Caroline Koh *Editor*

Motivation, Leadership and Curriculum design

Engaging the Net Generation and 21st Century Learners

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Caroline Koh
National Institute of Education
Nanyang Technological University
Singapore

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Contents

Chapter 1
Understanding and Facilitating Learning for the Net Generation and Twenty-first-century Learners Through Motivation, Leadership and Curriculum Design

Caroline Koh

I help my mom to make the computer screen…a little bit bigger so people with bad eyesight can see…. At school I use computers to do 'Kidspiration' and on 'Kidspiration' you can write letters…you can do science… I use computers to figure out where to get certain things…stuff…. (Max, 7 years)

1.1 The Net Gen and Twenty-first-century Learners

Young Max (Zimmer 2007) shows typical attributes of the Net Generation (Net Gen): he is better at manipulating the computer than his mom, goes online to learn and surfs the net for information. Net Gen is one of many terms coined to describe those born in the years following the introduction of the personal computer and the advent of the digital revolution. Prensky (2001) called them the 'digital natives' in contrast with the 'digital immigrants', who were born before the computer era and have had to adopt and adapt to the new information and communications technology (ICT). Yet others, like McCrindle (2006) have dubbed them the Generation Y (Gen Y) or the Millennial generation since they succeed Generation X, the post-war baby boomers. The Net Gen thus consists of the cohorts of students populating the schools and institutions of higher education in the twenty-first century. As such, they would form the bulk of twenty-first-century learners, and are instrumental in shaping the educational landscape and policies of their era.

A number of authors suggested that since the Net Gen learners have been exposed to multiple types of technologies from a young age, their learning needs and preferences would differ markedly from those of their teachers (Oblinger and Oblinger 2005; Prensky 2005). For instance, they would prefer learning that is experiential

C. Koh (✉)
National Institute of Education, Nanyang Technological University, Singapore
e-mail: caroline.koh@nie.edu.sg

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and participatory rather than didactic. In addition, in lieu of conventional, top-down, unidirectional communication, they favour social interactivity and networking, with response or reaction effected at the click of the mouse. Needless to say, they are likely to make use of multiple types of media in their learning, being comfortable and adept at 'doing everything' on a single 'smart' gadget, be it an iPhone, iPad, notebook or one of the plethora of other competing models of mobile devices available in the market.

Undoubtedly, if learning has taken on a new orientation, it is imperative for teaching to follow suit. Currently, the Gen X teachers in charge of educating their Net Gen students have had a challenging time playing catch up with the slew of new technologies and 'apps' (applications) such as those in Web 2.0. Yet, literally speaking, one would describe the twenty-first-century learner as anyone who is actively learning in the context and with the tools and technologies of the twenty-first century. Any digital immigrant who actively embraces, adopts and adapts innovations is as much of a twenty-first-century learner as any of the Net Gen youths currently being schooled. Hence, twenty-first-century learning is really about students learning 'with' their teachers, rather than 'from' their teachers, with the teachers exploring with their students how best to make sense of all the available knowledge, and how to transform this knowledge into innovations and improvements. As Prensky (2005, p. 2) puts it, 'we can no longer decide for our students; we must decide with them'.

1.2 How the Net Gen Learns

If teachers are to involve their students as partners, it is important for them to have a good understanding of how the Net Gen learns and how the latter is likely to shape twenty-first-century learning for themselves as well as those born before them. Prensky (2001) views Net Gen learners as different from their predecessors in their ability to develop 'hypertext minds', enabling them to cognitively 'leap around' rather than to process information in a linear fashion. According to Oblinger and Oblinger (2005), they are nimble in terms of their deployment of attention, being able to multitask or switch their attention rapidly from one task to another. Being used to getting responses at the 'click of the mouse', they respond quickly to situations and expect others to do the same. Their familiarity with the visually rich, virtual environments makes them essentially visual communicators, with well-developed visual–spatial skills. They are inductive, experiential learners, preferring to discover and explore on their own rather than being told what to do. They have a predisposition towards bricolage, patchwork and cutting and pasting of information from multiple sources (Brown 2000). In fact, to the twenty-first-century student, learning does not need to be restricted to the classroom—with their mobile devices and the advent of cloud computing, they are able to learn anywhere, everywhere and from anyone.

The Net Gen learners have experienced life differently from the preceding generations and as such, their expectations and approaches to learning are unlikely to mirror those of their predecessors. Some authors have argued that young people are avidly making use of new technologies for communicating (emails and instant messages), social networking and sharing (blogs, Facebook, Twitter, amongst others), entertainment (YouTube, online games), fact finding and information dissemination (search engines and databases), and as such, have to be 'taught' how to make use of the new tools and systems in their learning (Prensky 2005). Yet, there seem to be some basic and fundamental needs that the Net Gen people have in common with prior generations. Although they are deemed to be 'prolific communicators', showing a clear preference for activities and tasks that require or involve social interaction and teamwork (Crittenden 2002), they are adamant in supporting the need for face-to-face interaction (Kvavik 2005), not only with peers but also with teachers, whose role they consider as vital to their learning and central to their sustained motivation to learn. Furthermore, although Net Gen students are avid users of new technologies in their personal lives, they make scant use of information technology for educational purposes (Oblinger and Oblinger 2005). In a study conducted on undergraduates in Australian universities, Kennedy and his colleagues found that the use of collaborative and self-publishing Web 2.0 technologies amongst the participants is lower than expected (Kennedy et al. 2007). In fact, for the Net Gen learners, the focus is on the activity enabled by the technology rather than the technology per se. They view technology as a means to an end rather than as the ultimate objective (Oblinger and Oblinger 2005).

1.3 The Needs of Net Gen and Twenty-first-century Learners

Eaton (n.d.) identified a number of learner attributes that could lead to a better understanding of the twenty-first-century and Net Gen learners' needs. For instance, the digital immigrants learning in twenty-first-century contexts need more help and guidance in their mastery of ICT competencies and the use of new technological tools and devices, whereas the Net Gen learners want autonomy in their education, as well as the freedom to express their creative prowess and to make an impact. They are adept at multitasking and collaborating. They learn by doing and through experimentation, thriving in a structured, yet challenging environment. Prensky (2005) expressed concern that educators are still using 'old' ways to engage students and not achieving much success, when in fact, such students need to be motivated using the twenty-first-century approaches, by means of the very ingredients that keep them engrossed in 'gameplay' for hours on end. These include the provision of attractive goals, interesting options, fast responses and rewards and opportunities to 'upgrade' and 'advance' to higher levels of competence.

1.4 About this Book

To meet the needs of the Net Gen and other twenty-first-century learners, educators need to adopt a three-pronged approach through motivation, leadership and design of learning. Currently, there are many publications on ICT and/or twenty-first-century learners, but none of them focuses specifically on a compendium of these three domains. The aim of this book is to gather the expert opinions of a team of international authors, who through their respective chapters would offer their perspectives on how motivational, leadership and curriculum design principles and constructs can be applied to promote learning in the twenty-first-century, Net Gen context. The contributions of these authors reflect the diversity and abundance of ideas, approaches and methodologies that other educators, researchers and practitioners can adopt or adapt in their own educational and sociocultural milieus.

The chapters in this book are arranged in three parts, based on their related themes:

Part 1—Motivating the twenty-first-century and Net Gen learners (Chaps. 2–7)
Part 2—Leading twenty-first-century learning (Chaps. 8–12)
Part 3—Curriculum design and pedagogy for the twenty-first-century and Net Gen learners (Chaps. 13–18)

Finally, Chap. 19 concludes by drawing the intricate links between the domains of motivation, leadership and curriculum design. For all their technological savvy, the Net Gen still needs the guidance and impetus from their instructors, tutors or mentors in the use of ICT and other innovative practices to promote learning. The infusion of new technologies in twenty-first-century learning can be facilitated and enhanced through the careful crafting and design of new curricula that incorporate and align knowledge content with the relevant ICT tools. However, the motivation to learn and to use new technologies for learning cannot be sustained if no support is provided by educational leaders and institutional administrators. Learner motivation is thus likely to be enhanced by the clever interweaving of technology with pedagogy and curriculum, endorsed by a supportive leadership.

