completed and occupied. Three connected classrooms with video conferencing and a school intranet with digital resources for learning are available to students from networked computers in the library.

Kitty gives insight into the school’s strong community connections:

Farner offers the students a safe, happy environment, where welfare needs are a priority. Because of their varied and disrupted backgrounds, which
include fleeing countries, living in refugee camps, little or no schooling, deaths of family members, or just settling in an unfamiliar country and language . . . many of our students need a stable and consistent learning environment. It can take some time settling in before learning is maximized. Research suggests it can take up to seven years to fully acquire a new language; many of our students move right through high school with a language disadvantage.

The school employs a Community Liaison Officer with an Arabic background who runs the Farmer Parent Café for 20–30 parents each week. Kitty is building a community website with these parents. This is how she describes it:

The parent community is very supportive of the school. However, English barriers present as difficulties and also some unrealistic expectations from parents still persist. For example, most parents expect that their children will go to university. In reality, the majority of Year 12 students go to jobs, or on to vocational training . . . approximately 30% of our students go onto tertiary studies.

Recently, another parent group began working on a community garden with small plots and farms for lease. This initiative is for settled migrants and newly arrived refugees in the community, and will expand to include a market garden and will be connected to agriculture courses taught by a local vocational education college.

The Classroom/s

Kitty teaches 22 students in a senior elective Visual Arts class for five hours of art history and art practice over a two week cycle. Often, the tasks she assigns the class run for seven weeks. This classroom is replete with groups of high tables, wet areas and a storeroom, as well as a state-of-the-art darkroom. Students also use a large, open classroom in a demountable space that has an interactive whiteboard, where they work on individual laptops completing assessment tasks. In the multistage digital media projects, students in the middle years spend from 15–18 hours each week working on film projects. Entry to this class is by Expressions of Interest (EOI) that are advertised on the school’s website each term. In the application process, students indicate a proposed project, make links to relevant syllabus content and state outcomes they intend pursuing:

The EOI is intended to mimic the real arts grant application process. They apply to come. I’ll have up to four projects at once, involving no more than 20 students overall, who come from subject areas across the whole school. For example, in History I am currently producing a video with mainly
junior students who are interviewing a famous Australian from the past. Another group in English is enacting and filming a scene from a play.

Kitty’s involvement in other digital projects in the school is generated by a demand within the school community. This take the form of information videos or electronic presentations on components of school programs. She is also involved in projects that come from regional or state education offices, such as the Schools Spectacular and the World’s Biggest Classroom. In any one year, Kitty constructs up to 80 individual short films and participates in the making of at least another 20 films for other reasons. She explains:

Because I teach alongside other teachers in my role as Head Teacher Technology, it involves co-teaching in the connected classroom. I move around a lot in the school, to support teachers with the state’s education strategies in their classrooms, and this might include making films.

Another example of this support was Kitty co-teaching with a colleague in a junior History classroom with 26 students on the topic of Gallipoli, using the Student Response Network (SRN). This commitment extends to modeling practice in several lessons. She accompanied this class on an excursion to the national war memorial in another city to make a short film about World War One soldiers. Her unique perceptions of technology integration are presented in the following section.

Representations of Kitty’s Perceptions of Technology Integration

Particular examples are useful here, for instance, the senior elective Visual Arts class in art history and art practice sessions, as well as several multistage digital media project groups, including the making of a promotional video for competition, and the junior History class using the SRN. Kitty draws on TPACK on a number of occasions:

It is a useful way to describe my deliberate attempts to consider technology, pedagogy and subject matter in teaching practice. I have developed TPACK because I love what I do. Can you imagine going to work every day . . . having a fantastic time and doing projects that you believe in?

The critical vehicle that enacts the TPACK framework in Kitty’s classroom is the making of films with students, using technology tools and applications, on various topics arising from syllabus content. The film product allows integration of a wide range of subject matter (or the PK and the CK combining as PCK), and this is enabled through Kitty’s skill—or fluency in the film medium—and the
enactment of her rich knowledge of technology (or the TK). The open-ended pedagogical interaction she displays arises out of her flexible approach to a teaching practice that stems from deep knowledge of the Visual Arts (or TCK) in its various forms. This understanding allows manipulation of various technology devices, programs and creative applications for engaging and motivating students in the subject matter they are learning. In effect, Kitty brings TPACK into play every time she teaches. This knowledge of technology integration in practice builds on a firm TPACK base to articulate specific conceptions of the HPC model. The main conceptions of Kitty’s knowledge of technology integration are detailed below.

The Main Conceptions

Conceptions of Kitty’s knowledge of technology integration in high school classrooms falls into five distinct areas. Each conception comprises diverse teaching strategies and student learning processes. The five conceptions are:

1. Flexibility: planning and organization, self-regulation and differentiation;
2. Experiential learning: authentic experience and developing subject matter knowledge;
3. Creativity: aesthetic significance and learning made public;
4. Preparation for a life of learning: risk-taking and self-efficacy; and
5. Whole school culture: professional responsibility and enacting a role.

The following sections of the case study note each of the five conceptions of technology integration.

1. Flexibility

Fostering flexibility in using laptop devices is important. The ‘3 × 3 rule’ is an observable example of how Kitty structures this approach to student learning. She reveals how this rule is applied as a pedagogical response to the daily realities of classrooms and technology at Farner:

It means students are either 1) working online using their laptops and the internet, 2) offline using their laptops with OneNote or SMART Notebook, or 3) by hand, on paper in a workbook. This work is done either as 1) an individual, 2) in a pair or 3) in small groups.

The rule is known to students; one senior student’s view, representative of the rest of the students, aligns with Kitty’s intention:

It’s more productive, quieter and less disruptive when we have options in the way we work when we use technology. It is easier to work when we use technology and it’s faster, because I can now touch type what the teacher says.
Kitty believes that the culture of Farner means teachers need to be flexible:

There are sets of procedures for students to expect, depending on whether it’s the school or the classroom setting. In fact often it’s the students who come up with school rules, things like flirting and the level of intimacy in the playground. Students at the school also have a big say in setting rules for the way their classroom operates. $3 \times 3$ is an example of that.

The conception of flexibility is supported by the pedagogical themes of planning and organization, self-regulation and differentiation.

**Planning and Organization**

Each day, Kitty establishes that planning and managing learning is a significant aspect of teachers’ work, and she explains: “You facilitate learning . . . you don’t direct learning.” Each 40-minute lesson commences with the distribution of a small ‘red slip’ of paper to every student. The paper states the lesson’s learning objective and success parameters, providing an explicit learning prompt for the diverse learners in her room. Every ‘red slip’ makes up a series of learning sequences, which usually run for about four weeks in a subject:

I use the ‘red slip’ to establish the purpose of the lesson, and what the students will do and learn, and what will indicate that they have achieved this. The technique allows for explicit instructions, it allows for the day-dreamers, and those who do not ‘orally’ learn. It also allows for latecomers.

The students like this organizer, and one senior student’s remark sparks conversation around their work bench: “I like the red slip. I can see the lesson structure in front of me.” Other students give more specific comments such as this one, which captures typical beliefs: “The red slip really keeps you on track.”

It is obvious that students in Kitty’s classes like using technology daily and enjoy having their own laptop. They use words like “great,” “really cool” and “fun” as common descriptors of their learning tools. Kitty explains: “I hold workshops to get students excited about using and working with their new laptops.” In addition, blogs are key pedagogical organizers for students too: “It’s good to have the structure of our learning on the blog too, and it really saves on handling piles of printed sheets.” Kitty uses various subject blogs for learning and assessment, explaining:

If I put a test within a blog it means I can cover more content and ascertain the students’ learning better. The tests I feature on the blog have links to content that supports students understanding of big concepts in a subject.
**Self-Regulation**

Kitty believes blogs are stable, accessible learning environments for students that encourage self-regulation. In regards to some web applications, she says: “User accounts expire and it means work is lost and not accessible, whereas a blog, once it is set up, is readily accessible from school or home.” She explains further:

>Blogs are a means to measure what is going on in the classroom, and they reflect practice and learning. I use them as a pedagogical tool to assess prior learning and for classroom management. If I combine them with Testmoz, the dashboard acts as a type of learning management system too.\(^5\)

The Hall of Fame is a memorable example. This particular blog is observed in operation, and how it serves as a method of self-regulation in token reinforcement for “good behavior and great work” is immediately obvious. One student from the multistage digital media projects in the junior school mentions that he wants to appear in the Hall of Fame blog. Kitty explains its purpose:

>I set this blog up so students can make it to the Hall of Fame when they do wonderful things. I try to rotate it so that everyone has their ‘five minutes of fame’, and it has also brought in the parents. Students show parents their learning, and their achievements.

Self-regulation using blogs also develops appropriate online behavior, class rules and quality posting. Kitty suggests: “Students draft their posts, then self-correct, and it means the quality of the work generated online is better than face-to-face interaction. It’s also because they are public.” This public aspect of technology integration is taken up further in a later part of the case. The notion links to Kitty’s comments about how “all students, including students with LOTE backgrounds, are ‘digital natives’ and are very advanced in their understanding of technology, even when their English is not strong.” Some education research suggests that this is one of the significant advantages of blogs as a medium for improving reading and writing (Gilbert & Hoepper, 2010; Richardson, 2010). Students are encouraged to choose how they learn content. Kitty confirms this belief: “They can choose the medium for their work, and if they feel embarrassed because of the way they speak, they can do a podcast or a slide show.”

**Differentiation**

The pedagogical theme of differentiation manifests in the multistage grouping in digital media projects. Kitty explains: “In projects, they have an opportunity to work with older or younger students and they learn from each other.” It is possible to see this action in the classroom. Students involved in the project identified the school’s need to promote its image in the wider community. A suitable video competition is sourced and written into their EOI, and they settle on the
“Great School’s Show Off” as a suitable event. A full storyboard of video footage is flagged for inclusion, and the group proceeds to shoot video footage around the school over four days. They edit the film, enter it in the competition, and then upload it to the school’s website. One student from the project reflects: “We like to make movies, and we get to work with kids in other years. It is the images and pictures that tell bigger stories in a promo, rather than teachers just talking about our school.” Kitty also sees this activity as an opportunity to report to the wider community in her region, and adds:

It’s important to differentiate Farner from other schools in the area. I got help from the English as a Second Language teacher when I saw what these students were proposing. I also approached the finance committee for pre- and post-production costs of this particular promo.

Kitty concludes the provision of laptops by the government have pushed some teachers at Farner to differentiate learning for students in more overt ways: “It means work in classrooms is now more student-centered, and many teachers work on individual education plans. Students don’t yet have enough choice in what they do in the plans, but this is a step forward.” She shares her belief that choice extends to differentiation of curriculum and assessment for students:

The school has started to post assessment tasks on the web. I feel that tasks across a grade in a subject don’t have to be identical . . . the outcomes need to be the same but not the task, depending on the students’ level of learning. Differentiating the curriculum for all students, including our gifted and talented students, is important.

Closely tied to the pedagogical theme of differentiation in Kitty’s conception of flexibility in technology integration is experiential learning. The conception is explored below.

2. Experiential Learning

One definition of experiential learning suggests “it is the process whereby knowledge is created through the transformation of experience” (Kolb, 1984, p. 4). In Kitty’s classroom, film is the medium that enables experiential learning. She says: “Being able to make films is the thing I love most. I bring this passion into the meta context of my work as a Visual Arts teacher.” It is not the only medium, but it is a very important one in Kitty’s classroom. When questioned about this, she is clear: “What the student is doing is important, and it’s a concrete experience. This is the key . . . learning by doing.” She adds more explanation:

Digital technology is the perfect medium for learning. Students learn through active engagement . . . recapping, replaying, preparing for acting,
reviewing. The product of a film brings learning together for them. They can see it, and look at their learning again later.

This conception of Kitty’s knowledge of technology integration is delivered and observed through learning the conventions of filmmaking in multistage digital media projects, when using the SRN and when making films to explore History topics and famous artists in Visual Arts classes. The pedagogical themes of authentic experience and developing subject matter knowledge underpin experiential learning.

**Authentic Experience**

In multistage digital media projects, it is theory first, followed by illustration, and then protocols, and “after that it’s lights-camera-action.” Kitty refers to this structure as “inside learning,” involving a set of shooting protocols and conventions learned inside the classroom. This mirrors procedures real filmmakers follow on set. For example, a board at the front of the classroom displays the shooting protocol and features the following commands: “1st position please, quiet on set, roll camera, camera rolling . . . 1, 2, 3, mark it with a clapperboard, action.” Students familiarize themselves with film techniques incorporating the codes, signs and symbols which are particular to the film medium. Kitty uses a range of short films, YouTube clips and extracts of feature films to support student learning of these filmmaking conventions. One key resource she uses is a DVD set called “Film as Text.” When asked about this choice, she reveals: “The film I love to show students most is ‘Living in Oblivion’—this is a film about making a film and it teaches kids the shooting protocol beautifully and . . . comically.” She expands her reasoning:

Students must learn the conventions first and they only understand this by being involved in the whole process. They learn that the type of music in film is a code, to tune the audience into a mood, or that the type of shot reinforces the feeling a character is experiencing. For example, there are high shots, low shots, and diagonal shots.

In her senior class, the importance of authentic experience prevails. Kitty outlines this belief further: “It all fits very nicely with everything I teach. It’s really Vygotsky’s Zone of Proximal Development and key constructivist notions. He talked about how instruction is only good when it proceeds ahead of development.” She delivers this idea with an additional quip about how it’s also important to disrupt protocol: “By teaching students film protocols . . . you encourage them to break them, and they can’t break them until they know exactly what the rules are.”
Developing Subject Matter Knowledge

In the History class where she co-teaches, students research the historical context, and the SRN is used to reinforce historical knowledge. Kitty is firm in her belief that this approach allows students to remember facts and succeed at learning. She recounts that, when trying the SRN the previous year, it gave her the “proudest teaching moment ever,” and adds:

It was dynamic and exciting, the kids were with me. The whole class was on fire. I was on fire. The teacher whose class it was watched what happened, and said to me afterwards . . . you have just got through about four weeks of content in a single period.

In the History class, a series of questions is presented to students based on work they have investigated during class time. In this instance, questions arising from a set of Gallipoli posters are given to students in advance, and then in a fixed period of time, they respond to the questions using the SRN. Students choose from multiple choice answers, short text responses and Yes/No feedback. Reinforcement is given instantaneously, and students compete with one another to gain the best result. If the result is poor, they repeat the test up to three times and only the best result is recorded. Kitty confirms her belief that the SRN develops subject matter knowledge again after this lesson. The technology enables efficient learning, which she says: “Aids better understanding of content, and also helps teachers to examine their practice.”

When each of the digital media project groups step through a particular film-making process, they research content, plan preproduction, think about the film techniques that might best convey ideas, film the sequences and then do postproduction work. Kitty describes how, after following this procedure, “they know their subject matter really well.” The example she gives to illustrate the point is from a multistage project group from the previous year. The group, although very problematic for other teachers, is a high-support class of new immigrant students. She manages to sustain their interest in Ned Kelly by making a film:

When they were making the film, they had to interview relatives of the historic figure and get into character. Students unpacked the story from the mother’s point of view. The depth of knowledge they developed was incredible. I wanted them to know that Australia has a hero who is criminal and a bushranger. They did vast amounts of research, and used all sorts of camera shots applying the correct conventions. Even now, when I see this group around the school, they remember facts about his life.

Kitty links knowing subject matter to “supporting students from the back.” Her belief centers on providing guidelines and creating a learning environment that allows students to arrive at their own understandings:
The process of continuous dialogue in making a film means students will learn the subject well. It's not just about subject and content, but about using a range of technologies to keep them engaged and supported, to discover new ways of looking at content. As a teacher, you must create that deep desire for knowledge and understanding in students.