1.5 Part 1: Motivating the Twenty-first-century and Net Gen Learners

Although students generally need no prompting to use new technologies in their personal lives, the literature shows that students are generally reluctant to use these ICT tools for educational purposes. It is as if the students wish to keep what they do in their free time separate from their student or working life. Hence, they perceive the use of the ICT applications as mainly for leisure, and thus not to be associated with work. Yet, ICT tools present a plethora of opportunities for the promotion of learning, and as such, educators play an essential role in initiating and sustaining

motivation, not only in learning but also in the use of ICT in education. This section presents research and reviews on motivating twenty-first-century learners with the use of technology and other approaches.

Introducing Part 1 on twenty-first-century learner motivation, *Dilani Gedera, John Williams* and *Noeline Wright* in Chap. 2 explore the factors that affect students' motivation and engagement in online courses. These authors believe that an understanding of the nature of these factors will pave the way for a positive learning experience for students, and this, in turn, will enhance their motivation and engagement in online learning environments. The chapter is based on a case study conducted in a tertiary institution in New Zealand. The experiences and views of student participants and their lecturer with regard to online learning activities were captured through interviews, observations of online learning activities, an online profile survey and document analyses. The authors found that the nature of the online learning tools and the sense of belonging to the community of users were two main factors influencing learner motivation.

In Chap. 3, *Quint Oga-Baldwin* follows up on the discourse of the previous authors, by offering further explorations on learner engagement with digital environments as compared to classroom learning environments. Using a self-determination perspective, Oga-Baldwin examines online-learner-perceived satisfaction of the basic psychological needs of autonomy, relatedness and competence. He argues that digital learning tools have limited long-term effects on learning if they are not able to meet these three psychological needs of the learners. The author offers a theoretical discussion on how the differences and similarities between virtual and physical learning environments may be reconciled in order to better motivate Net Gen learners towards positive learning outcomes.

Whereas the previous authors chose to focus on external factors affecting motivation in online learning, *Kah Loong Chue* takes a broader approach in Chap. 4, and investigates the effects of the internal factors of personality traits on motivational processes. In his study, the author adopts the Big Five personality model, a trait theory postulating that people occupy different points on a continuous spectrum of trait dimensions that includes extraversion, agreeableness, conscientiousness, neuroticism and openness to experience. Chue adds to the findings of the previous chapter by further exploring the relationship between the Big Five trait dimensions and the basic psychological needs of twenty-first-century learners. Like Oga-Baldwin, this author adopts the perspective of the self-determination theory of motivation to investigate possible correlations between learners' perceived needs satisfaction and their personality traits.

In Chap. 5, *Cathy Gunn* goes beyond the discussion of what motivates students, to an investigation on a specific approach towards promoting learner motivation. She proposes online assessment as a key feature of twenty-first-century learning environments that can enhance student engagement and provide timely feedback to students. She argues that online assessment tasks can be designed to match the needs and expectations of Net Gen learners, such as autonomy in user-generated content and tasks, fast responses from tutors and peers and opportunities for 'scaling up' in terms of their competence.

In Chap. 6, *Ashwini Datt* and *Trudi Aspden* contribute a different perspective to the discussion by presenting an overview of how Net Gen learners can be motivated to develop personal knowledge management skills. These authors argue that the Net Gen learners possess technical skills to utilize technology for social interactions and networking but not for educational gain. They describe an innovative learning design, using the WebQuest strategy to scaffold the use of various Web 2.0 tools, used to encourage and motivate students to develop transferable personal knowledge management skills that can be used beyond their student life.

Finally, in Chap. 7, *Collie Conoley, Beatriz Bellow, Mercedes Oromendia*, Elisa Vasquez and *Jane Close Conoley* bring a closure to this section by presenting the risks and benefits of the Net Gen involvement with online experiences, and how these may affect learners' well-being. Their arguments are based on the five elements of the PERMA model of well-being, whereby PERMA is the acronym for the five elements of well-being, **P**ositive emotions, **E**ngagement, **R**elationships, **M**eaning, **A**ccomplishment (Seligman, 2011). Although these have been introduced in the preceding articles, this chapter goes deeper into the discourse pertaining to how online experiences may affect learner well-being in each of these aspects.

1.6 Part 2: Leading Twenty-first-century Learning

'The first rule of any technology used in a business is that automation applied to an efficient operation will magnify the efficiency. The second is that automation applied to an inefficient operation will magnify the inefficiency' (Gates n.d.). By this, Bill Gates stipulates that implementing new technologies would be to no avail if there were no proper governance to ensure an efficient system in the first place. In the educational context, this translates to the leadership in learning, and refers to the institutional administration overseeing major decision making, policies and processes needed for the operation and growth of the organization.

Introducing Part 2, Leading Twenty-First-Century Learning, *Irene Ng,* in Chap. 8, explores how the instructional leadership practices of successful school principals lead to the development of a positive school climate catering for the needs of twenty-first-century learners. She posits that research conducted on effective schools indicated school leadership as one of the most important factors affecting student learning, adding that the school leader's involvement in nurturing and promoting a positive learning climate has the greatest impact on school achievement. This chapter explores how school leadership can provide support to the creation of a positive digital learning environment that sustains the engagement of Net Gen students.

In Chap. 9, *Maria Sit* presents the challenges that teachers face in a constantly changing education landscape, wherein they need to play catch up with the new technologies used by their students for learning. Following Irene Ng's earlier recommendation for school leaders to provide positive learning environments within their institutions, this author explores how they may do so by fostering amicable relationships with their teachers, and by encouraging and supporting them in their professional development. Sit believes that professional development courses

should focus on enhancing teachers' understanding of their Net Gen students and preparing them to be better role models as learners and practitioners of twenty-first-century competencies.

Using technology to scaffold learning is not without challenges, as *Bee Leng Chua, Oon Seng Tan and Woon Chia Liu* attest in Chap. 10. These authors share their experiences in leading the use of technology for the facilitation of problem-based learning tasks in pre-service teacher education. They further discuss the tensions and implications of pre-service teachers' use of online digital tools in carrying out problem-based learning tasks. The chapter paints a realistic picture of the implementation of pedagogical and technological innovations, in the hope that educational leaders will be better informed about potential difficulties in the implementation process.

In Chap. 11, *Constanza Tolosa, Martin East and Helen Villers* present outcomes of a 4-year study on a school's implementation of a foreign language curriculum through a technologically rich programme design. They showed how, under astute leadership, a vibrant language-learning programme was implemented in line with the expectations of the Net Gen. A key component of the programme was the incorporation of technology-mediated exchanges between students in two different countries, New Zealand and Columbia, who took part in an online reciprocal peer-tutoring programme. Besides gains in fluency and language proficiency, surveys and interviews conducted with students from both countries showed benefits in terms of improved engagement with peers, as well as motivation towards learning a foreign language and culture. This chapter also discusses the influence of the school's leaders in shaping and enacting the school's vision for language learning, thus establishing the links between leadership support and effectiveness in the design and implementation of technology-infused curricula.

As a closure to this section, *Caroline Koh,* in Chap. 12, presents a review of recent research and findings on the role of leaders in initiating, implementing and sustaining the integration of new technologies in education. In addition, the chapter discusses the challenges encountered by educational leaders, as well as some of the effective practices and strategies they employed when tasked with the integration of technology with learning.

1.7 Part 3: Curriculum Design and Pedagogy for the Twenty-first-century and Net Gen Learners

One of the main challenges encountered by educational leaders, practitioners and learners is the lack of alignment of the curricula with new technologies to support student learning. At all levels of schooling, conventional curriculum design followed the product model (O'Neill 2010; Tyler 1949) which was teacher centric, focused on content delivery and was performance-oriented with precise assessment outcomes. However, this model does not sit well with twenty-first-century Net Gen learners, who consider it their prerogative to decide on what and how they should

learn, and for whom curriculum content may not be as important as the acquisition of competencies and skills. The needs and expectations of the Net Gen are thus better addressed using the process model (Knight 2001; Neary 2003; O'Neill 2010), since the latter takes on a more learner-centric approach, offers opportunities for students to participate in the design of their curricula and has greater emphasis on learner development and skills mastery.

Introducing Part 3, Curriculum Design for the Twenty-First-Century Net Gen Learner, *Judine Ladbrook* and *Judy Parr,* in Chap. 13, suggest a framework targeting at the design of student learning for and in a networked world. They posit that this should include considerations of the knowledge, skills and dispositions that young people would require to operate with agency in twenty-first-century contexts. In addition, they propose that curriculum designers should take note of the attributes of the Net Gen in terms of how they learn and what motivates and engages them.

From what transpired in Part 1, Net Gen students revel in showing what they can do and in getting feedback on their accomplishments. In Chap. 14, *Alan Ovens, Dawn Garbett and Rena Heap* draw on findings from an ongoing learning enhancement project to explore the potential of having students use Web 2.0 applications with mobile devices, to enable instructors to easily assess student learning and reflect on future pedagogical actions. The flow of feedback from students to instructor/facilitator could enable the latter to more effectively respond to and adapt to the learning needs of the students. This chapter also considers the role that technology and assessment provides for motivating, leading and designing learning for the Net Gen.

Alexander Seeshing Yeung, Zhu Chen and Bingyi Li continue the exploration into the use of technology in Chap. 15. While reviewing pedagogical and psychological factors related to technology use, this chapter investigates how to utilize technology to its full potential for language-learning purposes and overcome obstructive factors related to current technology use. The authors surmise that it is important for teachers to ensure that technology use does not detract teaching from the learning objectives. They propose that for the best outcome of language assessment, both technological use and non-technological approaches may be useful depending on the desired outcome. Furthermore, subject-specific professional training in technology application should be a priority for teacher education—teachers need to be deliberately trained to incorporate technology into their language pedagogy.

Whereas the previous chapter focuses on technology in language learning, *John Williams, Kathrin Otrel-Cass, Elaine Khoo, Bronwen Cowie, Kathy Saunders and Suskia Van Der Merwe* in Chap. 16, presents findings from a teaching and learning research initiative project on networked inquiry learning in science lessons. This project investigated the planning and implementation of inquiry learning projects by science teachers from three secondary schools in New Zealand. The author found that e-networks motivated students to exercise agency, collaborate and co-construct knowledge using a wide range of resources. Like other authors in this book, he also postulates that the positive outcomes are contingent on the interplay of teacher organization and school provision of an effective technological infrastructure and support for flexible curriculum design.

The next two chapters of this book focus on the development of innovative twenty-first-century pedagogies and curricula. In Chap. 17, for instance, *John Yeo* suggests how the theoretical tenets discussed in the previous chapter can be further developed by equipping twenty-first-century learners with problem-finding competencies. This author posits that doing well academically can no longer warrant a good career. Rather, one needs to help the learner develop an inquiring mind and problem-solving skills. He suggests that one should start by teaching students to identify unique problems, and that educators should first walk the talk and develop creative minds predisposed to generating problems.

In Chap. 18, *Susan Sim* presents how one can nurture the youngest of the Net Gen with what she terms 'the playful curriculum', a new initiative for pre-school education in Singapore. The author discusses how, in order to develop twenty-first-century competencies, there is the need to provide a curriculum that is age appropriate, holistic and learner centred. 'Learning through play' becomes a central tenet in pre-school curriculum due to the vast opportunities that play offers in developing children socially, emotionally, physically and cognitively. In addition, the chapter explores how active learning can be encompassed through purposeful play and how new technologies can facilitate the interpretation and implementation of play in pre-school classrooms.

1.8 Epilogue

The book concludes with the editor's final discussion, in Chap. 19, of the major findings from the chapters. It draws together the key ideas, with the aim of establishing the links between motivation, leadership and curriculum design in the transformation of learning in the twenty-first century. Knowing the intricate relationships between these three domains will facilitate the tasks of researchers and educators in their endeavour to create a better learning environment for the present and future cohorts of the Net Gen.

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Part I
Motivating the Twenty-first Century and Net Gen Learners

Chapter 2
Identifying Factors Influencing Students' Motivation and Engagement in Online Courses

Dilani Gedera, John Williams and Noeline Wright

2.1 Introduction

The emergence of educational technologies offers flexible learning opportunities to the twenty-first-century learners. Research affirms that online courses provide learners with some flexibility in terms of time, place and pace (Gedera and Williams 2013). However, the anonymous nature of the online learning environment can lead to demotivation and disengagement with subsequent minimal participation or even withdrawal. In face-to-face classrooms, students' levels of motivation can be observed to a certain extent with few of the physical cues available. However, online courses present challenges and concerns in relation to students' motivation and active participation. The challenge of engaging online learners seems common across subject matter, levels and institutions. Therefore, in order for the learners to have positive learning experiences, it is vital to identify factors that affect students' motivation and engagement in online courses. Through a case study, this chapter highlights some pedagogical and practical ideas and strategies that teachers may like to consider when designing online courses to enhance students' motivation and engagement.

2.2 Student Motivation and Engagement

The term motivation is derived from the Latin word 'movere' which means 'to move'. The idea of movement in relation to motivation is understandable if we look at some of the definitions of motivation. For example, Ryan and Deci (2000) say:

> To be motivated means to be moved to do something. A person who feels no impetus or inspiration to act is thus characterized as unmotivated, whereas someone who is energized or activated toward an end is considered motivated. (p. 54)

D. Gedera (✉) · J. Williams · N. Wright
University of Waikato, Hamilton, New Zealand
e-mail: dilani.pahalagedera@gmail.com

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This denotes that motivation can be something that keeps us 'moving'. Motivation is defined as the 'desire or willingness to do something' (Oxford Dictionary 2013), the condition of being eager to act or work, a force or influence that causes someone to do something (Merriam Webster 2013). There are two different kinds of motivation: intrinsic and extrinsic. Intrinsic motivation comes from within and is associated with the joy or passion that the task gives the learner rather than any reward it brings (Irvin et al. 2007). Extrinsic motivation is something to do with external factors associated with the task such as assessment. External factors can also be related to instructional strategies, learning conditions, educational technologies and other elements in activity systems.

Motivation can be a prerequisite of learner engagement. For instance, because of a long-term goal for credentials, learners can be motivated to engage in courses. Motivation can also be a feeling of satisfaction/success when being engaged in worthwhile learning. Either way, student motivation and engagement are closely related elements of student learning that can have an impact on learning outcomes. Beer et al. (2010) state that in spite of the fact that there is no universally accepted definition of what comprises engagement, student and college success, student retention and student motivation are always linked to engagement. For instance, some of the early studies defined engagement in terms of aspects such as interest (Dewey 1913), effort (Meece and Blumenfeld 1988), time on task (Berliner 1990) and motivation (Skinner and Belmont 1993). For the purpose of this chapter, online learner engagement is defined as students' active participation in e-learning activities (i.e. discussion threads, virtual classroom) to achieve learning goals. Motivation is considered an essential element to engage learners and thereby enhance students' learning experiences.

2.3 Methodology

This chapter is based on a case study carried out in one of the universities in New Zealand in a course offered in semester A of each year which is part of a Post Graduate Diploma. The data collection took place in 2012 and seven students and their lecturer participated in this study. In order to capture the experiences and perspectives of the participants in this research, individual interviews with the students and teachers, observation of online learning activities, online profile questionnaire and document analysis were used as methods of data collection. The learning technologies that facilitated the synchronous and asynchronous learning activities of this course comprised Adobe Connect virtual classroom and the university learning management system (LMS), Moodle.