Often students in the multistage digital media projects are reluctant to explore subject matter in mainstream classes, and prefer to use the medium of film to explore content they would otherwise be less interested in. This notion is apparent among the older of the high school students: “It makes learning more fun, and you make it factual by putting facts into the film content and by including special effects. It’s more interesting this way, and it’s fun for people to listen and watch.” The following commentary also highlights the positive effect and sense of ownership making films has on classroom management. Several students mention: “There is less noise and less disruption to learning in project work,” and they believe they “are more productive,” and subjects are “easier.” It is argued by some students in the same group that if concepts are not well understood then it’s possible to explore content in different ways using: “Digital games, the internet or other software applications.”

In Kitty’s classroom, so much more content can be investigated through the process of filmmaking. She states: “Films are a brilliant way to teach subject matter in Visual Arts. I use the same process as I use in the media groups. Films bridge the gap for students between context and culture.” Kitty expands further: “All digital technologies are a key way to build literacy, for example, videography, photography, and digital slide shows and of course filmmaking.” A senior student in the elective class, who is making a film as a response to a prescribed art history assessment task, says: “I love filmmaking, it is such a beautiful thing—it’s an art when you can capture an artist you are studying on film.” Closely tied to this pedagogical theme in the conception of experiential learning is the importance of creativity.

3. Creativity

Students using technology to create and make films supports a range of Kitty’s learning objectives. She reiterates: “Technology can recap learning; you save it, play it back, remember and listen. All students can more easily develop their verbal skills . . . they are learning through this process.” The conception of technology integration involving a flexible pedagogical approach is also mentioned in this theme. Kitty says: “Deviation off the set path is central to the creative path, and technology provides a means to do that.”

Kitty uses films made by students in past digital media projects as a way to illustrate creative possibilities to new groups. She suggests they allow drawing on different creative techniques to do with ‘shot size’:

They love to see themselves on film, or what other students have done, and they always think they can do way better. They seem to want to
understand the film technique more, if they can criticize what another group actually did.

In an art making session in the senior Visual Arts class, students choose a suitable medium for creating midterm major works. In the center of each table group are bonsai trees belonging to Kitty. When questioned about this feature, she explains that bonsai is a personal hobby, and in the classroom she uses them as:

Living sculptures for inspiration. They give the students a strong aesthetic focus. If they are stuck for an idea they can photograph the bonsai using a digital camera, they might make a screen shot of it, project it onto a wall and then begin their drawing or painting work. Artists are like collectors, and they work with form, so that is what I have done with the trees.

Some of the trees are extremely old and valuable. Students respectfully carry them from place to place, looking at them while doing their artwork. She stops to show them how to draw something on a large canvas while projecting the bonsai image on a laptop. Students experiment with the idea, using pen and paint and large sheets of paper. The pedagogical themes of aesthetic significance and learning made public are important considerations in the conception of creativity in technology integration.

**Aesthetic Significance**

The term ‘aesthetic’ reveals itself in this context as both an adjective and a noun. Concern for beauty or appearance is important to Kitty, as is the set of principles that underline or guide her conception of aesthetic significance. The value of the visual nature of film and its aesthetic is enacted through Kitty’s knowledge of technology integration. This value may play an increasingly important role in school education in the next century and beyond. There is congruence between Kitty’s ‘inside life’ as a Visual Arts teacher and her ‘outside life’ as a filmmaker. Preoccupation with the aesthetic manifests in making films with students, the software applications she introduces to them and her preference for photographic mediums and bonsai.

The nature of a school subject like Visual Arts automatically incorporates the aesthetics of visual form. Kitty asserts that technology’s visual form: “Makes teaching easier because of its recordable nature, and therefore the inherent openness allows manipulation for artistic purposes.” This theme surfaces in several ways. Students present assessable work using a range of technology applications; one noteworthy example is Prezi. Students experiment with the tool overnight, and the following day, they come to class with elaborate and beautifully displayed midterm major works demonstrating their use of Prezi. She expresses surprise that so many students immediately responded to the creative uses of the
software: “The aesthetic is valued in something like Prezi because students really need to think about the audience viewing their work.”

Many students agree with this assessment: “It’s a good alternative to PowerPoint, easier to use and it’s more fluid. I really like the look that it gives my artwork.” In Visual Arts, technology assists structuring what they know about various Australian artists. In one example, the blog created for “The Angry Penguins” is mentioned:

I remember more when I use something like Prezi because it looks nice, and you have to use headings and structure the information so it flows. You don’t put everything on display. Ms. . . . showed us how to use it, and now we show her more things it can do. It’s really memorable to watch, compared to someone reading off a worksheet or some paper."

Students in Kitty’s classrooms describe valuing the aesthetic of the visual form that technology opens up for them as learners in this way: “most teenagers are visual these days.”

**Learning Made Public**

Closely linked to aesthetic significance is the idea that publication, and making what students produce public, means it can be viewed, read over and edited. Kitty repeats a long-held view that: “Because technology exposes the students’ work publicly, the quality is better. The performance aspect of technology has produced a new writing convention.” The students seem to like seeing what other students create, and whether it’s writing or creating films, there is enormous interest from students outside the classroom context in the final product from the multistage digital media projects. One example is the high number of ‘hits’ recorded for the promotional video within minutes of it ‘going live’ on the school’s website. When asked about the importance of peer acknowledgement as a driver for learning, one student comments: “By the time we finish the film, other students have already seen us filming around the school. They think they might be in it, and they want to see what we have come up with. It’s really fun.”

Kitty notices in the History class that when she first uses a blog to record and structure this group’s learning, she would ‘hear’ from students who never ask questions or make comments in class: “I now hear from the quieter students, their written responses are more considered. [The responses] seem deeper because they have time to think, and they know other people (including me and their teacher) will be reading the work.” The idea of being a self-conscious learner in the classroom is not new. Both Kitty and the class’ usual teacher agree that for many students who are new language speakers: “A heavy or broken accent is unheard when students post online, or send an email. This [use of
technology] encourages and builds confidence in using English. Technology is a way to hook migrant students in.”

The conception of technology integration as preparation for life follows on from creativity, and is detailed below.

4. Preparation for a Life of Learning

It was John Dewey (1934) who famously said: “Education is not preparation for life; education is life itself” (p. 12). Kitty parallels this well-known quote when she says: “I am preparing students for life beyond school . . . for life. Visual Arts may be the only subject where some students experience success in their learning, and can walk out of school with a sense of how the world is.” This conception in her knowledge of technology integration as preparation for a life of learning is pursued daily, both inside and outside the classroom. It is the way education happens. This message is overtly and repeatedly given to students through conversation and the manner in which Kitty underwrites the conception with the pedagogical themes of risk-taking and self-efficacy.

Risk-Taking

Tied to the idea of preparing students for a life of learning is the notion of risk-taking. This theme unfolds in Kitty’s practice of learning alongside students, it’s returned to repeatedly, and it’s couched in terms of how important it is for “teachers to take risks, so that students will also be encouraged to take risks.” She adds: “It’s the life I want for my learners.” This philosophy extends to enacting her knowledge of technology, as students see her constantly trying different technology hardware and software. Early one morning before school starts, Kitty uses the school’s connected classroom to join a professional conversation “Brekkie with a Techie” with education colleagues from across the region. This group is experimenting with new software applications.

Another example of Kitty’s emphasis on the value of risk-taking for teachers: “Students take risks in digital media projects. It requires structure . . . loose time, and if they are not conscious of this, the project will not be realized.” The students agree, and seem to understand her expectations and ways of working. Students in another digital media project expressed this understanding: “We do so many cool things . . . animation, making short films . . . we can try different things and if it doesn’t work out we can re-do it, until it’s just right. It’s OK.”

Sustained importance is given to the pedagogical theme of risk-taking:

When teachers take risks they will be more successful at teaching. You must have excitement and passion about the job and the subject you teach. I adopt a role, and pretend that I am not frightened. I am confident. I am happy and I want to be here. The students know we are going to do something
important together. I am not afraid of making a mistake. I have realistic expectations and I hold high expectations of what I want from the students.

Risk-taking links to not being afraid of failure. Kitty sees a characteristic present among her teaching colleagues, and she remarks: “There is a fear of failure, which means the same tasks are used year after year. I’m more critical of myself.” She implores her colleagues:

Trust your students with technology . . . it makes them lead their own learning, rather than being dependent on the teacher but it’s done within boundaries . . . you want them to use it wisely . . . it’s not for filming the fight at lunchtime.

Kitty facilitates their technology exploration, shows them and then stands back, and says: “They do what I can’t do . . . they become co-producers.” There is opportunity for students to move from a sense of failure to success when teachers work alongside them.

Self-Efficacy

Modeling self-efficacy as preparation for a life of learning is a conscious decision. Kitty says: “If you open up a crack in the door, young people will run through it. I know some teachers are very nervous about this approach.” The previous pedagogical theme of risk-taking has an impact on an individual’s self-efficacy. Students who are self-regulated learners believe that opportunities to take on challenging tasks, practice their learning, develop a deep understanding of subject matter and exert effort will give rise to academic success; self-regulated learners usually exhibit a high sense of self-efficacy.

Students in both the junior and senior years of high school explain how being in Kitty’s class has led to greater feelings of autonomy. For example, this junior student explains: “If we work with others, there are more ideas, I like it. I’d feel too nervous otherwise.” Another senior student captures Kitty’s intention: “In this class we are taught how to use technology, we have more time, more freedom, more contact and we can make mistakes. Now I can do stuff I have never done before.”

In many respects, it is as if technology is a mirror or model for personal practice. Kitty believes teachers need to have realistic expectations about students’ use of technology, as: “Not all talk in the classroom is work-related and so this is the same when using technology—we need to remember to give students the same freedom online.” She describes this vicarious experience:

I like them to behave like professional students. Film projects enable that . . . to work in a team and disagree with one another . . . try different possibilities . . . that’s what happens in life. I don’t interfere. Dictating the
outcomes lowers the bar. You go on a journey with your students . . . have fun . . . explore . . . investigate . . . take risks.

When modeling self-efficacy using technology, Kitty acknowledges: “There are good days and bad days in teaching . . . you don’t take it personally. Doing the same thing every day doesn’t mean students learn or become independent.”

Conceptions of Kitty’s knowledge of technology integration are felt in her impact on whole school culture. This final conception is detailed below.

5. Whole School Culture

Throughout history and in education contexts in particular, the importance of a school’s educational leadership and its role in shaping school culture cannot be underestimated. At Farner, Kitty’s designated role on the school’s executive as the Head Teacher of Technology means leading technology innovation in the school. Kitty describes the position:

The subtext of my position is responsibility for up-skilling teachers in their use and competence in technology hardware and software, as well as trialing new technology devices on the market. For example, the iPad, the SRN, flip cameras and new photographic equipment. I play a central role in the distribution and maintenance of the students’ laptops.

It is her belief that the current government is instrumental in pushing teachers to change their approach to teaching. The conception of whole school culture in Kitty’s knowledge of technology integration is built upon the pedagogical themes of professional responsibility and enacting a role. Both themes are detailed in the following sections of the case.

Professional Responsibility

Kitty’s school principal is highly supportive. He encourages and actively enables her to take professional responsibility for leading technology innovation in a variety of forums. One example of the level of support observed is “Meet ‘n’ Greet.” The activity involves five members of the school executive board, led by Kitty and the principal, standing at the front gates of the school each weekday morning from 8:15 am. This team personally greets students as they enter the school grounds, and if they are out of uniform, they return home to change (provided there is enough time; if not, they change into correct uniforms/shoes provided at the gate). iPads are used to mark names off class rolls as students arrive. Kitty explains the rationale behind “Meet ‘n’ Greet”:

It’s about greeting students, as they start their day, with a smile. On Fridays it’s accompanied by breakfast. It is a lovely way to get to know the
students. It’s about fostering pride in the school. In the first week, 30 uniform slips and 30 detentions were issued, in the second week it had come down to 8, and now this week it has come down to 1 or 2. We’ll see how it goes.

The aim of this action is to improve school culture and communication; it’s also about lateness and compliance. Kitty points out: “The idea of Meet ‘n’ Greet fits with expectations of using technology for administration and programming, which is all part of our professional responsibility . . . I see it [technology] also as time saving devices for classroom learning.”

Many teachers at the school don’t always think about using technology for teaching and learning. The principal has impressed upon her the idea of “you are only as strong as your weakest teacher.” She explains:

I do a lot of training of weaker teachers . . . I have failed some. It’s about unpacking what good teachers do. It’s about being consciously competent. If your students are failing, that’s your professional responsibility . . . you need to think . . . maybe I haven’t taught them well. Have I given scaffolds, models, structures, skills or knowledge to build their competence?

Gathering performance data on students assists teachers to examine their practice, and Kitty says that this, too, is part of professional responsibility. She says: “You can’t blame the kids if over a five-year period you have only had one student pass the subject at a high level. You need to reflect and take responsibility for what you are doing.”

**Enacting a Role**

Positional power in the school means Kitty is seen to enact a particular role. The title of Head Teacher of Technology allows teachers to ask for support for technology integration. She elaborates:

It’s easier to ask for technology support, rather than asking for help with your teaching . . . it’s a good doorway which has been opened where I can work with teachers, and even if they are confident they train me and I can co-teach . . . it’s about not being the best . . . we are all at varying points in our development.

The leadership role in technology means Kitty can see what goes on in other teachers’ classrooms. Her team of ‘ICT Champions’ is growing at the school and she says: “Teachers volunteer to become a champion in technology, and they ask me to support them in the classroom, to design units of work, watch lessons . . . I am inundated with requests.” This is observed in the junior History classroom using the SRN for the Gallipoli studies.
It is Kitty’s belief that teachers are more willing to present their teaching weakness to her when it’s framed as “difficulties in technology integration.” The request for technology support becomes a type of shared lever to ‘up-skill’ colleagues in classroom practice:

I have the sexy tools to do it, however it’s underpinned by really confident teaching practices. It’s much easier to ask for help to integrate technology, than ask another teacher about classroom management, programming, literacy, teaching strategies and other quality teaching elements.

Kitty recognizes that she is different to other teachers in the school; she tends to use her appearance as a kind of visual code; her style of dressing will indicate the activities she plans for the day. She explains: “Teachers wear costumes . . . they take how I am dressed as cue for how we will be learning. Maybe as a Visual Arts teacher I push the costume idea a bit further?”

Kitty also sees herself as a “highly competitive teacher” in her technology role, and adds: “Competition is the vehicle for me to achieve personal goals for the school, and the region.” Most significant are the goals she has for the students she teaches, and she explains:

I know how to get the bottom kids up. They barely pass in other subjects . . . in my subject they perform better. I want to get the best from them. You have to like kids . . . love them to death. I care about the community’s perception of the teaching profession. I like to be a good example and I want the kids’ work to be of a high standard.

Kitty gives an example of a student from the previous year: “One senior student I taught in Visual Arts got a high pass and passes at the lowest levels in all of his other subjects. He was not producing anything in art to begin with, and then we went together into the darkroom and made photograms. That changed everything.” The students concur with her inspirational role and readily acknowledge the fact. One senior student expressed it in these terms: “We know we will do well in this class.”

Professional Conversation—Fresh Points to Consider

In summary, the fourth case study reveals rich ideas for fresh ways to motivate less ‘tech savvy’ teachers to think about technology integration. The case study offers another example of non-threatening, technological professional learning through a model of co-teaching. This model is successful when less confident teachers volunteer to work alongside an innovative practitioner—whose role in the school might be deemed Head Teacher of Technology. Inspiring specialist teachers in high school contexts who work alongside the class teacher find that
hesitant teachers are more willing to experiment with technology integration, rather than ask for support to improve their teaching. The notion of co-teaching is less threatening, and not at all different to Gina’s consultancy role in various primary school settings.