The aim of this study was to examine factors that affect students' motivation and engagement in a specific online learning environment. In exploring mediational factors that affect students' motivation and engagement that exist in activity systems, Engeström's (1987) Activity Theory framework was used in this research. The constituents of an activity system include *subject, object, tools, rules, community* and

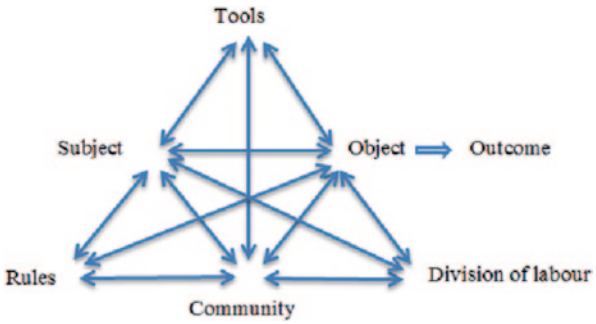

Fig. 2.1 The basic structure of an activity system. (Adapted from Engeström 1987)

division of labour. Activity Theory provided a framework to guide data collection, analysis and interpretations of our study. The framework allowed us to recognize the whole structure of the course and learning activities as activity systems and examine how different elements of activity systems influenced and affected each other in this context. Figure 2.1 shows the basic structure of the Activity Theory.

2.4 Factors Affecting Students' Motivation and Engagement

This Post Graduate Diploma course was taught fully online for a period of 12 weeks and delivered via the university LMS. The participants included seven students (six New Zealanders and one from the Middle East) and the lecturer (New Zealander). The activities which provided the data for analysis included synchronous virtual classroom and discussion forum that was facilitated by the LMS.

In this context, the elements—*tools* and *community*—seemed to mediate students' active participation and motivation in the process of achieving their (*subject*) learning objectives (*object*). Tool mediation, which is a key principle of Activity Theory, highlights that human activity is mediated by various tools (Kaptelinin 1996). These tools can be external (physical)—a computer or a book—or internal (psychological)—a mental model, concept or a plan, for instance. The tools that mediated students' motivation and engagement in this context included the educational technologies—Adobe Connect virtual classroom and the university LMS, Moodle.

The Adobe Connect virtual classroom facilitated a synchronous activity in this case as an individual assignment which represented 30% of the marks students received. The objective of this activity was to present their research to the members of the class in the virtual classroom environment. The dates of presentations were predetermined and posted on the Moodle site for students to choose the day that best suited them (out of 3 days from 7.30 to 9 pm). The presentations took place during week 10 of the semester. Figure 2.2 shows the virtual classroom activity system that is overlaid in Activity Theory framework.

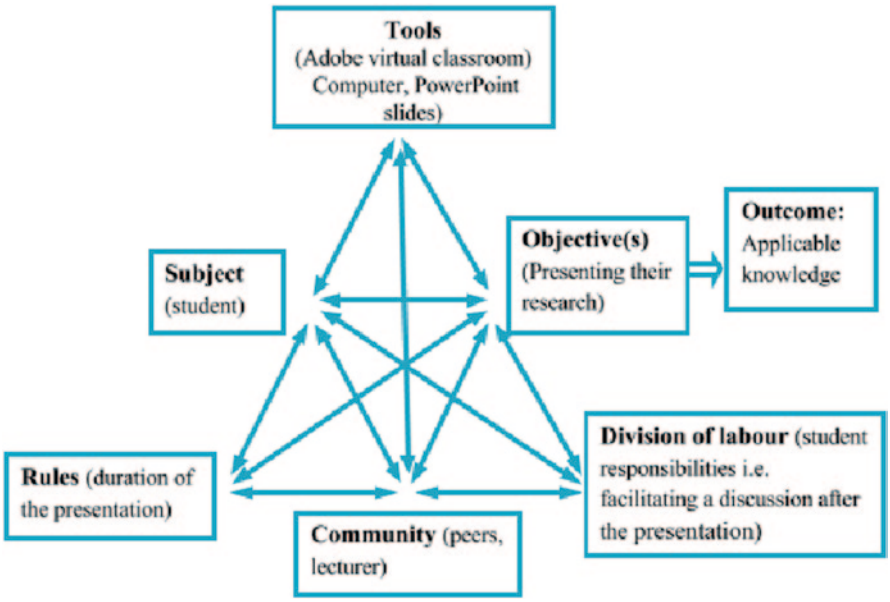

Fig. 2.2 Virtual classroom activity system. (Adapted from Engeström's Activity Theory framework 1987)

For students to access this password-protected virtual class, they clicked on a specific URL, entered their password and joined the activity. Figure 2.3 shows the layout of a typical virtual classroom that included video/audio, participants, PowerPoint slides of the presenter, text chats, file sharing and polling features.

In the virtual classroom activity system, the affordances of virtual classroom software allowed the participants to see each other in real time, and the participants perceived this as a benefit, as they could get to know each other better. Alex commented:

> I would like to see more synchronous. Only because I like seeing people when I'm talking to them and stuff like that. I like that backwards and forwards that can happen very easily in that environment. (Alex, interview 2)

Another feature of virtual classroom that supported students' active participation was the ability to have an oral discussion in real time right after each presentation. As part of students' responsibilities, each student was nominated by the lecturer to ask three questions from another student in the form of a discussion. The dates, list of the names of presenters and the reviewers were posted on Moodle 2 weeks before the activity. Having a discussion after each presentation allowed the students to immediately clarify the issues related to the topic as well as provide some instant feedback.

In synchronous learning, instant feedback and the interactions with peers and the facilitator seem to increase motivation and student learning (Schullo et al. 2007). The findings of our research also suggested that by having audio and video features,

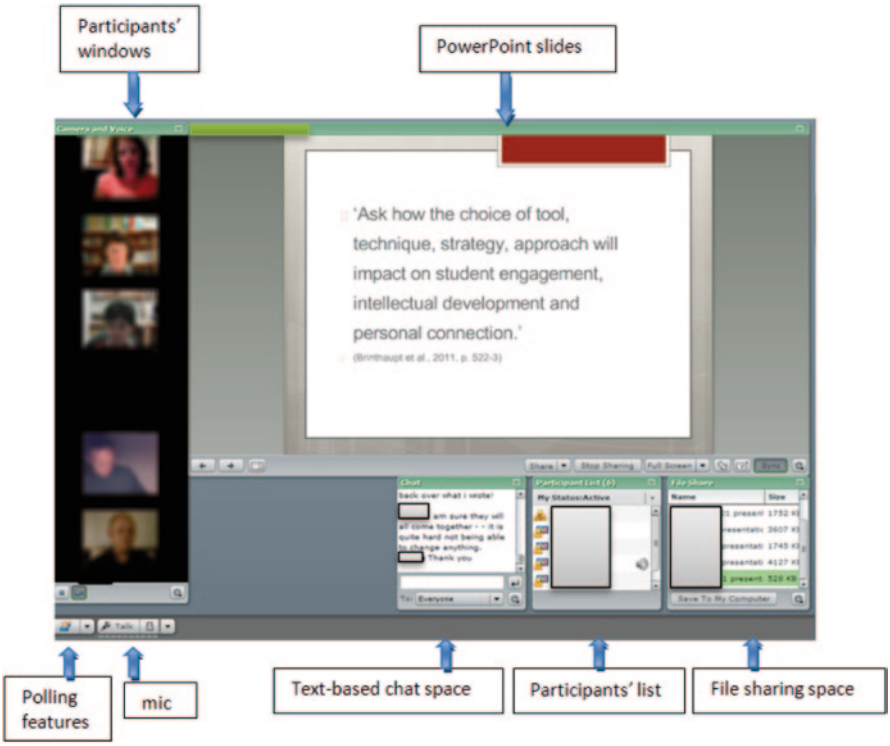

Fig. 2.3 Virtual classroom activity (9 May observation)

the virtual classroom facilitated reciprocal communication among participants where they could clarify issues and provide instant feedback as they were engaging in the activity. Students also acknowledged the value of physical cues in the virtual classroom environment.

As a group, they were also motivating each other by giving words of encouragement after their presentations. The words exchanged included 'very interesting', 'well-done' and 'excellent presentation'. Apart from the video and audio functions, the virtual class also allowed the students to have a text-based chat during this activity. This was particularly useful when they had questions to ask from a particular person in private or in public as well as to have a chat before the facilitator (lecturer) joined the group where they could support and motivate each other to do well in the activity. An example of a text-based chat is shown below.