Like Gabby, Gina and Nina, Kitty sees pedagogical value in providing opportunities for students to perform publicly. She recognizes that her video publishing skills to support students are a gift, and not all teachers have them nor should they be required to develop them. What these teachers do is: “Share what we know with our peers.” Some education jurisdictions that are now beginning to focus on up-skilling classroom teachers in video production, using simple software programs, suggest schools are better at understanding the importance of fostering creativity and imagination in the lives of young people in schools. Each of the case studies shows that the teachers adopt classroom pedagogy that they believe prepares their students for life, both within and beyond school.

Chapter 7 now turns to the discussion of the commonalities and differences in their pedagogies. This leads to understanding what is fresh in their approaches to teaching and learning in technology-rich classroom environments, and whether all teachers can in fact create HPC classrooms.

Table 6.1 shows what emerged from the data collected in Kitty’s classroom.

### Table 6.1 Key conceptions and themes in Kitty’s classroom

<table>
<thead>
<tr>
<th>Flexibility</th>
<th>Experiential learning</th>
<th>Creativity</th>
<th>Preparation for a life of learning</th>
<th>Whole school culture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning and organization</td>
<td>Authentic experience</td>
<td>Aesthetic significance</td>
<td>Risk-taking</td>
<td>Professional responsibility</td>
</tr>
<tr>
<td>Self-regulation</td>
<td>Developing subject matter knowledge</td>
<td>Learning made public</td>
<td>Self-efficacy</td>
<td>Enacting a role</td>
</tr>
</tbody>
</table>

**Discussion Pointers**

In a whole group or in pairs, discuss these questions and record your answers as a podcast using a mobile device:

1. How do you approach film making in your classroom? Your students?
2. How has the culture of your school changed in recent times as a consequence of technology integration? Does your school use technology to build school culture using processes like Meet ‘n’ Greet?
3. The ‘3×3’ rule and ‘the red slip’ are effective learning organizers. Do you use something like this in your classroom? Explain.
4. How significant is the aesthetic in the students’ use of technology in your classroom?

5. In what ways do teachers balance the needs of students with their professional responsibilities?

Notes

1. NAPLAN refers to the Australian government’s National Assessment Plan for Literacy and Numeracy.
2. Meet ‘n’ Greet is about improving school culture and getting students to school on time; the teachers check entry to the school and the main gate on iPads.
3. Schools Spectacular is an annual entertainment showcase for more than 3,500 students from public schools in the state. It is recorded and broadcasted on national TV. The World’s Biggest Classroom is a series of three multimedia exhibitions of the work of 900 students and teachers from 53 public schools.
4. The red slip referred to is from the History class where Kitty modeled practice to the students’ usual classroom teacher.
5. Testmoz is a free online test generator. Its dashboard is simple to use and presents information in a way that is easy to read. Learning management systems are software applications that administer, document and track online events. Testmoz can be accessed at http://testmoz.com/
6. Gallipoli is an important war time event in the History curriculum in Australian schools.
7. Ned Kelly is an infamous Australian bushranger whose activities are studies in the History curriculum.
8. Prezi is a cloud-based zooming presentation software, access examples at http://prezi.com/explore/
9. The Angry Penguins were modernist Australian painters from the 1940s who included Arthur Boyd, Sidney Nolan, Max Harris, John Perceval, Albert Tucker and Joy Hester.
10. A photogram is a photographic image like shadow. It’s produced without a camera, usually by placing an object on or near a piece of film or light-sensitive paper and exposing it to light.

References

The chapters in this book bring together the global contexts for technology integration in schools in countries like Australia, the USA, the UK and in Singapore and South Korea; the second chapter details the popular TPACK and SAMR frameworks and places a spotlight on a new vision for technology integration known as the High Possibility Classrooms (HPCs), and in the four chapters preceding this one, I describe exemplary teachers’ knowledge of technology integration in four case studies.

In this chapter, I use the organizer in Table 7.1, which sits alongside the HPC model, to tease out the fine detail of how HPC works in practice drawing on commonalities and differences in the four case studies. This step is crucial in understanding the layer of Action Knowledge (AK) that emerges from the research comprising particular processes and strategies that add another dimension or layer to technological, pedagogical and content knowledge displayed in the original seven components of the TPACK framework (Mishra & Koehler, 2006). Collectively, these conceptions form what I propose is practice in action, or AK, and together, they create motivational and engaged learning spaces for students in all schools.

I begin with an examination of the first conception: theory driven practice + technology = theory-driven technology practice. I then move into the consideration of the other four conceptions, which will be detailed in their own sections. In the Professional conversation at the end of the chapter, provocations are issued for how all teachers can focus on what is fresh in their practice as the means to create High Possibility Classrooms for all students in schools.
Creating High Possibility Classrooms

TABLE 7.1 HPC model featuring conceptions with the underpinning themes

<table>
<thead>
<tr>
<th>Theory-driven technology practice</th>
<th>Creativity for learning through technology</th>
<th>Public learning through technology</th>
<th>Life preparation using technology</th>
<th>Contextual accommodations using technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology drives construction of learning</td>
<td>Technology boosts creativity</td>
<td>Technology scaffolds performance</td>
<td>Technology operationalizes the real world</td>
<td>Technology remains personal and professional</td>
</tr>
<tr>
<td>Technology enhances purposeful teaching</td>
<td>Technology creates opportunities for production</td>
<td>Technology enhances outcomes</td>
<td>Technology gives voice</td>
<td>Technology changes time</td>
</tr>
<tr>
<td>Technology focuses planning</td>
<td>Technology unleashes playful moments</td>
<td></td>
<td>Technology means ownership and possibility</td>
<td></td>
</tr>
<tr>
<td>Technology enriches subject matter</td>
<td>Technology supports values</td>
<td></td>
<td>Technology reveals effectiveness</td>
<td>Technology defines the game</td>
</tr>
<tr>
<td>Technology promotes reflective learning</td>
<td>Technology differentiates learning</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technology shifts conversation and thinking</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technology engages students in authentic ways</td>
<td></td>
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</table>

**Theory Driven Practice + Technology = Theory-Driven Technology Practice**

This first conception reveals how the teachers’ technology philosophy in the classroom affects practice, and it is supported by three themes: technology drives the construction of learning, technology enhances purposeful teaching and technology focuses planning. Through the implementation of these themes, the teachers also transform student learning from a focus on the teacher’s actions to its impact on student learning processes, such that technology enriches subject matter, technology promotes reflective learning, technology shifts conversations and thinking and technology engages students in authentic ways. Considered together, these seven themes illustrate theory-driven technology practice. Each theme is now considered in priority order.
1. Technology Drives the Construction of Learning

Constructivist teaching is based on constructivist learning theories (Bruner, 1960; Dewey, 1916; Piaget, 1954; Vygotsky, 1978). Such philosophy, shared by the teachers in this book, values constructivist teaching as transactional knowledge and is based on the idea that what you know as a teacher must be applied in order to support students in making sense of their world. All four teachers favored highly student-centered modes of learning, where technology was the vehicle that enabled both teachers and students to make meaning of their world. For example, technology was used to project the dismantled images of the battery that Gina used to begin the unit of work on energy and systems, and this illustrated to students that what is used in production has implications for its waste disposal.

Having established the construction of learning as a central part of her practice, Nina’s QUEST framework allowed students to seek out answers to questions or problems they wanted to explore. Similarly, inquiry-based approaches to learning are made effective in Nina’s classroom, using technology like laptops and the internet to search and record information, and QUEST work was always presented back to the class using various multimedia modes. While project-based learning (PBL) sometimes referred to as self-directed learning are not necessarily new, they are increasingly cited as important learning skills for equipping students to live well in the 21st century. What was interesting in Nina’s classroom was her deep knowledge of theory, and that the learning she constructed arose directly from her own doctoral research. Nina’s principal at the time gave support to implementing her thesis findings. The approach used stemmed from “generative theory” (Schaverien & Cosgrove, 1999, p. 1224). QUEST aligned to the students’ developmental stage, and not to their chronological age. In Nina’s classroom, there were no limitations or constraints placed on what students studied or wanted to question, build or structure, and such an approach supports what developmental theory has known for some time.

Teachers sometimes underestimate how capable students are as learners, and, though it may be difficult for the teachers, it has been shown that including open-ended or PBL may enable students to move beyond syllabus outcomes. New, problem-focused projects reviewed in a recent report Decoding Learning (Luckin et al., 2012) details the example of Savannah as a case in point. Savannah is a virtual game played on mobile devices about animal habitats. The notion of finding out, examining problems or inquiring is taken a step further; here learner knowledge is supported by a game where students act as lions in a grassland simulation in order to improve their understanding of the topic of animal behavior.

Like Nina, Gina’s recent postgraduate study propelled classroom practice. Also, Kitty’s theoretical understandings linked to her broad, artistic community and to her formidable technical skills as a filmmaker, and Gabby’s recent
professional learning enhanced her knowledge of storytelling from a position of theory. Technology compelled the construction of learning in these classrooms and enhanced purposeful teaching. It is to this pedagogical theme consideration now turns.

2. Technology Enhances Purposeful Teaching

In Gabby’s classroom, students are encouraged to experiment with language. They play and practice using words, not only when they write elaborate narratives, but also when they read and perform the same narratives in front of peers. Students practice their work over and over using digital microphones and through drafting and redrafting written and recorded texts.

There is a long history of technology being used to support learners practicing their skills and knowledge, but what remains central is the foundation of knowledge gained and how it can be used in other contexts. The notion of practicing until fluency is reached is seen as key to becoming expert. The sense of purpose in developing students’ skills with words in narratives was acknowledged by other teachers in Gabby’s school, in conference presentations and in books published by the students in her classes. Writing samples were used to guide future written tasks and often ‘new words’ surfaced in different story contexts as students progressed through the year.

Purposeful teaching for Gina was supported by deliberate engagement with the Quality Teaching (QT) framework, which was also frequently referred to by the other teachers. Gina’s QT practice is most explicit in classroom planning documentation, and she situates QT in each step of the planning process. The four QT questions were critical as she used them to focus learning on the element of ‘deep knowledge’ and the dimension of ‘significance.’ Deep knowledge was about how content was presented in a lesson, and it was evident when either the teacher or students provided information, reasoning or arguments that addressed the complexity of a key concept or idea. For example, Gina’s students knew something about climate change. Their knowledge deepened when they articulated clear links to battery consumption, landfill and how much the world needed to seek alternate energy sources. In the dimension of significance in QT, background and cultural knowledge, knowledge integration, inclusivity, connectedness and narrative are present. At each juncture, Gina considered knowledge components in the significance dimension when she gave students opportunity to answer questions, make connection and express narratives in the handmade picture books.

Technology and the choice of digital tools to match the learning purpose were common across cases. If the ‘no tech or low tech’ option was the ‘right tool,’ then it was used. Technology was another classroom resource, and the sense of teaching innovation being driven purely by technology innovation itself was not a trademark of any of the teachers in the case studies. They preferred a variety of technology and aimed for proficiency. For example, Gina’s technology
use included laptops, iPads, iPhones, digital cameras and software applications. On the other hand, Nina’s tool of choice was the laptop supported by software applications and desktop sharing. Gina was cautious about laptops on a whole-classroom basis as she believed it promoted individual work with the teacher out-in-the-front and was akin to working separately at a desk in your own workbook. Nina’s practice was anything but isolated. Students could work on their own if that was their preference. The use of iWeb and remote desktop functions ensured significant sharing and collaboration. Both Gina and Nina were highly critical of interactive whiteboards and didn’t use them, whereas in Gabby and Kitty’s classrooms, they were used often.

It is important to acknowledge here that there has been some criticism of teachers’ use of interactive whiteboards in schools in that they may encourage didactic teaching. This was not so in Gabby or Kitty’s classrooms. Here, the interactive whiteboard was for students’ use and experimentation. Practices such as those of Gabby and Kitty suggest that if the teacher’s pedagogical purpose is not clear, then placing students at the center of technology use or choosing ‘no tech or low tech’ options are appropriate. Another example of this aspect and what it means was the low tech ‘red slip’ Kitty used to focus planning.

3. Technology Focuses Planning

Three planning actions in Kitty’s classroom supported students’ work with technology. For example, the ‘3 × 3 rule’ for laptop work meant students had clear expectations about bringing the device to school each day. Several studies (Collins & Halverson, 2009; Curwood, 2011) reveal that the ‘I forgot my laptop’ catch cry is a frequent problem for teachers. Students who do not have laptops disrupt others, and it is often for this reason that some teachers are less inclined to embrace technology, fearing of its implications for classroom management. Some educators argue that positive uses of laptops outweigh the negatives (Howell, 2012; Papert, 1973, 1980), and this belief is held by all four teachers in this book. Students in Kitty’s classes participated in the development of the ‘3 × 3 rule’ when laptops were first introduced to Farner five years ago, and they rarely came to class without them. The second action that directed Kitty’s planning was the ‘red slip,’ which is also an example of a ‘no tech or low tech,’ or a ‘paper-based backup tool.’ The slip was handed to students when they entered the classroom. It outlined lesson directions and took into account late arrivals, students who came to class without a laptop and needed to catch up without disturbing peers, and it meant that Kitty was not interrupted if she was working with particular students. The ‘red slip’ directed students to the third planning action—the class blog. This tool is used for lesson structure and is a place for further classroom instruction, content links and set tasks.

Blogs, as used in the classrooms of some of the case study teachers, are useful technology tools because they provide a skeleton on which teachers can hang
rich subject matter and they help structure classroom learning (Richardson, 2010; Thomas & Brown, 2011). Blogs are important planning tools. The flexibility they provide is important, and when teachers consider technology integration in the classroom, then planning actions like these are helpful (Thomas & Brown, 2011). None of the other teachers used the same combination of planning supports; although in Nina’s classroom, a short free-standing whiteboard (not interactive) was used to plan a structure for the day, and its content made available to students via the class blog. In Gabby’s classroom, the plan for the day was discussed with students, and in Gina’s classroom detailed lessons plans were kept on a personal laptop. Now, in her role as principal in a new school, Gina writes a weekly blog for parents, and she uses a blog to capture lesson outlines for students in the upper primary school. At this point in the first conception, the pedagogical themes that follow begin a transition to how the teachers’ technology decisions impacted the student learning processes. Technology and its enrichment of subject matter is the focus of the next theme.

4. Technology Enriches Subject Matter

Studies suggest that opportunities for technology to enrich learning content are endless in schools (Bos & Lee, 2014; Mishra et al., 2013). This action was common in all four case studies. However, what happened in Kitty’s classroom demonstrated that access to current content from a class blog was more engaging when combined with other technologies. The History lesson not only required knowing aspects of the history of Gallipoli, it required the self-testing of students’ understandings; the whole class was able to test their topic knowledge using the SRN. Mobile technology meant Kitty quickly saw who had grasped the lesson content, and thus it served as a useful assessment tool. The teacher, whose regular class it was, remarked on the pace of the lesson. In addition, when one of Kitty’s digital media project groups from the previous year made a film about Ned Kelly using various mobile technologies, it was their recall of the subject matter more than a year later that surprised her most. Such technology enrichment of subject matter is supported in UK research (Blake & Edwards, 2012) with a group of pre-service teachers discussing the teaching of History. One teacher in the study remarked: “Accessing historical concepts using technology links students to their ideas and creativity . . . the constructed and contestable nature of historical inquiry” (p. 85). The work of The Deep-Play Research Group at Michigan State University takes this further, suggesting that “creative work emerges within deep knowledge of the discipline” (Mishra et al., 2013, p. 10). On the other hand, it could be argued that because technology like an SRN enables “Yes/No” responses, it was only useful for superficial recall activity. Though, the constructive effects on learning of other mobile technologies, like tablet devices, netbooks and laptops for instance, have been known for some time (Kearney, Schuck, Burden & Aubusson, 2012; Luckin et al., 2012). In the case of
the Gallipoli lesson, the SRN supported a History teacher new to technology, to see—in a non-threatening way—a highly engaging technology lesson in action.

Nina and Gina’s approaches to technology-enriching subject matter were interesting. Ready access to content using the internet, for example, meant Nina was quickly able to gather resources for learning from her “modern day storeroom.” When students explored subject matter using a PBL approach, like QUEST or in an Asia Pacific Project, they used content readily accessible on laptops. Used in this way, laptops are efficient tools for teaching students how to ‘search.’ It was Papert, in the late 1970s, who first recognized the power of the computer for masterful student learning and that learning to use a computer can change the way they use everything else. This kind of preparation was evident in the sets of statistics Gina used in mind maps she created with the students’ input. It is arguably the case that the possibilities for teachers to access rich and current content for planning lessons are infinite using the internet, especially given that approximately 2.9 billion people across the world accessed the internet each day (Kende, 2014).

In Gabby’s classroom, learning mathematical content was enhanced using student-created Notebook files for both online and student-created mathematical games. Video game advocates like Gee (2003) have campaigned for schools to consider the possibilities for games in learning in both literacy and mathematical problem solving. Again, it was Papert (1980) and his work in Logo that acknowledged the ability of young children to write code and program computers. In Gabby’s classroom, for example, when they studied the topic of mass, students produced podcasts about weight and size and then constructed games using Notebook software. Such game-based tasks were useful to gauge their grasp of the concept, especially when assessing their learning. More recently, Mishra, Koehler and Henriksen’s (2011) work has extended the content aspect of TPACK to include cognitive skills, or a set of what is referred to as “transdisciplinary habits of mind,” and they assert that “great thinkers in the past enjoyed unbounded ways of thinking that stand in contrast to how our education system today is structured” (Mishra et al., 2012b, p. 19). In work with the Deep-Play Research Group, Mishra and Henrikson (2012a) suggested that rote solutions to problems do not help students to engage in the deep and reasoned mathematical thinking that connects perceptions and action to deeper abstract ideas. Gabby’s intention in conducting her Mathematics Day at the beach aligns with what is detailed in this new work and in the learning approaches noted by Sir Ken Robinson. Making meaning out of technology integration, and how it enhances reflective learning for students and for teachers is the theme examined in the following section.

5. Technology Promotes Reflective Learning

Nina’s practice was supported by a deep knowledge of technology theory from particular philosophical traditions, Bronowski (1974) and Ihde (1990). She sees
herself as a more experienced learner having studied learning, being an older learner and in a position to apply what she knows, draw on it and take her students further along their learning path. Reflective learning was a deliberate act, and it is technology (in this case, laptops) that allowed Nina's students to find out, look at what they found, make decisions about what their research meant and share what they knew and understood with others. Nina referred to this as the skill of metacognition, enacting or knowing about knowing, comprising planning, monitoring and evaluating. Laptops facilitated students working more powerfully and expeditiously with ideas. Nina strongly identified with Papert's vision. Papert is recognized as having provided a means to understand and apply Piaget's experiments in concrete and formal thinking in child development (Resnick, 2012). Nina's classroom in many ways mirrored Papert's insight into how young children learn best. For example, Nina's students used Scratch computing and attended the robotics club—they were very successful at national competitions. Their level of freedom to explore what they were curious about in the world was palpable. Research from The Digital Media and Research Hub (Ito et al., 2013) referred to examples like this as “connected learning, that is, learning driven by peers, academic performance and tied to in-school recognition” (p. 8). Nina's classroom was fast paced, highly democratic, technology rich, and students had a say in what they learned. When questioned about her approach with this 'gifted class,' Nina was quick to point out that, regardless of students' cognitive abilities, she approached teaching all students in the same way. In Gabby's, Gina's and Kitty's classrooms, the ideas of metacognition as a vehicle to drive reflective learning were not as explicit; it was more about giving students freedom to create sustained responses to learning. It is possible to speculate that the nature of Nina's 'gifted' class made the difference.

In many countries, there is a call for teachers, students and school systems to have a greater say in what is learned in classrooms, both in terms of curriculum content and in developing thinking skills. Facer (2011) suggests a significant disruption to this pattern may come “during the next decade in the form of challenges to the legitimacy of adults to make decisions on the part of children” (p. 39). Other examples exist in strategies like those detailed in international and national education policies. The role of technology in shifting conversations and thinking dominated both Gina's and Nina's classrooms and the presentation of this theme now follows.

6. Technology Shifts Conversations and Thinking

In contrast to Gabby's use of new words as a measure of purposeful teaching, Gina's practice required students to build lists of discipline-specific words on charts around the classroom. Her emphasis on knowing a subject and its meta-language was paramount. An example of this was Gina's deliberate collection of a scientific, technical vocabulary appropriate to the topic of energy, as shown
in her lesson plans. For Gina, the notion that technology and what students can access from the classroom extended beyond subject matter knowledge and its associated language. Similarly, teachers who foregrounded particular words, sentences, text features and discourses in the *Queensland School Reform Longitudinal Study*, large-scale Australian research found classrooms that “were of higher intellectual quality than those where the language did not change or was unsophisticated” (Hayes et al., 2006, p. 45). Dictionaries and thesauruses have always been classroom staples; fast access from mobile devices, for example, on an iPhone or an iPad, means students can find, build banks of words, record them and use them again in texts. In Kitty’s classroom, students used artistic terminology in presentation and group work, and when making films in multi-media projects, their repertoire of genre-specific terminology was pronounced.

Closely linked to shifting student conversation through the teachers’ use of *metalanguage* supported by technological devices was the importance teachers placed on questioning. For instance, in Nina’s classroom, the probing and questioning of students was relentless. This strategy was supported by ‘verbal challenges’ in the form of questions while working on QUEST, or when undertaking Thinking Adventures. Polanyi (1966) writes about the concepts of knowledge and knowing in what he refers to as the tacit dimension. His premise is we know more than we can tell. More recently, this point is taken up by Thomas and Brown (2011) in what they refer to as “a new culture of learning” where the asking of questions is more important than the answers. They suggest teachers need to shift from the limited “ask a question . . . find an answer” to “every answer serving as a starting point and inviting us to ask more and better questions” (p. 74). This notion was echoed some years ago by Mike Summers, CEO of Dell computers when he said: “People who’ve learned to ask great questions and have learned to be inquisitive are the ones who move fastest in our environment because they solve the biggest problems in ways that have the most impact on innovation” (Jerald, 2009, p. 60).

It was Gina’s parents who fostered her questioning from an early age. Whereas her approach to asking questions was not as unyielding as Nina’s, it was still about creating a schema in the child’s mind that aroused curiosity in the world. In addition to the handmade books, Gina would invite students to think further, actually giving them ‘thinking time’; if they struggled to explain something new they had encountered, she would persist with questioning them until their thinking shifted. Resnick (2012) too, in his ‘playful learning’ sees interactive technology like Cricket, not unlike Papert’s Logo, as a means to foster independent questions and to create new inventions borne out of students’ questions about the world. If students do this, their thinking goes beyond the discipline; it can span disciplines (Mishra et al., 2013). The final theme examined in the conception of theory-driven technology practice is the ability of technology to engage students in authentic ways.
7. Technology Engages Students in Authentic Ways

Nina’s classroom engaged students in authentic learning modes. She made the decision to structure her pedagogy using technology and used an approach to learning that gave students freedom to learn in a more real manner. Some teachers may consider this risky. Nonetheless, Nina’s approach was supported by the school principal, parents and students. They trusted her judgment—and she recognized not all teachers have the autonomy to conduct learning in the same way. When teachers make decisions like this, the Carr and Kemmis (1986) definition of praxis is useful: “Action that embodies particular qualities” (p. 190). It was a type of authenticity drawn from Nina’s belief that what students do with technology engaged and motivated them to want to explore their world and to learn how to learn. This was not necessarily the perception articulated by the other teachers. Their beliefs were more pragmatic. For example, Kitty expressed a belief that if you want students to know about something, they have to experience it—that is, you learn about filmmaking by becoming a filmmaker. Technology associated with producing films, such as digital cameras, microphones, software programs, editing equipment as well as clapper boards and storyboards, fulfil what Kitty called the “concrete experience.” This fits with what Craft (2011) suggests is “pedagogy that fosters high participation and high possibilities, expects, encourages and rewards high learner engagement” (p. 130). In Kitty’s view, engagement arises from knowing film conventions and protocols, just as a filmmaker would on a film set. Digital media projects are popular at Kitty’s school. Students like to learn this way, and each term, Kitty has to turn many students away from her elective classes. She does this gently through another professional process using Expressions of Interest (EOI). This again, is an authentic, real-world process. In both Gina’s and Gabby’s classrooms, students were also highly engaged in authentic learning and didn’t want to leave when the bell rang. For students in these classrooms, learning was fun, which is part of the second conception of teachers’ knowledge of technology integration and is key to creativity.

Creativity for Learning + Technology = Creativity for Learning Through Technology

Creativity was a potent common force in the classrooms of Gabby, Gina, Nina and Kitty. In a well-known TED talk familiar to the teachers, Sir Ken Robinson (2006) said: “My contention is that creativity now is as important in education as literacy, and we should treat it with the same status.” It was Gardner’s (2007) research that proposed the “creative mind” as one of five necessary minds for the future; such ideas had been flagged previously in popular texts about the future of education (p. 7). New education research from Mishra, Henrikson and the Deep-Play Research Group (2012b), among other key players, argued that “creativity is essential in education” (p. 20). This conception in the case studies was demonstrated...
through five themes: technology boosts creativity, technology creates opportunities for production, technology unleashes playful moments, technology supports values and technology differentiates learning. In the first pedagogical theme, it is what the teacher did that in turn affected student learning processes in the other four themes. The role of technology in boosting creativity is now considered.

1. Technology Boosts Creativity

In Gabby’s classroom, the emphasis was on hands-on activities and her belief that unless students were making “beautiful products,” they were not learning. Interactive whiteboard technology sparked Gabby’s creative edge. Her interaction with it was always about what students did with it; in many ways, it was her ‘electronic crayon box.’ Students operated it independently in conjunction with scanners, digital microphones and Notebook software. In the classroom, Gabby often said: “Get those creative juices flowing.” Students knew exactly what she meant. Not only was the classroom a visual feast of technology-created artifacts, parents in the school wanted their child to have at least one year of primary education in Gabby’s class. Craft (2011), among others, has identified several challenges for teachers in schools who focus learning in this way, namely: the economic rationale, the elision between creativity and culture, conservative education policies, creative partnerships with schools and how to assess creativity. For Gabby, her approach was principal approved, widely disseminated and publicly applauded, and she, like Nina, recognized this was not always the case.

The production of creative students was a long-held priority for Gina. Her professional background as a programmer led her to develop an overt concern with school-age students learning “the backend stuff,” for example, programming language at primary school. She stated a view that teachers needed to capitalize on young children’s innate creativity, and for her, this meant encouraging less passive consumption of what software companies produced. Her belief correlates with what Papert (2002) referred to as “hard fun” and the fact that all children liked challenging things to do. The sense of “hard fun” also resonated with Nina. She directly associated good learning with creativity and giving students time to let their imagination lead them. Space for creativity and imagination is important in classrooms. It is just as essential in curriculum design. To paraphrase Einstein, ‘knowledge is limited; imagination on the other hand encircles the world.’ Physical space was also a critical element of learning design, and will be returned to later in the chapter. Nina’s students worked with laptops on long benches around a central table and outside in the school garden. The other teachers had similarly flexible ideas about unbounded physical space.

The value of being able to make or produce something using technology was critical for Kitty in the secondary school context. This was coupled with her belief that deviation off a set path using technology only served to accentuate creativity. For instance, it was possible to elicit recordable responses from her
students while they experimented with shot sizes using a digital camera, or when using bonsai as a photographic subject to begin a new project. When we build, we do more than create content. Thanks to new technologies, we also create context by building within a particular environment, often providing links or creating connections and juxtapositions to give meaning to the content. This act of seeing the fine detail in Kitty’s classrooms correlates with what has been referred to “as the move from looking to seeing” (Root-Bernstein, in Mishra, Henriksen, & and Deep-Play Research Group, 2012b, p. 14). Students created products, in particular the making of films, in all four teachers’ classrooms, and it is to that theme of production that the analysis now turns.

2. Technology Creates Opportunities for Production

In a report of 210 technology innovations from the UK, “Learning through Making” was identified as one of eight key themes (Luckin et al., 2012, p. 24). In research almost 30 years ago before that, Simonton (1984) found creative success is linked to the sheer quantity of productive output. The more ideas you have, the more likely you are to have a truly valuable creative insight; the more you produce, the likelier you are to creatively succeed. This echoes how technology creates opportunities for production in the case study classrooms, and is strongly aligned to Gina’s view of creativity. Technology was most effective when students created something to share, so that it could be discussed and reflected upon. A good example of this was when Gina showed her new class a video of solar cars made by a previous group. When questioned about her tactic, she advocated video recording as top of the technology list, and she mentioned the ‘flipped classroom.’ This concept relies upon homework traditionally done at home being completed in class where each class starts with a few minutes of discussion about a video students have viewed the night before. The ‘flipping idea’ from the Khan Academy is built on blended learning principles, and the idea of restructuring classroom time. Under normal circumstances, Gina would have required students to view the video the night before, take notes, and then come to class with questions. Video used in this way helps students learn and revise, and it means for some teachers that they can’t just be content delivery agents.

Gina extended her preference for video production further when she modeled how to record content for students in various podcasts and short films. Similar practices existed in the classrooms of Gabby, Nina and Kitty. Arguments for this kind of production in classrooms abound in the literature: using technology to make videos means better learning for busy students, struggling students and those who excel, and it gives more student-teacher interaction. What was clear from the case studies was that video production was time-consuming for teachers and students. Invariably, films had to be completed outside of class/school time. Yet, in these classrooms, there was undoubtedly more to gain than lose. Another important gain in these classrooms was playfulness, and this theme is examined next.
3. Technology Unleashes Playful Moments

In his book, *Homo Ludens*, Huizinga (1971) argued that play created culture, and for this reason, play was not something that we do, “it is who we are . . . and the structure of play makes the player’s agency central to the learning” (p. 17). Play is influential and provided agency to students, giving opportunities for experimentation, something Gabby gave voice to, and it was in the early years of schooling that more evidence of play in the cases emerged. It could be argued, however, that like the students, the teachers in the case studies played too. For example, Gina’s students played when they constructed cars, Nina’s when they responded to Thinking Challenges, and Kitty’s when students recorded ‘film takes’ on set. Thomas and Brown (2011) state that “whatever one accomplishes through play, the activity is never about a particular goal . . . it’s about finding the next challenge and becoming fully immersed in the state of play” (p. 99). Technology unleashed these playful moments by creating a base from which to structure, guide and realize the desire to learn, and in so doing, provided certain legitimacy and a vehicle for immersive, and often experimental, experiences. Perhaps this is what Craft (2011) states is the “exploratory drive that is nourished by digital contexts common in the lives of children and young people” (p. 73). What was seen also aligns with what Mackey (2009) terms “thick play,” and her idea that children must be encouraged to “linger in a particular fictional world, savouring, repeating, extending and embellishing the imaginative contact with that world, often in complex, irregular and inexplicit ways” (p. 92).

This kind of play was apparent in Gabby’s classroom most of the time; the music lesson with Charles stood out as an excellent example. What occurred in the lesson resonated with what Mackey (2009) refers to as “big worlds” activity (p. 103). This complex learning event was an adaptation and extension of the fairy tale “Hansel and Gretel.” It began with storytelling alongside scripted music played on recycled musical instruments, as well as dialogue, background scenes scanned onto the interactive whiteboard and dramatic action. In addition, each week Gabby held ‘play time’ in class for students to report news stories by bringing them to life through dressing up and performance. Students filmed each other using digital cameras, and played the material back in class; some wanted to revisit the recordings at lunchtime or after school. Play in schools, especially in elementary schools, is being given less time. The teachers played in all of these classrooms and they expressed delight in that they ‘got paid to do this job.’ Gabby made exotic Notebooks, Gina completed picture books, Nina acted in scenes for the “Breaking the Silence” movie and Kitty was active on the film set and became part of the crowd interviewed in the promotional video.