Alex: Hi Fiona… I hope you're not too nervous :)
Guest: Hi Alex and Fiona hope technology is on our side tonight
Fiona: no I am not
Alex: That's good.
Guest: Debbie here I'm nervous
Guest: How do we see each other?
Brent: Richard will come on at some stage and enable all that business and then you click the camera button that will appear at the bottom of the "Camera and Voice" thingy at the top left :-)

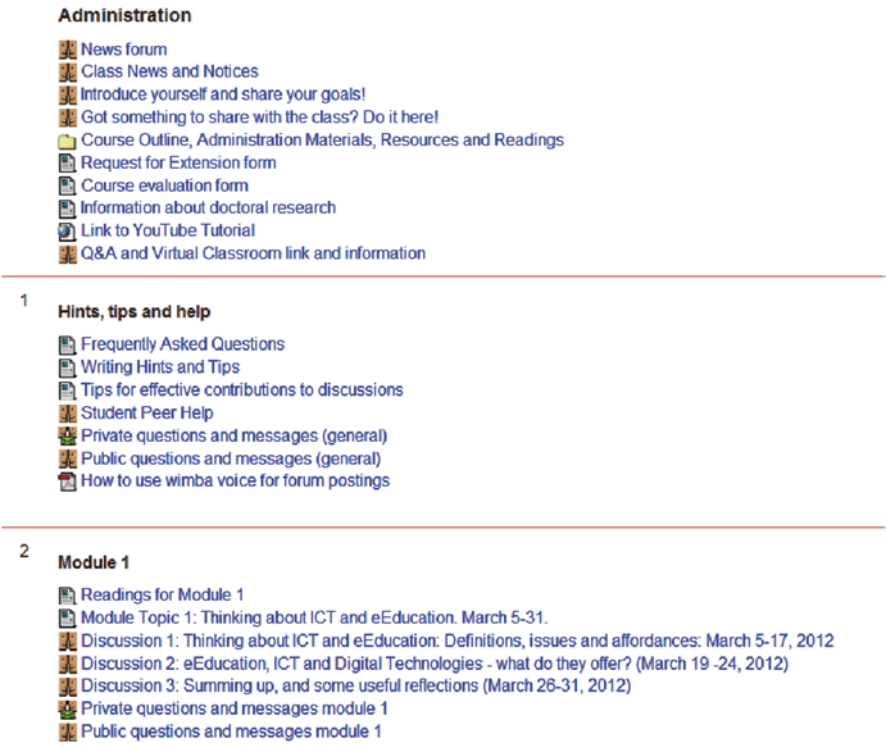

Fig. 2.4 Case study one: Moodle course layout

The conversation above shows how the students were supporting each other by giving instructions how to set the camera and also encourage them to do well without being nervous.

2.5 Learning Management System

Anderson et al. (2001) suggest that 'Thoughtful design of learning activities is critical to the attainment of educational outcomes' (p. 15). The design and the way courses are structured can be vital factors that are associated with students' motivation and positive/negative experiences of learning online.

Figure 2.4 shows the course layout in Moodle. The data indicated that Moodle as a virtual *tool* also affected students' motivation and engagement. The Moodle page of this course was well-structured and the lecturer deliberately used several structural strategies in its design. As the lecturer, Richard acknowledged, 'students did not have to wrestle with the interface or find resources to be able to learn' (interview 1). In particular, the lecturer's design in embedding all the teaching materials and

resources within texts and hyperlinks in logical order made students' learning experience as easy as possible. This is supported by the strategies suggested by Savenye et al. (2001) in providing students with easy access to hyperlinked resources and materials that are well-organized in modules. The University of Texas (2013) states that to help motivate students, it is crucial to structure courses where students know what to expect. In this case, the lecturer, Richard acknowledged this factor and mentioned that 'patterns are important in online learning' (Richard, interview 2). He explained:

> A lot goes down to the fact that I must stick to the uniformity and the design of the interface. Anything that is neat and tidy…and the same order for each module…, so it's predictable.

The importance of a structured course was also highlighted by the students and they appreciated that the lecturer 'has been a very good coordinator and his work is structured' (Christine, interview 2). Students also mentioned that all the information is there and they can read in their own time. Brenda acknowledged that the course has a logical organization of materials and concepts that help students to understand the subject better.

> We read all those papers where things haven't been going that well. That was fascinating because we kind of looked at the history and then we looked at the potential benefits and then we looked at how things are not going that great, but we already got ideas of potential benefits, I like the way he puts things together. (Brenda, interview 2)

Brenda here refers to the reading materials that Richard has put together to suit the topics that are covered in the course. In summary, the logical arrangement of the learning materials to provide a well-structured course seemed to sustain students' interest and led students to actively participate in learning activities.

Creating conducive environments for learning and a community of learning where students feel supported is seen as another factor that can motivate students to actively participate in class activities (University of Texas 2013). This was apparent in the case of my research. The aspect of *community* influenced students' motivation and engagement in learning activities in this context. In designing the course, Richard created several spaces for students to interact and communicate. As Fig. 2.4 shows, these spaces comprised class news and notices, private and public communication spaces, sharing spaces, peer support spaces, FAQ and Q&A spaces for each module.

These spaces seemed to foster closer connections among students where they felt supported. The personal introductions the participants were to share with the class at the beginning of the course included details about themselves and their families, their goals and also their photos. Students seemed to value these detailed personal introductions, as it helped them to get to know each other a little better. As Fiona explained, in face-to-face classrooms there is a chance for students to get to know each other well, as they meet each other often, unlike in a fully online environment. She further explained how the detailed introductions helped to know more about other students in the class; 'at the beginning of the paper we had to introduce ourselves, not just the name' (Fiona, interview 1). The importance of sharing their photos with the personal introductions was also emphasized by Debbie:

> I've been surprised…it was better than I thought. It's not face-to-face, but it's amazing. You introduce to each other and you see a face and then you contribute and when you are reading someone's post, you are replying whatever the personality you are imagining you know. (Debbie, interview 2)

By creating several spaces for communication, the students were given a choice to suit their needs. The lecturer's deliberate attempt in creating strategies such as social, communication and sharing spaces clearly facilitated closer connections among students. This is supported by Schwier's (2007) views that 'communities cannot be created; rather they emerge when conditions nurture them' (p. 18). These social interactions among students maximize students' motivation and peer collaboration in learning (University of Texas 2013).

Learning from more capable peers is aligned with Vygotsky's (1978) concept of zone of proximal development (ZPD)—that is, the distance between what an individual can achieve on his or her own and what one can achieve by the help of others. This concept was evident in this case where students achieved more by interacting with each other than on their own. By introducing and sharing with others about useful software such as PDF reader, tips to show how to include a video clip into a post and dock blocks as well as offering technological knowledge, the more capable students assisted their peers to achieve their objectives. For instance, when Christine was looking for help with one of her assignments where she had to make a YouTube video clip:

> Making the YouTube clip…that really was a disaster. I thought that was quite frightening and I honestly didn't have a clue what to do. One day I asked 4 people at work and no one could help me. And then I sent out a question on the public Question place. Alex came in and sent me an email how to do it. To me, it was little bit like a miracle because I had no knowledge of how to do either of those the Movie maker or the YouTube. (Christine, interview 2)

A teacher's presence in learning activities and as part of community in online learning environments is motivational (McIntyre 2011). In this case, Debbie felt that the lecturer's presence was a vital factor that helped to create a sense of belonging to a learning community. Almost all the students clearly expected the lecturer to be part of forum discussions in this context because they believed that the lecturer needed to be there to direct them, guide them, provoke them to think further and also to help develop a depth of knowledge. The students felt that 'he is present' (Alex, interview 2) and that motivated them to engage in learning activities. It was interesting to note how Alex felt that the lecturer was just focusing on them and also the concern that the lecturer must be waiting for the students to respond:

> Definitely it's better that he is there. I like the way Richard has been involved. It's like he is present. And even though I know that he must have other responsibilities sometimes I feel that he focuses just on us. And I guess that's another aspect of the asynchronous nature of what we're doing as well. I mean sometimes I'm thinking Richard must be wondering what on earth I have been doing or where I've been. He is good at it and it's good to have him there…. I mean if we were in face-to-face situation, we probably have quite I think with the nature of some of the people in the course we probably would have very dynamic conversations without him … he wouldn't need to be there. However, he does guide us, he ends it with the things he likes us to consider, so that has been good. (Alex, interview 2)

Alex's analogy to face-to-face contexts highlights the need for a teacher's presence in online contexts where other means of having dynamic conversations are not possible. In addition, the students expected the lecturer to acknowledge their participation and contributions online.