When educators play more, or think more about play or playfulness as noted by Craft (2011), they are “faced with two dilemmas, one at the level of principle and the other at level of practice” (p. 85). This refers to the question of who is in charge, and therefore who is in command. This matter is returned to at the end
of the chapter. In examining creativity, imagination in these contexts was core, and worked as a common way of opening up thinking for both teachers and students alike. This notion is closely associated with ideas on intuition, inspiration, ingenuity and insight as the ‘core businesses’ for schools. Connecting play and imagination, as seen in these classrooms, may be the “single most important step in unleashing the new culture of learning” (Thomas & Brown, 2011, p. 118). Another vital component of creativity for learning through technology was how it was sustained by particular values held by teachers in the cases studies, and this is the subject of the next section.

4. Technology Supports Values

A widely distributed post-WWII schooling pamphlet, *Story of a School*, detailed values in “illustrations that showed creativity in action” (Burke, 2011, p. 423). Although published for the English and Welsh education market in the late 1940s and early 1950s, from Burke’s description, there are parallels with current calls for how education jurisdictions might prepare children for the future. Today, the role of school design and digital tools are prominent. To fast-forward that vision into the Australian context, the latest curriculum paper, *Shape of the Curriculum: Technologies* (2012), focuses attention on technology and its central role as an education goal for young Australians. There are parallels in curriculum documents in the UK, the USA and in new education policy in the Southeast Asian countries of Singapore and South Korea. Emphasizing technology as a vital force in students’ lives in curriculums makes links to literacy, numeracy, information and communication technology capability, critical and creative thinking, personal and social capability, ethical behavior and intercultural understanding. The role of technology in supporting values in education policy is evident everywhere in documentation across the globe. On the other hand, how technology props up what is valued in Nina’s and Kitty’s classrooms does not always appear in official documentation; it is more subtle.

For Nina, what was manifested was joy and celebration, as shown when students trained for peer support. Technology was the vessel used for discussion and collation of understandings on leadership. Nina’s learning values shaped her constructivist teaching principles, as detailed in the first conception. Students, when questioned about what Nina valued, understood that learning mattered in their classroom. She devoted time to praising achievement and persistence in problem solving, calling out “what joy!” and other celebratory comments on more than one occasion. The action summoned Dewey’s (1916) idea of intrinsic valuing, and, more recently, Pink’s (2009) idea that it’s more about autonomy, mastery and purpose. Nevertheless, ‘integrity’ or ‘doing your best’ aligns to what Nina wanted for her students. Earlier, Pink (2006) implored audiences around the world to consider “left brain activities that powered the information age are no longer sufficient, right brain qualities of inventiveness, empathy, joyfulfulness and meaning will now determine who flourishes and who flounders” (p. 3).
Creating High Possibility Classrooms

In Kitty’s classrooms, the values of aesthetic significance fit alongside her formal training as a visual arts practitioner and filmmaker, and arise from current models of creativity in art education practice. Technology affected the visual form and gave Kitty endless possibilities in art practice. Other scholars cite “attention to visual literacy as increasingly necessary in technology rich landscapes” (Craft, 2011, p. 109). Kitty modeled software applications such as Prezi to students; subsequently, they would experiment with the apps at home or in class, and often returned with better versions than they were shown. Technology provided a positive, quiet space in which text, audio and the visual collided, and, in this case, linked to the teacher’s considerable aesthetic commitment. There was also a sense that students in Kitty’s senior high school classes had chosen to study visual arts with a practitioner who improved their technology skills. The last theme in the second conception is captured in differentiating learning, and it is detailed below.

5. Technology Differentiates Learning

Across all four classrooms, learning differentiation is linked to the pace of learning. It was conspicuous and reached to a fever pitch in Nina’s context. Pace is cited in education literature as one of the key affordances of technology integration, and the way it enables differentiated instruction in schools is well documented. Use of laptops meant students could work on different tasks at their own pace, and Nina exploited this advantage by setting short timeframes and high expectations for task completion. Students moved swiftly from one task to the next, reported back and then went onto new work. Such positive technology effects are supported in reports that listened to what students wanted from their school experience (Green & Hannon, 2007; Moyle & Owen, 2008). Other literature takes the plan a step further and sees it as means for personalized learning (Leadbeater, 2009). Elsewhere, other educators believe this is the route to achievement of differentiated instruction (Fullan, 2009; Hattie, 2009).

In Kitty’s classrooms, differentiation linked to pace in a particular way. It gave impetus to cross-stage groupings of students in digital media projects. Making films with students from different years promoted social, as well as academic, benefits. Distribution of laptops at Farner assisted teachers to better differentiate learning for students, and increase the potential of digital tools like iPads to more successfully create differentiated learning environments.

For Gabby, the potential for technology to differentiate instruction was enlivened by negotiation, and through processes of ‘going with the flow’ and allowing students to have ‘incomplete tasks’ or ‘work in progress’ to continually inspire creativity. She called it “unfinishedness.” Choice was a key feature here, and technology served to broaden how students worked differently. At different times, they chose the scanner combined with the interactive whiteboard, or the desktop computer with Notebook software. The notion of ‘flow’ and
‘getting into flow’ are hallmarks of successful technology integration in education (Landhäusser & Keller, 2012; Shernoff, Csikszentmihályi, Schneider & Shernoff, 2003). The term ‘flow’ comes from positive psychology and refers to intense concentration in the moment, giving the person a sense of agency and loss of self-consciousness. In many ways, this distinguished what went on in Gabby’s classroom in stark contrast to other teachers in the school. She spoke about ‘letting go’ and ‘giving students control’ as her approach to differentiation; it worked, and meant she was able to step back and see how students used technology without teacher intervention. Craft (2012) presents a summary of narratives that may be useful to explain Gabby’s approach; there are two dominant discourses: one sees “childhood as computerized” and therefore empowered, and the other views children as “at risk,” requiring protection where play is private (pp. 176–7). Such ideas about empowerment of children versus ideas of ‘at risk’ are taken up further in Chapter 8. Attached to differentiation are opportunities to make learning public through technology integration, and this conception is examined in the next section.

Public Learning + Technology = Public Learning Through Technology

The third conception was supported by two pedagogical themes: technology scaffolds performance and technology enhances outcomes. Both themes positively impact student learning processes. The public dimension of technology is controversial and there are concerns globally that young people know about safe online behaviors and understand that everything done online leaves a ‘digital footprint.’ Furthermore, Craft (2012) supports this idea of openness and making learning public with technology, and then argues for:

Lyman et al.’s (2004) “cultural production” notion, which acknowledges opportunities through digital media for children and young people to make public co-representations of experience which are then challenged, evolved, manipulated online by others . . . such cultural co-production makes audible children’s voices in a more political sense.

(p. 181)

What came through strongly in this conception of the teachers’ knowledge of technology integration in the four case studies was the propensity of technology-enabled learning environments to scaffold performance by making it public. The conception was more covert in Nina’s practice, probably as a consequence of the nature of the group. Her students received considerable public attention for the films, robots and 3D models they created. Both the teachers’ pedagogy and student learning processes illustrate the efficacy of making learning public through technology.
1. Technology Scaffolds Performance

Gina used apps when she worked with teachers in other school settings, and she chose programs that deliberately exposed students’ work to one another. Working this way was another aspect of creativity, and confirmed Gina’s fundamental belief that if students viewed learning done by peers, this supported and enhanced what everyone learned. If learning was screened, for example, on a projector or in an online program, all students stood to benefit. This belief fitted with what occurred in other classrooms in the case studies. The theme was not performative in essence, although pushed to its logical conclusion, what the teachers wanted was better and deeper learning for all students and to tap the potential of many minds working together. These attributes are not easily testable through rubrics of standardized assessment. In recent discussion, Mishra et al. (2012a) raises the importance of “in-disciplined thinking,” and cites the software application Kinect, developed at the University of Washington–Bothell, that is used to teach students the functions of distance, velocity and acceleration in real time: “Students in the 5th grade were able to understand this concept without any previous instruction” (p. 16). Gina’s students’ understanding of energy transfer was impressive, as were Nina’s students’ performances in national academic and arts–based competitions, and their explanations of complex ideas in QUEST projects were similarly remarkable.

Kitty’s long experience as a senior high school teacher confirmed her observation that technology had improved student learning outcomes over time. This was borne out in the final examination results achieved by her students in comparison to students of other teachers in the school, who used little or no technology in learning. Another ingredient in the performance theme was how her students used social media, like blogs, to give themselves a voice. Some were shy; while others believed it disguised their ethnic background and meant their accent was not on display. Student engagement with social media aligns to the public aspects of blogging, in particular to the teachers’ perceptions of the usefulness, or otherwise, of this technology.

There was pressure to produce something worthwhile in high school contexts, as students knew others would view it, and this pressure was equally apparent in the early years of schooling. Immediacy, pace, the notion of learning being made public and performativity are linked here, and considered together, raise concerns for some educators. For some students, little effort led to something interesting and stimulating being made available to others, and this suggested possible tensions between performativity and mastery, or performativity and creativity (Kim, 2011). Increasingly, teachers are torn between what they believe counts as good learning and ‘teaching to tests’ where creative thinking is marginalized. This is a concern raised by more and more educators in many countries.
The outward displays of learning created by using technology provided visual records or documentation for Gabby's students, which could be viewed by others, including parents. However, because students valued the visual medium, what they produced as final products or work-in-progress was better. Such belief was based on what Gabby noticed across more than 20 years in the classroom. Kitty had also taught for this long, and she, too, believed that what students produced today in her classrooms was better than when she first started teaching. The proposition that when students' work has a public audience, it enhances outcomes is detailed below.

2. Technology Enhances Outcomes

The work that Gabby’s students produced was held up as exceptional both within the school and beyond. Her students gained an impressive level of technology mastery from an early age, and what they did confirmed the notion of the tech-savvy child. Support from peers was central to growth in technology skill, and students would more often ask each other for assistance than ask the teacher. There is an argument that if teachers harness students’ natural technology interest, and see it as positive and not a threat, it may free up class time for other things. Martinez (n.d.) took this approach in what she termed ‘participatory learning,’ in the project GenerationYes. Here, students worked alongside their teachers as technology leaders, collaborators and mentors. Students in these contexts were agents of change, rather than objects of change. The idea, again, falls within a perception some educators have of childhood as being about risk and others viewing children as empowered. What the teachers in these case studies demonstrate is that it’s possible to prepare students to succeed at school in authentic ways with technology enhancing the outcomes. For example, teachers’ technology use of electronic portfolios in schools is a means to bring about changes in school outcomes. If peer or collegial audiences are nurtured effectively, they, too, can boost outcomes using technology. The belief can be extended to the professional tensions around raising standards, testing and school rankings, and where measuring creativity—or not—falls within such considerations. Thomson (2011) frames this issue in ideas of capacity building for change that often appear in “development discourses citing Bascia and Hargreaves, 2000; Fullan, 1993; McLaughlin et al., 2007 and others” (p. 347). Luckin et al. (2012) argues that there is little innovation in technology-supported assessment, and possibly this is due to the lack of excitement assessment generates more generally within the education sector. Their report cites increasing interest in formative e-assessment among teachers, and gives examples of how ‘off-the-shelf’ technology like Audacity and Movie Maker might be used. Notably, all four teachers used these software programs extensively with students. The possibilities for life preparation using technology are critical, and this is the subject of the fourth conception.
Preparation for Life + Technology = Life Preparation
Using Technology

In the preface to Alan November’s book *Empowering Students with Technology* (2010), he details the case of Yves, a former high school student who broke into the school’s computer lab. Although Yves was a weak student, he explained that if he had a computer, he could do the whole of the school’s programming course in a weekend; he did just that. November touts this example as more than just a failing student being motivated by using computers; it represented a case of a shift in the control of learning, and demonstrated the importance of students learning how to learn. What it also showed was a vision for technology as central to preparing students for life beyond school. Much of the global debate now centers on the well-known, albeit highly contested, phrase “21st Century skills.” There is a call for teachers to integrate these skills into the curriculum. While it was a less common concern in Gabby’s classroom as she teaches younger students, the cases together show it is supported by several themes: technology operationalizes the real world, technology gives voice, technology means ownership and possibility, and technology reveals effectiveness. The fourth conception, ‘life preparation using technology,’ is supported by four themes: operationalizing the real world, giving voice, ownership and responsibility and the revelation of effectiveness in terms of self-regulation and self-efficacy.

1. Technology Operationalizes the Real World

The spirit of this theme involved connecting what students learned to the real world and questioning them about it. Gina touched on providing students with other ‘real experiences,’ like preparation for assessment regimes like NAPLAN. This presented a dilemma for her—and indeed, for all the teachers—in that perhaps her students were disadvantaged because she didn’t teach like other teachers whose classrooms were awash with ‘drill and preparation activity.’ Often life’s most important lessons generally don’t appear in standardized tests.

In Nina’s classroom, another aspect of creativity that linked closely to life preparation was her consciousness that, as a teacher of students in the middle years, she needed to prepare her students for high school. Nina’s belief was ‘life isn’t school,’ and “if you are just a school learner I will not have succeeded in my mission.” This preoccupation was not dissimilar to the message Kitty gave to her students. She, too, felt a sense of urgency. Kitty’s students were in the later stages of their school lives, and mostly from migrant families where perhaps there was even greater pressure to succeed at school. The sense of what the real world expects surfaces in Facer’s (2011) research that supports conditions for what she terms as enabling “future-building schools.” These range across:

Governance, local curriculum, mapping students and schools wider education ecology, housing education, transport and environmental policies,
assessment for competency not certification, rethinking child protection policy, rethinking teacher education, building school-university collaborations and developing an ethical code for the educational use of digital and bio-technologies.

(p. 128)

Some educators tie such education futures to students being more self-directed and to theories of transformative learning. It could also be asserted that transformation in its more current use is the normal condition of creating meaning in one’s life. In Siemens’s (2005) theory of constructivism, he points out that using technology and making connections are linked. If teachers are able to frame how they teach with real-world considerations, then perhaps education is a step closer to closing the gap between the students’ school lives and what occurs outside. A further theme in this conception is that technology gives voice, and it is examined in the following part of the chapter.

2. Technology Gives Voice

Both Gina and Nina held the view that technology gave students ‘voice’ in overt and covert ways, and each used technology to affect that opportunity. For example, they used Scratch, class blogs, desktop sharing and video production in “Breaking the Silence,” a film that focused on creating a vision of the “school they’d like.” The notion of ‘student voice’ in part returns to an earlier reference to personalized learning and to the previous work of Fielding (2001) who argues that ‘authentic student voice’ should encourage young people’s active participation in shared decision making and consequent actions. What occurred in these two classrooms (and to some degree in Gabby’s, and, in a more pronounced manner, in Kitty’s) came with deliberate opportunities for students to have control over what they learned. Often, it was technology choices that students made that determined how learning was realized. This was very compelling, and matches McWilliam and Taylor’s (2012) arguments for personally significant learning; it asserts that:

When learning is not personally significant children become vulnerable, and if they think learning is boring and just about preparing for tests and reliant on teachers and parents who tell them what to do, then they are in deep trouble.

(p. 1)

This argument broadens out into wider implications for culture. Still, what this means is that current models of schooling and personally significant learning are at odds with each other. Technology is a means to enact personally significant learning and to give students voice as agents of change who work alongside teachers. Florida (2005) opines that “we should look to life after school, not during it, as a time of creative possibilities” (p. 33).
Creating High Possibility Classrooms

According to Craft (2011), the idea of possibilities is just one of four digital dimensions in children’s lives. Other researchers, like Ito (2009), suggest that if young people are given time to hang out, mess or geek around, they will more successfully “indwell.” This term, first developed by Polanyi (1966), refers to an adaptive process and means a familiarity with ideas, practices, possibilities and processes that become so ingrained they become second nature and eventually enable individuals to make connections among the tacit dimensions of things. Focus allows students to construct their own collective learning communities with their voice and form what has been referred to as ‘collective indwelling’ and ‘networked imaginations’ (Ito et al., 2013). This concept is often evident when students play Local Area Network games like World of Warcraft (de Fretas & Maharg, 2011). It was Nina who saw technology integration, the laptop in particular, as the means to create community in the classroom. This was coupled with her beliefs about shared ownership and possibility, which are essential to balancing the personal, the collective and the key parts of life preparation using technology. This pedagogical theme is appraised in the next section.

3. Technology Means Ownership and Possibility

Claymation, a form of stop-motion animation, was used by Gina to extend a colleague’s technology skill set. It was students in this teacher’s classroom who commented on how much they liked the program and also the autonomy it gave to their learning. Gina referred to this as ownership. In positing challenges for creativity and learning over the next 10 years, Craft (2011) identifies ownership as important from the perspective of “whose hands is the future in and what role does learner participation and voice play in nurturing creativity?” (p. 136). Concerns like those identified by Craft are active in the beliefs of teachers in the case studies in this book. Students in Nina’s classroom cite the freedom to find out when ‘QUESTing,’ and sharing what they know, as liberating. Yet, there was also student comment about the temptations and distractions of technology, and the need to be disciplined. Facer (2011) refers to perceptions that technology represents “dangerous knowledge” (p. 67). For some commentators (Greenfield, 2009; Richtel, 2012), technology is responsible for creating more distracted children with shorter attention spans. What was clear was that even within the parameters of the classrooms, for teachers and students, there were personal preferences in terms of their technology choices.

Kitty viewed using different tools as a matter of risk-taking, and felt that this was central to a sense of ownership, and therefore key to students’ life preparation. Students’ preparedness to take risks in learning, and therefore take responsibility for personal learning, is critical for future employment skills. Kitty believed it was simple, as she stated: “If students see teachers taking learning risks, and I am talking about technology... then they will too.” In her context, that meant teachers using technology, or asking for professional support with
in-class technology mentoring. This notion tied in with her beliefs about flexibility, particularly in a school like Farner, where teachers needed to be even more supple, and rules like ‘3 × 3’ were examples of how technology integration was achieved. Cremin, Burnard and Craft (2006) present a Stage 1 model of pedagogy and possibility thinking where risk-taking, posing questions, playing, immersion, being imaginative, self-determining and intentioned are important. Although the study was not carried out in digital contexts, it is possible to speculate that what was revealed by Craft’s (2011) work, in light of the teachers in this book, has much in common with ideas of ‘possibility thinking.’ The question of whether teachers require a specific digital pedagogy is an issue examined further in the fifth conception. The last theme in this conception is how technology reveals effectiveness.

4. Technology Reveals Effectiveness

In the classrooms of Nina and Kitty, perceptions of teacher knowledge of technology integration and effectiveness developed around notions of self-efficacy and self-regulation. The domain of self-efficacy owes much to the work of Bandura (1977) and is about beliefs in the ability to succeed in specific situations. Students who are self-regulated learners believe that opportunities to take on challenging tasks, practice their learning, develop a deep understanding of subject matter and exert effort will give rise to academic success. Creative self-efficacy is an emerging area of research that has received little or no attention in education even though it is instrumental in developing and demonstrating creativity.

Creative ability alone is not sufficient for creative performance using the Bandura (1977) construct. For example, in Nina’s classroom, self-regulation was built on such foundations and this paired with her self-described model of “distributed leadership” which she admitted would not sit well with other teachers. Nina didn’t have a desk, she moved around the classroom with her laptop perched on one hand and the table where her desktop computer sat was accessed by students. She used the metaphor of a “mothership” for her computer with a whole fleet behind her on the same “mission.” However, she said: “sometimes there were scouts out front.” This issue was flagged long ago by Lankshear, Peters and Knobel (1996) who suggested that new technologies, with their effects on compressing time and place, would challenge these spaces of enclosure and therefore the authority of the teacher. There was a heightened awareness from Nina’s students in terms of the amount of work she expected from them and they mentioned how much time they spent at screens in the classroom. Students aired their grievances in class, and Nina was quick to act and change direction. When teachers take the concerns of students seriously and have positive relationships, students are less likely to fail. In a recent document, a meta-review of knowledge work, Claxton, Lucas, and Webster (2010) distill a phrase “wider-skills” to encompass a
series of interventions over the past 10 years in curriculum and research analyses. These made reference to:

Soft outcomes, or life skills for the 21st Century as well as creative learning as falling into these catch-all ideas, and are described in an OECD book that advocates a model of education which encourages students to become “self-regulated” learners.

(Dumont et al., 2010, p. 14)

Such calls suggest that there are a new set of qualities being demanded of learners and Sefton-Green and Bresler (2011) refer to these as “intra-personal” qualities. This means being able to work in teams, to negotiate, to work cooperatively and within communities and to be able to present oneself confidently. Bandura (1989) identified this as personal agency, and it was Zimmermann (1990) not long after who urged educators to think about self-directed learning. Recent research in a middle school in the Midwest of the USA (Mishra et al., 2013) is built upon the notion of self-directed learning and how “technology combined with exploratory, learner-directed environments fosters development of learner-directed attitudes and behaviours” (p. 12).

What was also interesting in the classrooms of all the teachers in this book is that there were few, if any, behavior problems. On the odd occasion, it concerned noise level and being mindful of learning taking place in the next classroom. Kitty described these moments as “good days and bad days in teaching.” This fits with findings of research in the Fair Go Projects that demonstrated when students are in-task, they are less inclined to be “off-task” or misbehave (Munns et al., 2006, 2013). Kitty encouraged this type of self-regulation, or effectiveness using technology, and the most memorable example was the Hall of Fame blog. It was a classroom management tool at one level, while at the same time reinforcing content and students’ ideas. Since the introduction of blogs at the school, Kitty noticed greater confidence in students’ learning in a range of classrooms. The previous four conceptions are highly dependent on the last conception, contextual accommodations using technology, which is examined below.

**Contextual Accommodations + Technology = Contextual Accommodations Using Technology**

Teachers’ knowledge of technology integration is bounded by context. This is played out as a series of accommodations or realities using technology and what this might mean for teachers and for schools. The conception is underpinned by four themes: technology remains personal and professional, technology changes time, technology nurtures community and technology defines the game.
1. Technology Remains Personal and Professional

More common in Gina’s, Nina’s and Kitty’s classrooms, but also significant in Gabby’s, this theme bestowed opportunities as well as challenges for the teachers. For Gina, the move from computer programming to classroom teacher changed her sense of professional identity, and this identity was reshaped again when she took on roles of assistant principal, consultant, and, now, school principal. Her career progression was not without concern. She lamented less time in the classroom and being able to build rapport with the one class. Instead, it was now multiple classrooms and mentoring colleagues in pedagogy. In effect, Gina’s personal passion for technology had become her professional mantle in a very short period of time. In studies of teacher identity, Day and colleagues (2006) found that teachers balance three dimensions in their work, a personal dimension (teachers’ life outside the school), a professional dimension (social and policy expectations of what a good teacher is and the teachers’ own educational ideals) and a situational dimension (the direct working environment of the teacher). It is through the ways these dimensions interact that different professional identities are formed.

This balancing act was turned into a proactive position; Gina’s expert technology knowledge informed her practice, and she shared that willingly with teaching colleagues. Indeed, all of the teachers did this. Nina didn’t consider herself ‘exemplary,’ she preferred the idea of ‘pioneer,’ by which she implied that all parts of the personal, professional and situational came into play. As the first teacher in her education jurisdiction to implement a whole laptop classroom, this description was appropriate and aligns with what are ‘common secrets’ of inspirational teachers.

At Kitty’s school, professional responsibility was personally enacted and leveraged with technology among teaching colleagues. Meet ‘n’ Greet was an excellent example of how iPads were used to excite staff about technology and were also a means to interact with students and build school pride. Kitty’s personal background in filmmaking was recognized and promoted by her principal, and together, this experience and acknowledgement were an authoritative combination for access to other teachers’ classrooms. This approach to in-class mentoring and up-skilling teachers’ pedagogy using technology as the lever ‘worked.’ It was remarkable that teachers would readily ask for support with technology in preference to admissions of poor pedagogy, and in light of their history of non-acceptance of improvement gestures.

Kitty’s growing group of ICT Champions was testament to her success. Technology as education reform continues to receive attention (Gunzenhauser & Noblit, 2011; Thomson, 2011). In earlier education studies, Nias (1989) claimed that professional identity was related to how teachers respond to educational reforms, and this factor more generally pertained to how teachers saw themselves based on their interpretations of their continuing interaction within their context.
Adaptation to changes in learning and teaching is about having an attitude of ‘digital expectancy,’ and this is not limited to teachers, but includes students, parents, employers, government and the wider community. Gabby accommodated her personal and professional contextual realities. She deliberately made time to improve and develop her colleagues’ familiarity with technology both within and across the education jurisdiction. This professional commitment included representing her region at several international education conferences. What she enacted, mediated by technology, was unique. This theme is detailed below.

2. Technology Changes Time

Gabby invested significant personal time in technology integration; she used the metaphor of “choosing the right dress for the right occasion” to describe that process. Rushing into using technology was not something she championed, and for Gabby, thoughtful choices about what was better to use for (what) learning were central. Above all, making certain the technology worked immediately was paramount. In Gabby’s classroom, longer blocks of time were a pedagogical choice, alongside recognition that if students were to produce good work, it could not be achieved in short timeframes. The term “slow learning” used by Thomson (2011) is useful here, as it describes the opportunity for children to engage with longer and larger tasks and work together in ways that allow them to learn from one another. Gabby’s notion of technology changing time also includes an aspect of “creative learning where variety in sequencing and pacing are offered” (p. 262).

There is increasing tendency in Australian classrooms and classrooms around the world to segment lesson time in primary schools into shorter blocks of learning time; this action is seen as a consequence of two factors: crowded curriculums and pressure by education jurisdictions to prepare students for various testing regimes. In some high schools, there is experimentation with shifting timetables and subject timeframes to enable technology-rich environments to be more effective (Kolbe, Partridge & O’Reilly, 2011; Mass 2020, n.d.). In Kitty’s digital media projects, time and having more time was a reason cited by students for their liking the film projects. Notions of time link back to Papert’s (1993) idea of ‘flow’ and that ‘getting into flow takes time.’ Research (Facer, 2011) suggests a reimagining of schools that are designed for “future building not future proofing” and reconceptualizing the way the school day is organized is part of that reimagining (p. 133). Time is seen as an effective vehicle to develop learning and can be further nourished when technology nurtures community. This theme is now considered.

3. Technology Nurtures Community

Teachers are integral to learning communities in the classrooms in the case studies. The sense of community is nicely captured in Woolgar’s (1988) idea of ‘workbench or workbench communities’ and he described them as typically
involving small groups of individuals who work closely together to solve problems of immediate and joint concern around tables. John and Wheeler (2008) used the idea to place emphasis on classroom community in technology-rich contexts. Furthermore, they suggested that if classrooms are set up this way, then technology can act as a catalyst to shift pedagogy from more transmissionist forms to more social-constructivist approaches. This pedagogy issue, and how technology as part of learning community extends classroom boundaries, is taken up further in Chapter 8. Students working on benches and around large tables were first mentioned in Nina’s classroom. How students worked and learned together mattered, and Nina saw her role mainly as the leader of the learning community in the classroom, in terms of the “mothership” metaphor. Students in Gabby’s and Kitty’s classrooms saw their teachers as leading the classroom, and they would readily seek their guidance and support. Gathered around tables, both Gabby and Kitty saw space as a lever to build the learning community, and this was reflected in the pedagogical approach. Space is important to ‘place pedagogies’ in digital cultures involving young people.

Gina’s beliefs about technology as a key promoter of learning communities in classrooms were very close to the other teachers. In each new context, Gina quickly got to know the students’ names. She did this to build rapport. This action was her commitment to facilitate students working together, to solve learning issues and to share understandings. To assist her sense of connection to community, Gina made a point of nurturing her professional technology community using a PLN, a personal learning network. This practice enabled her to combat the ‘professional technology isolation’ she sometimes felt. She was very active in the Twitter space and saw this as the ‘best means’ to connect her to technology-savvy colleagues beyond the work context. Like Gina, Kitty’s commitment to “Brekkie with a Techie” was her link to an outside professional technology community. She readily presented useful technology tips to peers, and often took suggestions from these sessions and enacted them the same day. Nina and Gabby tended to rely on individual technology contacts outside of school to foster a professional community.

TeachMeet (AUS) is a relatively new initiative that has parallels around the world in the form of regular chat forums; other teachers might prefer organized forums using social media like Twitter where they can share stories of practice, ideas and personal insights into teaching with technology. It is reasonable to suggest that all of the case study teachers felt some kind of professional technology isolation in their contexts. The isolation meant that, as leaders in their contexts, there was really no one to learn from. The sense of professional technology isolation wasn’t a preoccupation. But, it was spoken about by all of the teachers, and it was overcome to some degree by personal initiatives and extensive outside networks.

The schools and education communities in which Gabby, Gina, Nina and Kitty worked did reward and appreciate their technology leadership. The technological leadership of the teachers was profound, generous and munificent.
It was reshaping whole school culture in the contexts in which they worked and the schools accommodated the teachers’ passion for technology. It is implicated in having potential to shape school culture, and in a comment in *Education Nation*, Linda Darling-Hammond states “media and technology can spark innovation and redefine teaching and learning” (Chen, 2010, p. 1). In the same text, George Lucas suggests that “technology is a virus that is changing education” and refers to education as “the single most important job of the human race” (Chen, 2010, p. xiv). Conceptions of technology integration being driven by contextual accommodations are underpinned by how technology defines the game and it is to this theme the analysis now turns.

4. Technology Defines the Game

Changing and improving teacher quality is a concern for many educators around the world, and for school leadership, technology integration poses similar dilemmas. Technology is one of the key drivers for change more generally in society, and for schools it is particularly important. All of the teachers expressed their frustrations with existing school and education structures and the lack of technology enthusiasm and knowledge of colleagues. To say they felt conflicted would be an understatement. They all loved their work and when the teachers in the case studies met one another at an education meeting, the experience gave them comfort; knowing other teachers were doing comparable things validated their sense that they were on the right path to good learning for students. Nina said: “It has been great to finally meet like-minded colleagues, sometimes you can feel very alone.” However, standardized testing regimes like NAPLAN, Pisa and TIMSS and the political agendas in schools sometimes worked against what the four teachers viewed as more effective ways for students to learn. In Gabby’s case: “I am often accused of not teaching, yet parents want their children to be in my class.” Gina argued that: “NAPLAN should be telling us more about our students’ progress and how I can improve my teaching.” Kitty provided an anecdote about a teacher she knew who had been teaching the same way for 18 years and wasn’t going to change. She challenged the teacher, and the principal rang and thanked her for “saying what he couldn’t.”