According to McIntyre (2011), students can be greatly motivated when their comments are acknowledged as contributions of relevance and interest to the peers. In this case, the students stressed that their participation and contribution 'need to be acknowledged. Otherwise why are you doing it?' (Brenda, interview 2). Others pointed out that he needed to be there in order for them to be guided.

> I think his presence is absolutely vital. I hate not to have Richard there. He directs and he sort of tells us and I think we'll be like a head…going to 100 different directions if we didn't have Richard. I'm very grateful that he is there. (Debbie, interview 2)

Richard, the lecturer, also believed that there is a strong correlation between tutors' presence and students' active participation in online discussions. There is substantial support for this view in the literature. The significance of tutor presence in online discussions is supported by multiple studies in the review of literature conducted by Tallent-Runnels et al. (2006). Similar to the findings of my research, these studies highlight that the students' active participation is influenced by the reciprocal interactions of the staff (Dennen 2005). The findings of the qualitative study carried out by McIsaac et al. (2006) on students' and teachers' perception of interactions in online courses replicate some of the perceptions of our research participants. McIsaac et al. (2006) found that students' interactions and positive learning experiences could be promoted by the teacher's effort in providing immediate feedback, participating in discussions, encouraging social interactions and using collaborative learning strategies. These efforts by the instructors do seem to motivate students' participation in learning activities in online learning environments (McIntyre 2011).

2.6 Conclusion

The aim of this chapter was to illustrate factors that affect students' motivation and engagement in a specific online learning environment. The findings of the case under study suggested that students' motivation and engagement were affected by the *tools*—Adobe virtual classroom and the LMS that facilitated the design of the course and forum discussions. With the audio-, visual- and text-enabled features of the virtual classroom, students were able to see and hear each other in real time, provide instant feedback and encourage each other which enhanced students' motivation and students' active participation in this case. In addition, the aspect of *community* was another factor that affected students' motivation and active participation in learning activities in this case. In particular, the deliberate strategies the lecturer employed in the Moodle design of the course facilitated easy access to learning materials and fostered a community of learning. The academic and social interactions enabled the students to have closer connections and a sense of belonging to

the learning community where they felt supported and motivated. The lecturer's presence as part of the community that was reflected through the instructional strategies, acknowledgements and feedback also seemed to have an impact on students' motivation and active participation in this online course.

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Chapter 3
Supporting the Needs of Twenty-First Century Learners: A Self-Determination Theory Perspective

W. L. Quint Oga-Baldwin

3.1 Introduction

In recent discussions of the modern educational landscape, much thought has been given to the substantive and methodological changes resulting from technology. New technologies provide learners with increased opportunities for interaction with learning material, from individual smartphone and tablet applications to digital whiteboards structuring whole-class instruction to entirely online learning environments with no classroom structure. As the use of these advances becomes increasingly common in education, students rapidly grow accustomed to their use. The question then arises as to how these advances influence students' motivation.

From a self-determination theory (SDT; Deci and Ryan 2002) perspective, motivation develops from the intersection of autonomy, relatedness, and competence (ARC) needs satisfaction. When learners feel that these three basic needs are met, they will engage in learning activities in a self-directed fashion (Ryan and Deci 2002). Autonomy represents the basic need for individuals to feel that they are acting from their own volition, freely and voluntarily participating in an activity. Relatedness represents how connected individuals feel to the other members of a group during an activity, and the strength of that positive connection. Finally, competence represents the belief that individuals can successfully interact with the world to achieve their desired ends. This chapter sets out to review the digital influences on education, and how teachers may address some of the concerns that accompany the technological-medium-based changes to meet students' needs.

W. L. Q. Oga-Baldwin (✉)
Fukuoka University of Education, Fukuoka, Japan
e-mail: qogab1@fukuoka-edu.ac.jp

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3.2 Motivating Digital Environments

According to SDT, learners interpret external events according to whether they support these basic needs, and then use this information to interact with the world appropriate to their internal goals and desires (Reeve 2012). In nondigital learning environments, teachers' need-satisfying practices have been shown to reflect positive in-class engagement and learning outcomes (Jang et al. 2012; Skinner et al. 2008). According to this framework, a supportive and engaging environment is crucial to promoting motivation.

In a similar fashion, numerous studies in this research paradigm have indicated the ways in which individuals interact with digital games. Across cultural contexts, individuals who persist in digital virtual worlds largely do so because the experience satisfies basic psychological needs, perhaps better than the real world (Przybylski et al. 2010; Wang et al. 2011). From an SDT perspective, games are designed to be need satisfying in order to make them more appealing and interesting for long periods of time (Ryan et al. 2006).

Gaming then represents an act of volition (Ferguson and Olson 2012), originating from the player and allowing the individual to escape, express their desires, or achieve feelings of success (Yee 2006). Gamers immerse themselves in the experience of the digital world, whether that world is an online multiplayer role-playing game like *World of Warcraft,* a physics puzzle like *Angry Birds,* or first-person shooter like *Call of Duty,* because it is a fulfilling experience. If education seeks to promote optimal experiences and well-balanced passion, greater autonomy and respect for individuals volition is necessary (Lafrenière et al. 2009; Wang et al. 2008, 2011).

The important element to remember for both games and learning is that content matters. Individuals return to the gaming experience not because of the digital environment, but because the content that is provided by the medium has previously satisfied their needs, and they expect it to do so again (Rotter 1966). It is hard to imagine gamers returning to the game world if the content on some level does not satisfy them internally, and learners will avoid activities which thwart perceptions of autonomy, competence, and relatedness. Whether this experience provides the individual with a new challenge, the opportunity to solve an interesting puzzle, or the chance to collaborate and compete with friends, the degree of need satisfaction predicts whether they will willingly return to the experience again.

3.3 The Digital Age of Education

Recent work by educational commentators has stressed the importance of embracing and employing digital and game-oriented measures for improving learning. Researchers and educators such as James Gee have pointed the positive aspects of games, with benefits as diverse as identity formation and role modeling, building

relationships through social interaction, and requiring conceptual understanding of complex or ambiguous situations (Gee 2007). Numerous other writers have followed suit with ideas for how to apply these principles in the educational setting (e.g., Sheldon 2011), with commentary on everything from content organization and presentation to learning environment designs.

With regard to the adoption of online learning platforms for use in university classrooms, universities have been pushing to increase online content delivery, and while many universities have not yet adopted massive open online courses (MOOCs), many are planning for them. Between 2010 and 2011, the number of students taking these courses in the USA alone increased by more than 500,000 to a total of 6.7 million (Allen and Seaman 2013). At the time of this writing, even greater numbers and increases seem likely. As much as 99 % of the incoming student body may now be bringing laptops to university (University of Virginia 2009), and large numbers are similarly bringing them to classes (Fried 2008).

Recent surveys have also shown that many secondary school students in the UK find reading books to be embarrassing or undesirable, indicating the desirability of digital platforms for promoting literacy (Clark 2013). New innovations for more independent and open-source learning may provide learners with opportunities to master content through their desired learning medium. The worked examples (Cooper and Sweller 1987) shown through open-access learning platforms such as Khan Academy (Khan Academy n.d.) offer students not just one but many chances to interact with learning material, and have been touted as an educational revolution by the popular press. By offering students the chance at an inverted classroom model (Lage et al. 2000) where lectures happen for homework and students complete activities in class, these online courses give students a greater chance to autonomously interact with learning material, guided and structured by teachers' in-class activities, exercises, and discussions.