Issues around performativity were a concern for these teachers. This is increasingly the case for many teachers across the globe. For teachers who value the freeing up of classrooms for creativity, possibility, student-centered learning and greater acknowledgement of technology in the lives of young people it is particularly challenging. At the education meeting previously referred to, Nina shared a newspaper clipping from a major national newspaper that she had kept: *Let’s bring classrooms into the 21st Century* (Murdoch, 2011). It was text from a speech given by Rupert Murdoch about what needs to happen to education in schools. The teachers read it and expressed surprise that they agreed with almost every issue he raised. Nina expressed the view that current school practices “hijacked learning,” and she didn’t know how much longer she would be able to subjugate her values.
to the “superficial values” of schools in their current form. As they discussed the Murdoch article, Kitty mentioned, “I like Ken Robinson and his ideas” and she added: “Education should be customized to students . . . current teaching is about conformity and standardization.” Gina gave an example of why students should be more creative, citing eminent Australian cardiac surgeon Victor Chang, who was, in her words: “An example of creativity in action.” She said: “I feel strange being defined as an exemplary teacher, it doesn’t sit well and implies I can’t get any better. I feel like I am fluffing my way through most of the time.” The other teachers laughed, and nodded in agreement. The teachers knew how to ‘play the game.’ Perhaps it was time the education game was redefined?

Professional Conversation—Fresh Points to Consider

The classrooms of Gabby, Gina, Nina and Kitty highlight new and important possibilities for technology integration into pedagogy and curriculum in schools. In summary, the conceptions are constructed from knowledge of theory, creativity, public learning and life preparation. Collectively, these conceptions work in concert with the fifth conception, contextual accommodations. The fresh model for technology integration, High Possibility Classrooms, is summarized in Figure 7.1.

![FIGURE 7.1 HPC model featuring the five key conceptions](image-url)
This chapter draws together key points in the HPC model. It details the commonalities and differences across four teachers’ knowledge of technology integration in some classrooms in Australia by its analysis of the dynamic relationships between technology, pedagogy and content and the interactions between these knowledge components within the broader conceptual framework of TPACK (Mishra & Koehler, 2006). The HPC model shapes deeper understanding of practice that forms the notion of Action Knowledge or AK, and as such, offers a new way to conceive teachers’ knowledge of technology integration. In effect, it adds another layer to the TPACK framework, illustrating what it might look like ‘in action’ in the classrooms of exemplary teachers.

In summary, the HPC model has five conceptions and 22 themes:

The first conception showed how theory drives technology practice and was supported by seven themes: technology drives construction of learning, technology enhances purposeful teaching, technology focuses planning, technology enriches subject matter, technology promotes reflective learning, technology shifts conversations and thinking and technology engages students in authentic ways.

The second conception, creativity for learning through technology, was demonstrated through five themes: technology boosts creativity, technology creates opportunities for production, technology unleashes playful moments, technology supports values and technology differentiates learning.

The third conception confirmed public learning through technology. The conception was displayed in two themes: technology scaffolds performance and technology enhances outcomes.

The fourth conception presented life preparation using technology. It has four themes: technology operationalizes the real world, technology gives voice, technology means ownership and possibility and technology reveals effectiveness.

The fifth conception and final component of the HPC model is contextual accommodations using technology. There are four themes in the conception: technology remains personal and professional, technology changes time, technology nurtures community and technology defines the game.

**Discussion Pointers**

In a whole group or working in pairs, discuss the five conceptions for technology integration and how they manifest or could be put into action in your classroom. Use these questions as a guide and record your answers as a podcast using a mobile device:

2. Is creativity something I think about every time I plan for learning? Explain.
3. Are opportunities to make students’ learning public always happening in your classroom? Explain.
4. Does life preparation for students have to be a consideration for teachers? Explain.
5. Does the ‘game’ of school or learning in classrooms more broadly need redefining? Explain.

Notes
1. The Quality Teaching Framework (NSW DET, 2003) has four questions that are useful to include in planning for classroom learning:
   - What do you want students to learn?
   - What will students do or produce?
   - Why does this learning matter?
   - How well do I expect them to do it?
2. Cricket is an app for a cross-platform audio software library.
3. Khan Academy is a video library with thousands of free online resources for students and teachers. Retrieved from https://www.khanacademy.org/
4. Kinect is a motion-sensing input device developed by Microsoft.
5. NAPLAN refers to the Australian government’s National Assessment Plan for Literacy and Numeracy.
6. This professional learning opportunity was a before-school, weekly connection via video-conference to teachers across the region interested in technology. It was organized by technology consultants in regional education sites.
7. Now popular in Australia, TeachMeet (AUS) is gaining momentum among technology-interested teachers. Retrieved from http://www.teachmeet.net/ Chat forums on Twitter are well-liked by teachers, one excellent example is #edtechbridge started in New York by @mr_isaacs; it targets teachers interested in gamification and building entrepreneurship in students and tech developers.

References


This book has showcased exemplary teachers’ knowledge of technology integration in a collection of case studies at four Australian school sites. The previous chapter gave rich details of commonalities and differences in their practices. These case studies are examples of what I refer to as Action Knowledge (AK). Polanyi (1966) first recorded this suggestion as a special kind of knowing embedded in practice. A somewhat similar point is made by Furlong (2013) about teachers’ practical knowledge when he reminds us that it was Schon (1983) who discussed the importance of knowing-in-action “within the swamplike lowlands of professional life” (p. 9). Examining classrooms like those featured in this book gives teachers exciting opportunities to mimic or reshape what resonates with personal practice and to experiment with what it might be possible to do next.

The idea of reforming is very important and present in what Dewey (1933) refers to as reflection: “active, persistent and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it and the further consideration to which it tends” (p. 9). Other education scholars like Cochran-Smith and Lytle (1999) refer to this as knowledge-of-practice, arguing that the experience in which knowledge is developed is critical. Niess and Gillow-Wiles (2014) posit that this knowledge and two other conceptions (knowledge-for-practice and knowledge-in-practice) are useful, for example, when thinking about TPACK. HPC builds on the TPACK framework and I contend that Gabby, Gina, Nina and Kitty not only move between all three knowledge components, but go beyond them in practice to demonstrate Action Knowledge (AK). The four teachers are experienced practitioners who draw on theory both learned ‘on the job’ or through pre-service and in-service professional development; they express wisdom in the manner in which they enact practice and have continued
“systematic inquiry about teaching” using technology as the central driver (Cochran-Smith & Lytle, 1999, p. 274).

In this final chapter, I draw on Furlong’s (2013) ‘notion of re-tooling the discipline of education’ and apply it to the school context as a means of judging whether it’s possible to view technology integration and the creation of High Possibility Classrooms or HPC as mechanisms to ‘re-tool education in schools.’ What is being suggested here is a paradigm shift that involves seriously thinking about AK from the point of view of theory, creativity, public learning, life preparation and contextual accommodations (Hunter, 2014). In taking this step, what are the conditions that might foster widespread development of HPC in schools, and if enacted, what are some of the likely implications for future education policies, practices and teacher professional development?

To conclude, I argue that although some HPC conceptions are present in some contexts, teachers’ actions must go further. The idea of ‘re-tooling education in schools,’ when considered through a lens of AK drawn from case studies of particular teachers’ knowledge of technology integration practices enhances important principles of what many teachers and school leaders understand is highly effective learning.

Each proceeding part of the chapter pays attention to AK from the perspective of ‘re-tooling education in schools’ using the HPC conceptions of theory, creativity, public learning, life preparation and contextual accommodations. This dialogue is followed by understanding what the emergent form of new knowledge means for education policy, teacher pedagogy and professional development. The following section returns to the debate from the position of how theory drives technology practice.

**Theory as a Means to ‘Re-Tool Education in Schools’**

To recap, theory-driven technology practice, the first conception in the HPC model, was underpinned by seven pedagogical themes, namely: construction of learning, purposeful teaching and focused planning, as well as enriched subject matter, promotion of reflective learning, shifts in conversations and thinking and authentic student engagement. Implications for education policy, pedagogy and professional development will be discussed in turn.

Education policy that recognizes the importance of teachers continually renewing their exposure to education theories emerges from the case studies. Deliberate and frequent conversations about ongoing learning are central to professional practice and should commence as professional expectations in pre-service teacher education programs. All of the teachers in the case studies had continued their professional development beyond initial teaching qualifications. They integrated what was learned from ongoing professional experiences and could readily identify theoretical and pedagogical frameworks like Quality Teaching, for example, as necessary for successful classroom practice (NSW DET,
The current development of teaching standards, such as those developed by the Australian Institute for Teaching and School Leadership (AITSL), is one way in which governments can seek to address teacher renewal. In Australia too, the development and implementation of a national curriculum is an action used by the government to determine and standardize what is taught within school subjects.

Adherences to standards in both teaching and curriculum are often vexed issues for teachers and frequently serve as more ‘stick than carrot.’ For example, the National Board for Professional Teaching Standards (NBPTS) in the USA began in 1987, and seeks to advance the ‘quality of teaching’ by setting out what accomplished teachers know and are able to do; it is voluntary, and if teachers desire, it leads to certification. There are standards known as the Common Core for curriculum, which were set out in 2009 to ensure that all students who graduate from high school have the skills and knowledge necessary to succeed at university, in their careers and in life in general, regardless of where they live. Now, more than 43 states have voluntarily adopted and are moving towards implementation of the Common Core. Such standards are touted in education policy as being led by research and evidence, they are said to provide consistency to teachers in the application of knowledge and are believed to be informed by what other countries are doing to prepare students for their global lives.

I don’t seek to engage in a lengthy excursus here other than to say such claims about teaching and curriculum standards are highly contested. There is little or no evidence to date that having more standardized teaching of curriculum content, or more teachers who are professionally registered in a school according to sets of common teaching standards, leads to better student learning outcomes. If, on the other hand, governments and education bureaucracies use the implementation of common standards in curriculum and teaching to address the revitalization of subject-matter knowledge, or to better prepare teachers through creation of more well-resourced professional development opportunities, then this is a positive course of action. Unfortunately, this is rarely the case and in times of ever diminishing resources for education, teacher professional development is often left off or minimized in policy agendas in some countries. In the UK, Furlong (2013) underlines the fact that it was Aristotle who first talked about two forms of practice in education, both of which imply notions of excellence. In the contemporary world, striving for excellence underlies beliefs of teaching standards that dominate swathes of educational policy. For example, continued professional development to support quality teaching is popular in Singapore. It is one of the main impacts of technology in the country, and it is designed to shift the mindset of educators to discover how curriculum and the teaching environment can become more learner-centered through enabling more technology integration. While encouraging experimentation, the Singapore government believes it is taking a balanced and judicious approach, paying attention not just to getting the tools into schools, but also to capacity building.
among educators for changes in practice (Rubin, 2013). There is recognition that using technology to create better teaching in classrooms and changing curriculum design all need to move in tandem.

In South Korea, the Ministry of Education, Science and Technology directs schools by its use of government rules and regulations; these are organized according to nationwide standards for teaching and the curriculum (Grzybowski, 2013). Many education policies and strategies are implemented with a top-down approach. For example, the government develops and manages professional development programs for teachers, and these include training for qualifications, as well as in-service training and special training in areas such as information digitalization or curriculum formation. In-service programs take place over at least 180 hours (30 days) each year; teacher performance is assessed on a 100-point scale and teachers who complete a program earn a certificate, which can enhance their promotion and wage prospects.

Release time from face-to-face teaching, and professionally focused sabbaticals for teachers in schools every five years could be another step towards reconnecting theory with practice. Day to day teaching in schools offers few opportunities for reflection on practice. Research for decades has pointed to the importance of this action, and yet few schools are able to implement it on a regular basis as a valued part of teachers’ work. Long ago, Little (2002) argued that:

One of the most significant resources for teacher professional learning is to be found in teachers themselves and their interactions with one another when they collectively question ineffective teaching routines, examine new conceptions of teaching and learning, find generative means to acknowledge and respond to difference and conflict and engage actively in supporting professional growth.

(Campbell, 2011, p. 141)

Furthermore, it’s about giving teachers time to learn more, whether it is new pedagogical theory or experimenting with pedagogical tools like blogs and wikis, or using project-based approaches to learning in inquiry-based structures like QUEST. When teachers keep learning themselves, they tend to broaden their pedagogical repertoires and have time to become the ‘expert learners’ schools want them to be (Fink & Stoll, 1996). The power of the workplace as the preferred site for teacher professional development is well documented (Groundwater-Smith & Mockler, 2009; Needham, 2011).

Creating more occasions to play with technology at school, in particular with mobile devices and software programs on iPads, or learning how to make films in iMovie, or using an app that supports learning subject matter, is vital if teachers are to better understand the potential of technology for student engagement. Every teacher needs access to a personal device 24/7, not simply the shared resource in the staffroom at lunchtime. Just as teachers once had the customary
chalk box to commence the school year, laptops or other reliable mobile devices are now standard tools for the profession.

In addition, well-funded and frequent professional development in technology integration in the school context, like that offered to teachers in South Korea, is a good model. Moreover, opportunities for teachers to co-plan and co-teach in teams are other ways to support teachers to reconnect with theory as a means to ‘re-tool education in schools.’ This priority is evident in President Obama’s request to Congress to provide $200 million for the 2015 financial year for technology professional development in schools (The White House: Office of Management and Budget, 2014). Implications of the second conception of creativity in the HPC model are detailed in the next section.

Creativity as a Means to ‘Re-Tool Education in Schools’

To recap, creativity driven through technology in the HPC model is sustained by five themes: the first theme is boosting creativity, the second is creating opportunities for production, the third is unleashing playful moments, the fourth is supporting values and the fifth theme is differentiating learning. These themes have implications for ‘re-tooling education in schools’ through policy, pedagogy and professional development, and each is discussed in turn.

Creativity is on the current education policy agenda in many countries, and in Australia, it manifested most recently in a new document Creative Australia (Australian Government, 2013). The focus is on workforces skilled with people who know “how to be flexible, think and create” (p. 3). Therefore, schools have a crucial role in preparing young people for future jobs in creative and innovation industries. The research and projects of Professor Anna Craft in the UK, Sir Ken Robinson and Associate Professor Kyung Hee Kim in the USA and numerous other education scholars have long championed the important role of creativity in learning.

A quick scan of education conferences around the globe show that for many education leaders, creativity is receiving long overdue attention. Technology learning through festivals for educators delivered by businesses like EduTECH and through academic conferences like that of the Australian Council for Computers in Education (ACEC), the Society for Information Technology in Teacher Education (SITE) and the International Society for Technology in Education (ISTE) in the USA are evidence of the high-level opportunities for teachers and education scholars to connect around creativity issues in technology integration.

The spotlight on education policy in many countries for a long time now has been on better schools, not necessarily better education, for young people. For pedagogy in classrooms, creativity involves teachers themselves being engaged in producing and making. This is a key part of ‘re-tooling education in schools.’ All teachers in the near future will need to learn computer programming language. This knowledge is now part of the school curriculum both in Australia
Where to From Here

and in many other countries. Such moves will enable students and teachers to be creators of apps and other computer software rather than being passive recipients of whatever developers choose to produce. Conversations using social media apps that connect teachers, schools and tech developers are common in the USA. One excellent example is #edtechbridge, a weekly Twitter forum initiated by classroom teacher Steve Isaacs from New Jersey. Another example to support creativity and the notion of producing is the ‘flipped classroom.’ Here, teachers record short segments of video material detailing core content, and then, prior to lesson time, it is viewed by students. Amanda Fox from the STEM Academy School in Savannah, Georgia has taken the concept of ‘flipping’ to a whole new level. This pedagogical approach entails modeling, letting students see teachers using technology, practicing with it and trying new applications in front of the class while students are working. The ‘flipped’ approach frees up more class time for the teacher to facilitate learning and to explain and support students in understanding content more easily during face-to-face interactions. Filmed or photographed assessment outcomes can also be recorded by teachers and then watched by students online.

Such ideas have strong implications for pre-service and in-service professional development. Teachers need more time for creativity-focused professional learning during the school week. Powerful examples of such approaches involve creativity and technology integration components in all pre-service teacher education programs, championing ‘creativity leaders’ in all schools and scheduling timetabled sessions in the school week. Space for all students and teachers to learn technology together, in the style of the Sylvia Martinez Generation YES projects, is ideal. The development of ‘maker cultures’ are important avenues for ‘thick play’ in classrooms (Mackey, 2009). Such cultures involve actions around Do It Yourself (DIY) that emphasize learning-through-doing.