In considering the development of motivation for the Net Generation, we must think about both content and medium changes brought about by digitally oriented learning environments. How do the traditional content and new media interact? How do learners perceive the juxtaposition of the two? The substantive changes brought about by technology have been minimal. Besides the technology itself (and the developments it has allowed), very little basic content has been added or changed by digital innovation. A cursory study of learning sites like Khan Academy will display learning content remarkably similar to that of any standard textbook; mathematics requires comprehension of numerical values and logical relationships, learning to read requires phonological awareness of written sounds, the scientific method is based on a cycle of observation and testing hypotheses, foreign languages require knowledge of vocabulary and grammar, and Rosencrantz and Guildenstern are still dead.

Rather, the means by which this information is communicated has been changed within this paradigm. The difference lies in the ability to choose what and when to study, and the connection of learning with individually driven interest and desire to learn. Thus, while the new digital media may offer choice and convenience, their ubiquity may also create motivational hurdles which will require careful navigation.

3.4 Digital Environments for Learning: No Panacea?

Research into the world of digitally oriented learning environments have shown that simply moving to a more digitized platform has not necessarily shown strong educational or motivational outcomes. In a comprehensive review of both quantitative and qualitative research on serious gaming for education, Michael Young and colleagues found that educational games may not yet show conclusive gains for all subjects (Young et al. 2012). One issue comes from the forking branches of choices learners make when gaming often differs with each replay of a game. Since, in traditional learning settings, some learners need to get the full body of information on three separate occasions before they successfully learn it (Nuthall 2002), designing games and stories in such a way that the complete body of knowledge is repeated sufficiently to ensure uptake becomes difficult. Some serious games may also lack the stories necessary to engage learners' full interests, or may not engage learners beyond surface learning.

Other reviews of the same topic have found some positive evidence for gaming. Using large-scale meta-analytic procedures, Wouters et al. (2013) demonstrated that serious games show benefits over conventional instruction (defined here as lectures, reading, drill and practice, and hypertext reading) in terms of learning and retention, though not so for motivation. Some moderation effects showed that serious games were more motivating than an active control group completing hypertext tasks or prompted learning activities, and had stronger motivational effect when they were not combined with other learning activities. This, unfortunately, contrasts with the finding that the best learning demonstrated by serious games was in concert with other learning activities. Further, serious learning games in this study were thought to be potentially less autonomy supportive, unlike numerous games investigated by Ryan et al. (2006), which may account for the lack of motivation-related results. As with the review by Young et al. (2012), these results show some positive evidence for the effects of gaming, but most conclusively point to the need to structure games which work to motivate and mentally engage students.

Some have made the claim that games may help in multitasking, though the evidence here is also inconclusive at best. Some researchers have found that video games may improve students' ability to carry out multiple tasks in laboratory settings (Stroback et al. 2012), while others have indicated the opposite (Donohue et al. 2012), especially with regard to more real-world tasks (i.e. answering difficult questions while distracted). This line of research seems likely to go back and forth before conclusive evidence is found, but the base theory of attention seems to indicate that, as yet the digital generation has not introduced any practically relevant abilities to allow for greater cognitive integration with digital technology.

The educational results with regard to increases in digital age learners' multitasking abilities echo the above psychological findings. Research on digital classrooms and attention has found that students who bring their laptops to class are more likely not only to multitask but also to distract others. This ultimately leads to decreases in learning for both parties (Sana et al. 2013). As with traditional conceptions of

learning, divided attention appears to be weakened attention (Kahneman 1973). The implications for classroom practice are many here, primary among which is that laptops in lectures may do more harm than good.

Even digitally integrated blended learning environments have weak to modest gains in terms of learning and motivation. Previous writings have identified how digitally integrated classrooms using interactive white boards (IWBs) are received positively by teachers and students (Smith et al. 2005). At the same time, this enthusiasm has not demonstrated the same level of even self-reported gains in motivation (Torff and Tirotta 2010). Students receiving instruction in IWB classes showed statistically significant though minimal practical differences in their attitudes towards mathematics compared with students receiving instruction in traditional classroom settings. While digitally integrated environments may indeed show some benefits, the extent to which the classroom technology alone influences students' engagement and learning remains questionable.

To this point, gaps have been shown between the design of online learning environments and their ability to satisfy both motivational and learning outcomes. In a study of students' motivation in relation to online learning environments, Chen and Jang (2010) investigated SDT needs satisfaction in relation to time on task and expected and actual grades. Strong support for competence and autonomy had a positive influence on students' need satisfaction, and students reported strong expectations of high grades as a result of this support. Positive perceptions of the learning system also increased self-reported and measured time on task. However, final course grades were not strongly predicted by support, satisfaction, or motivation, indicating a disconnect between the motivation for the course and the learning that happened. Further, forthcoming studies have also shown that learning in digital environments may be perceived as inconvenient or lack real personal learning benefit (Fryer et al. 2014). These findings may indicate basic problems with online content delivery for both learning and motivation.

So may also be the case for independent learning via open-source learning. While research into this area has not yet been fully developed or organized, one issue that may occur with free platforms such as Khan Academy and smartphone app-based learning is the idea of motivational interference (Hofer et al. 2011), or the idea that another activity may be more attractive. Some twenty-first-century learners sum this up as "Facebook-itis." Both from listening to the stories of students and from my own experiences with digital technologies, no matter how determined people may be to use their electronic devices with the intention to learn or work, they may find themselves logged into social networking sites or "accidentally" push a game icon before they even think about it. This mirrors the more negative obsessive passion for certain games that some online gamers may experience (Wang et al. 2008).

Ultimately, while technology may provide greater choice, autonomy need satisfaction amounts to more than providing choices (Katz and Assor 2006). Rather, autonomy is a combination of agency, volition, and personally meaningful action. For all of these, choice is a part, but not the entire picture. Likewise, the medium of technology may not increase a sense of relatedness; quite to the contrary, recent changes through digital media such as social networking sites may actually foster

shallow relationships (Carpenter 2012). Finally, technology as a tool requires students to have at least some basic knowledge (Hirsch 2000), and will likely not improve competence further than a larger hammer improves the ability to drive nails; while the hammer makes the job easier than using a rock, it is the basic strength and skill of the carpenter's arm that guides the hammer. However novel and initially interesting technological developments may be, their use has yet to indicate basic changes in cognitive architecture (Willingham 2010), and their use will have a limited long-term effect on learning and instruction if they are not able to meet students' basic psychological needs of autonomy, relatedness, and competence.

3.5 Supporting Needs Through Self-control, Meaning Making, and Support for Relationships

While numerous issues remain with the digitization of education, twenty-first-century learners have indicated that the use of technology and other modern media is highly desirable (e.g., Clark 2013; Smith et al. 2005). Thus, from a SDT perspective, even knowing the traps and pitfalls associated with digital learning environments, supporting students' autonomy means meeting that desire to have classes, learning materials, and activities in a digital medium. These medium-based changes involved in the shift to digital learning represent a motivational reality that must be addressed by teachers, researchers, and administrators. Thus, the task for educators in motivating today's learners remains one of reaching students through their desired means while helping them successfully navigate the minefield of digital learning.

From the SDT perspective, motivating learners of this generation means building on the existing robust findings regarding building classroom motivation. Extrinsic rewards will show short-term gains but long-term losses (Deci et al. 2001). How we motivate students depends in large part on the way we structure classroom goals, and students with more externally regulated goals show less autonomous motivation and weaker learning behaviors (Vansteenkiste et al. 2008). How teachers interact with their students strongly influences how students perceive the value of tasks (Assor et al. 2002; Reeve and Jang 2006). Classroom dynamics have long-term effects on how students engage with learning materials (Skinner et al. 2008), and how teachers structure their learning activities through clear explanation, feedback, and authoritative (but not authoritarian) direction is strongly linked to positive autonomy need support (Jang et al. 2010; Sierens et al. 2009). In assigning independent learning, how teachers support students' psychological needs promotes positive and adaptive motivation for completing homework tasks (Katz et al. 2009; Przybylski et al. 2010; Wang et al. 2011). It should be noted that the majority of the research which gave way to the above principles for autonomy-supportive instruction was conducted in classrooms with twenty-first-century digital natives, further illustrating that SDT principles remain sound. In promoting self-determined motivation

among modern learners, considering how specifically to support and satisfy basic motivational needs becomes a priority.