Connections to values with a focus on creativity and what it means to be a responsible digital citizen must be progressed when working towards ‘re-tooling education in schools.’ Creativity is central to learning, and making that learning more personalized is better enabled using mobile devices. Some education jurisdictions have already picked up on this idea as a route to differentiated instruction for students by using learning analytics and online platforms like Oppia. The implications of the public performance conception in ‘re-tooling education in schools’ is detailed in the next section.

Making Learning Public as a Means to ‘Re-Tool Education in Schools’

To recap, public learning through technology is supported by the HPC themes of scaffolding performance and enhancing outcomes. Implications for education policy, pedagogy and professional development are profound. For example, education policy for schools should begin to acknowledge that multiple-choice tests
or prescriptive responses to demonstrate learning are limiting for many students. Schools must move away from such approaches.

In final year examinations in some Australian education jurisdictions, extended responses in a few curriculum areas have opened up ways for students to express their knowledge by performing in front of an examiner or a real audience of peers. Nonetheless, in the early and middle years of schooling, responding to multiple-choice ‘high stakes tests’ are still dominant measures of Australian students’ education performance. International tests like PISA and TIMSS are used by many governments to enforce education policy positions (Dulfer, 2012). There is increasing opposition to such arrangements, and in a recent address to Australian teachers, Sahlberg (2014) explained how Finland built its highly regarded education system without being slaves to standardized tests. He stressed that other high-performing nations are following the Finnish example and are continuing to improve their schools without competition, school choice and test-based accountability.

The case studies in this book strongly suggest that such ‘high stakes’ methods should be supplemented, or replaced altogether, by teacher and school-based assessments over longer time periods. Professional judgment of teachers must return to its former valued position in schools. Technology offers a window to change that direction. Teachers can more easily record students work using technology, making it more feasible to share and critique such examples with colleagues, or to showcase students’ achievements in the wider community context. Furthermore at parent-teacher evenings, students’ work shown or preserved in e-portfolio reports strengthens parent-school partnerships and gives public accountability for student learning. The use of digital portfolios is already quite widespread in schools (Smart & Finger, 2014). Other teachers use Google Apps for Education as a powerful and flexible platform to support student e-portfolios. Such reporting mechanisms scaffold the notion of ‘re-tooling education in schools.’ Implications of the fourth conception of life preparation are discussed in the following section on policy, pedagogy and professional development imperatives.

**Life Preparation as a Means to ‘Re-Tool Education in Schools’**

To recap, life preparation using technology is supported by four themes in the HPC model: operationalizing the real world, giving voice, ownership and responsibility and the revelation of effectiveness in terms of self-regulation and self-efficacy.

The funding of technology hardware rollouts to schools, in Australia and internationally, was promoted and fulfilled in various education policies (ACARA, 2012; Campbell, 2012; DfE, 2010; Hogan, 2014; OECD, 2013; US Department of Education, 2010). However, such commitments by governments need to be
sustained as technology quickly becomes obsolete and requires continual funding. In Australia, BYOD or Bring Your Own Device is a flexible measure used by schools to allow parents to provide technology devices for students as opposed to it being a state responsibility. This issue raises questions of inequality and who gets what kind of device and with what access. Most young people carry a mobile phone in their pockets that is connected to the internet. It may well be the responsibility of schools in poor districts to provide larger, good quality mobile devices for students to develop their technology skills.

If pre-service and in-service teachers learn alongside students in developing their technology skills, such approaches mean more distributed learning opportunities in classrooms where both students and teachers are in task (Munns et al., 2006). In such spaces, work occurs around work benches, students learn by themselves, they have access to the classroom teacher and to outside experts using mobile devices and are not totally dependent on their regular teacher for their every next move. In some school classrooms, the design of space takes on different configurations and furniture is flexible and easily rearranged into what students and teachers require.

Technology professional development in schools built around knowing how to access appropriate experts in the community and around a mentoring approach where more ‘tech savvy’ teachers co-teach with less ‘tech-savvy’ teachers is a worthwhile education goal. Pre-service teachers must be ‘tech-savvy’ with graduate professional teaching standards in technology integration endorsed and pursued in all teacher education programs. Academics working in pre-service teacher education programs have a responsibility to up-skill pre-service teachers’ technical skills, or to know where to access reputable educational tech companies that can. Closely tied to this necessity is building teachers and students’ digital resilience and determination in the face of blocked websites, failing services, antiquated tools and technology decisions in education that aren’t aligned with a new vision of teaching and learning (Ferriter, 2011). Making the most of what technology is available and supplementing less resourced contexts with personal devices means that teaching can continue regardless.

Creating students as Digital Leaders is another way to enact pedagogical opportunities for ownership and responsibility in ‘re-tooling education in schools.’ In Australia at Tea Tree Gully Primary School, students participated in fortnightly training sessions to enhance their skills, practicing and collaborating on tasks designed to move them from being users to being leaders (Gibbes, 2014). The idea of Digital Leaders began when teachers required assistance with tasks as they began learning how to use iPads at the school. Students took on roles of tutor or teacher for their own class or other classes in a range of areas, including game programming. Some Digital Leaders visited the early years classrooms in the school to assist teachers in creating an assessment video of children completing an oral language task. Implications of the fifth and final conception of contextual accommodations in the HPC model are explained in the next section.
Contextual Accommodations as a Means to ‘Re-Tool Education in Schools’

To recap, contextual accommodations using technology is maintained by four pedagogical themes: the personal and professional, changes to time, nurturing community and defining the game. There are implications from contextual accommodations and what needs to be considered in view of ‘re-tooling education in schools’ from an education policy, pedagogy and professional development perspective.

Maxine Greene (1997) in *Teaching as Possibility: A Light in Dark Times* invites “people to think of things as if they could be otherwise; it is the capacity that allows looking through the window of the actual towards alternative realities” (p. 2). This is ever more appropriate for teachers and school leaders when they are consistently challenged to clarify their beliefs and defend their practices to people outside education. The idea that ‘everyone went to school so therefore everyone must know about education’ is erroneous. Such beliefs are a constant challenge to teachers. Presently, policy regulations in most education jurisdictions do not extend to determining internal school structures. For example, how the day might be reconfigured in terms of start and finishing times, or, how the timetable might operate in a school is not determined by outside sources. The case studies in this book suggest longer blocks of learning time are crucial to working successfully with technology for ‘flow’ and for ‘fiero’ in learning (McGonigal, 2011). When decisions are made at the local level, school principals may be in a better position to match the needs of what students require to learn well. In Sydney, Australia, Principal John Goh starts the Merrylands East Public School day at 8 am and it finishes at 1:15 pm. He argues that from a learning and education point of view, this is what his students need and parents have supported the decision. He has termed his action as a principal as “disruptive leadership.”

Moreover, transition in teachers’ use of technology in classrooms draws on personal skills leveraged against professional use, especially when teachers are required to perform bureaucratic tasks like report writing using online pro formas or uploading test results onto spreadsheets. Principals of teachers in the case studies optimized technology professional development in their school contexts by recognizing that teachers who had the ‘technology spark’ should be in technology leadership positions. Co-teaching using such leaders to improve classroom practice often begins under the guise of needing to better integrate technology (Harris & Hofer, 2014). Regular, self-paced professional development at the school site with a ‘technology mentor’ who is paired with a less confident teacher is a highly effective strategy. Findings from the case studies in this book suggest funding such positions in schools needs to be a priority, as does frequent access to in-school technicians who can quickly repair, maintain and replace obsolete or malfunctioning technology devices.
Design of learning spaces and particular programs for future classroom blueprints are also important and could form coursework content in pre-service teacher education programs. Implicit here are ideas of working in teams in common spaces that extend learning networks beyond classroom walls. One idea is Project-based learning Fridays (PBLF), which takes the PBL model and makes it accessible to a wider range of learning contexts in high schools (O’Sullivan, 2014). The idea behind this style of project is to take existing parts of teaching programs and construct PBLF activities around specific skills that a teacher has observed needs development. These projects are then started on Fridays. The Friday element comes from the fact that on Fridays, many students are more open to different styles of learning and are therefore open to contributing to a project. An advantage of this model is that it makes PBL more adaptable to existing teaching programs and structures, making it accessible to a wider range of school contexts. Of course, PBL may form the key pedagogical approach in classroom teaching and teachers such as Bianca ‘Jim’ Hewes and Lee Hewes are doing exactly that.  

Partnerships with schools using an array of community-based allies provides real-world contexts for student learning and fosters links to much larger or whole communities. I argue that professional development using pre-service teachers, academic partners, or creative practitioners from the field supports development of teacher pedagogy in creative endeavors. Some schools do this, for example, by employing storytellers for specialist workshops in English, or by having artists-in-residence sessions. When teachers define the ‘education game’ and have a greater say in what works, it means communities are more likely to listen to their concerns, work with them and trust them. There will be less pressure ‘to teach to tests.’ Accountability in schools is about the valuing of teacher professionalism and the professional judgment of teachers. Opening up the current limitations of responding to curriculum in school education is important and assists the personalization, or customization, of education so that it is more relevant and even more significant for students. Scaling up these notions of change requires commitment from all levels of education, failure to take action does not auger well for the future of schooling. Continuing to play the current ‘education game’ is arguably not the answer.

The sense of urgency for action in education was picked up in an interview in the *Paris Review* some time ago, when E. B. White, author of many wonderful children’s books, reminded us:

> Anyone who writes *down* to children is simply wasting his time. You have to write up, not down. Children are demanding. They are the most attentive, curious, eager, observant, sensitive, quick, and generally congenial readers on earth. They accept, almost without question, anything you present them with, as long as it is presented honestly, fearlessly, and clearly.
Although discussing the context of writing, what he says is relevant to what is demanded by conceptions in the HPC model as a means to 're-tool education in schools.'

So What . . . and Further Research to Support ‘Re-Tooling Education in Schools’

Suggestions for further research that supports the notion of ‘re-tooling education in schools’ is conceived in four ways; the first proposition targets inclusion of video data in future case studies of technology integration in classrooms. To some degree, this expression is picked up in the recent work of Technology Enriched Instruction (TEI) and Microsoft in the USA and by the Australian Institute of Teaching and School Leadership (AITSL) on its website. Rich, visual examples are useful for pre-service and in-service teachers’ professional development. Such examples could sit alongside written descriptors of teacher case studies.

Action research projects with HPC themes that require groups of teachers to video record colleagues while co-teaching would add to the model’s validity and increase the generalizability of Action Knowledge in practice. Such vignettes could be analyzed and reflected upon, in pairs or groups, in professional development sessions. The theme descriptors might be used to understand what was captured in order to determine the next steps or areas for improvement. This approach, combined with on-site support from a new Action Research Mentor app like the one developed by Mertler (2014), could assist teachers in designing research studies for particular settings. Questions and prompts in the app design guide the user through the four stages of the action-research, decision-making process: planning, acting, developing and reflecting. Practitioner-led research projects in schools are powerful ways to enact change at the level of classroom practice (Elliott, 2011; Mockler, 2013).

The second suggestion involves more case studies of teachers’ knowledge of technology integration in subject areas within secondary school contexts, as they are much ‘thinner on the ground.’ Such cases provide useful understandings for the discipline-specific needs of technology integration. Discipline teams within schools could take the HPC conceptions, apply them to the development of a unit of work, incorporate ‘flipped classroom’ or blog and wiki structures and evaluate their effectiveness in student learning outcomes. Research that incorporates more data from the ‘voice of students’ and their experience of learning in different contexts (for example, single-sex, rural, or low socioeconomic-status schools) will add to the wider application of the HPC model in practice.

A third proposal is for continued observations of the same teachers over time to see how their knowledge of technology integration alters, or remains the same. It would be useful to go back to the four contexts, conduct a further round of observations, interviews and focus groups to see from a longitudinal point of
view whether the teachers’ conceptions remain or change. Cross-case comparison with teachers in other countries would make an important contribution. An essential question would be: What fosters ongoing teacher professional development of technology integration in HPC? It might also be advisable to track a group of less ‘tech-savvy’ teachers within the same contexts, perhaps some who have been mentored by highly ‘tech-savvy’ teachers, to understand what conceptions emerge from the mentees’ practices.

The fourth plan for ‘re-tooling education in schools’ is taken up in some recent technology initiatives and involves investigations of early-career teachers who are technology savvy and have been exposed to teacher education initiatives like those collaborations with Microsoft in TEI or Teaching Teachers for the Future (Dilworth et al., 2012; Romeo et al., 2013). It may be opportune to examine whether their knowledge of technology integration is defined by similar or different conceptions to the teachers in the case studies in this book. Furthermore, pre-service teacher education programs, both undergraduate and postgraduate, benefit from the inclusion of case studies of practice that focus on pedagogy. Such units featuring exemplars of HPC in action might be used as springboards for face-to-face and online discussions. Conducting pilot studies of final year pre-service teachers during the concluding practicum or internship period who use the HPC model would be valuable. Studies like these provide instructive insights for understanding the validity of the case studies and form a body of work that can only enhance knowledge of technology integration in practice. Such pilots could form the basis of a purposive study of in-service teachers as they commence full-time teaching in schools.

The TPACK framework laid valuable groundwork for technology integration in schools, and from that foundation, it has been possible to further elaborate on the TPACK framework using a set of case studies to identify a new model for technology integration, known as High Possibility Classrooms or HPC. The model provides a fresh and exciting scaffold of Action Knowledge and fits with the notion of ‘re-tooling education in schools’ that fosters teacher capacity to create the kinds of classrooms that all students need to inhabit in the future.

Professional Conversation—Fresh Points to Consider

The classrooms of Gabby, Gina, Nina and Kitty draw attention to contemporary and important possibilities for technology integration as a means to ‘re-tool education in schools’ constructed from knowledge of theory, creativity, public learning and life preparation. Collectively, I argue that these conceptions of AK work in concert with the fifth conception, contextual accommodations. These conceptions occur through a range of actions both at the level of practice through policy considerations and teacher professional development, including research and projects. The danger of not acting is bleak; the time for action in schools is now.
Discussion Pointers

In pairs or in a whole group, discuss classrooms in schools where you know HPC exist or are ‘works in progress.’ Use the following questions as a guide and construct a photographic plan, infographic or storify using your Twitter PLN. Explain what you are doing to ‘re-tool education in schools.’ These positive actions should include at least two themes from each of the five conceptions in the HPC model:

1. What will enable the HPC model to flourish in schools?
2. What will hinder the creation of more HPC in schools?
3. What policy and professional development direction does your jurisdiction focus on at present?
4. How could you pitch the adoption of the HPC model to leaders and executives at your school?
5. Dewey (1954) invited teachers to “resist the humdrum, the routine, the anesthetic in education” (p. 152). What did he mean and how does adopting the HPC model insulate schools and teachers against this kind of miseducative behavior?

Notes

1. Forecasts in the USA alone show that 1.4 million programming jobs will be needed over the next decade whilst current projections are for only 400,000 graduates in the field (Parker, 2014).
2. Follow Amanda Fox on Twitter @AmandaFoxSTEM
3. Cybersmart embeds cybersafety into the curriculum and is an important process in helping young people become digital citizens. Developed by the Australian government, it can be accessed at http://www.cybersmart.gov.au/
4. Oppia is an online platform that creates interactive activities for student learning. It aims to simulate the one-on-one interaction that a student has with a teacher by capturing and generalizing interaction dialogues.
5. With Google Apps, evidence and reflection of student learning can be captured, curated and shared from one platform. Students can create reflective journals in blogger, store work samples in Drive and Picasa, and showcase and present their learning using Sites.
6. These two innovative teachers can be followed on Twitter: @waginski and @BiancaH80
7. The E. B. White essay can be accessed at http://www.theparisreview.org/interviews/4155/the-art-of-the-essay-no-1-e-b-white

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