In supporting learners' competence, self-control (Baumeister et al. 2007) will prove crucial in digital environments. Digital platforms offer much of the freedom, but not necessarily the structure and direction, necessary for learning. Based on the currently indeterminate and somewhat contradictory evidence regarding the influence of gaming and digital life on digital natives' multitasking and attention focusing abilities (Donohue et al. 2012; Stroback et al. 2012; Sana et al. 2013), the importance of self-control becomes increasingly apparent. Especially in light of findings regarding excess choice as draining (Vohs et al. 2008), demoralizing (Schwartz et al. 2002) or potentially overwhelming (Iyengar and Lepper 2000), interventions to provide learners with better self-regulatory abilities (Baumeister et al. 2006) and more flexible implicit ability beliefs (Dweck and Leggett 1988; Job et al. 2010) may offer educators a path towards more successful integration of technology, such as laptops and IWBs, in the classroom. This may be understood as a form of competence support, improving students' ability to make positive changes on their environments (White 1959), while helping them to personally and volitionally handle motivational interferences during nonleisure activities (Hofer et al. 2010, 2011). Thus, as a base for supporting learners' competence in digital environments, self-control-supporting interventions such as physical exercise, behavioral tracking, goal setting, and other monitoring systems (Baumeister et al. 2006) may help to improve students' competence for managing the troubles and distractions of the digital world.

In order to support learners' need for autonomy and interest, demonstrating the meaningfulness of the learning task is of greater import than creating games. As Jere Brophy discussed (2004, 2009), simply turning education into a game may both reduce the focus on the learning task and diminish the enjoyment of previously enjoyable activities. Thus, if educational game designers and educators are not careful in the design and implementation of serious games to support learners' needs, they may inadvertently reduce students' positive affect for gaming in general, turning games from an activity learners *choose to do* and into something *done to* them (Ferguson and Olson 2012), thus making them less desirable on the whole. Education and instructional practices in general have been indicated to facilitate this change in attitude (Bonawitz et al. 2011), indicating that instruction may *decrease* studying. This finding aligns with SDT, as it shows how increasing external controls may decrease autonomously directed behavior, as recent studies have shown homework may do (Katz et al. 2009, 2013; Katz and Assor 2006). In the same way, assigning games as homework or creating storylines where players feel that they are being manipulated or forced may have the unintended effect of reducing students' desire to play both in and outside of the educational realm. While there are likely readers who might see this in a positive light, as it might push students to go outside and exercise more or stop develop more traditional interests, it may just as likely promote behaviors even less socially acceptable than gaming.

At the same time, gamifying the learning environment, without truly turning it into a game, may indeed have positive effects on students' learning and autonomy,

if done right. Knowing how games satisfy psychological needs and promote interest (Ryan et al. 2006), and considering the necessity of extensive contact with the learning material (Nuthall 2002), teachers may structure their learning environments to support autonomy, create positive relationships, and build comprehension of the material by making each task individually exciting and meaningful. An interesting idea in the design of learning environments is to mirror gaming environments, including starting the semester with learners at level 1, 0 points, and asking them to work towards acquiring knowledge to "level up" and achieve passing grades by completing learning activities presented as "quests" (Sheldon 2011). This concept accepts the idea of the "learner as hero" in their own hybrid digital real-world narrative of learning (Rigby and Przybylski 2009). In structuring the reward system as "now that" achievements (i.e., "Now that your group has completed the 'quest', you may choose a quiet activity, or you can go help one of the other groups finish") in variable intervals, teachers may help students engage without feeling controlled by a point system (Deci et al. 2001). While I am currently unaware of research into classroom effects of this intervention, studies using this methodology to promote motivation and learning may indicate of the validity of gaming as an autonomy-supportive method for teaching twenty-first-century learners. The crucial element here is to harness more internal, intrinsic elements of games in order to promote passion for learning and optimal experiences (Wang et al. 2011).

In supporting learners' relatedness, understanding how learners interact with each other in the new digital world is an important step to helping learners smoothly integrate with the online and real worlds. In promoting motivation through the digital world, supporting learners' positive relationships is a crucial step in improving motivation (Martin and Dowson 2009). While the digital world may indeed foster a sense of unreality and shallow relations (Carpenter 2012), helping students to recognize that events in the online world and the real world interact and have consequences may help to undo the sense that digital interactions are less "real." To this end, interdependent group work on learning projects ("quests" in the above modality) has been shown to positively influence motivation (Liu et al. 2008). Structuring these activities so that learning groups interact both in digital and face-to-face environments may help learners to feel a sense that the two worlds are connected. Through the sense that learners strive towards a goal together may help learners to deepen their understanding and prevent problems (Marsh et al. 2011). Likewise, just as parents may encourage their children's positive civic behaviors through time spent gaming together (Ferguson and Garza 2011), teachers' active presence in an autonomy-supportive digitally augmented classroom may promote better student engagement and learning (Cornelius-White 2007). The creation of a community of learners capable of working together and understanding each others' differences through a shared learning culture, all while moving towards an educational goal, remains crucial for motivating learners even when they do not meet face to face.

As a final note, even twenty-first-century digital natives have shown that stepping away from their smartphones and online worlds from time to time can replenish their feelings of vitality. In a series of studies, Ryan et al. (2010) showed how university students perceived natural, outdoor settings to be most supportive of their vi-

tality. Likewise, those who spent more time both outdoors and in natural settings felt greater subjective vitality. Returning then to the idea of physical exercise promoting self-control (Baumeister et al. 2006), taking the exercise outdoors and in nature when and where possible may help vitalize students and improve their self-control in the digitized classroom. In considering both learning motivation and well-being, this should not be overlooked, even for a more electronically oriented generation.

The above-mentioned methods represent the ways in which teachers may promote motivation for learning in a digitized society. While online coursework, IWB technology, and other digitized innovations may not promote learning and motivation in and of themselves, their use may indeed motivate learners by helping them to rationalize activities. Structuring learning activities such that the digital environment facilitates autonomy, competence, and relatedness support, while also providing opportunities for reinforcement, feedback, and growth is an essential step to promoting learning. The focus in self-determined twenty-first-century learning must be to balance supporting needs while at the same time ensuring that substantive learning occurs through the integration of digital and analog methods.

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Chapter 4
Examining the Influence of the Big Five Personality Traits on the Relationship Between Autonomy, Motivation and Academic Achievement in the Twenty-First-Century Learner

Kah Loong Chue

4.1 Introduction

Sustaining interest and engagement level in the classroom is a demanding task for all teachers in the twenty-first century. In a rapidly interconnecting world, many more interesting pursuits compete for the attention of students. Educators who interact directly with students have a trying time to ensure that students remain on task, understand the necessary concepts, apply the correct procedures, persist in the face of challenges yet remain positive throughout the lessons. Outcome-wise, they must produce students who can achieve excellent academic grades and are able to meet the challenges of an ever-changing society through lifelong learning.

The role of motivation to accomplish these educational goals has long been debated by psychologists and educators alike. Motivation has been defined as 'the process whereby goal-directed activity is instigated and sustained' (Schunk et al. 2010). In a nutshell, this means that educators need to be capable of activating mechanisms within students that will provide a direction towards action. Naturally, researchers became interested in finding out what causes people to act and the reasons for doing so. Early research on motivational models focused exclusively on achievement motivation. Subsequently, in the past few decades, the trend shifted towards social cognitive models of motivation.

There are three main assumptions that accompany the newer social cognitive models. Firstly, motivation is a dynamic, multifaceted phenomenon. Students' motivations are not placed in a dichotomy of 'motivated' and 'unmotivated'. Rather, student motivation can be characterized as a point in a unidimensional continuum. Secondly, motivation levels can vary depending on the situation and context. An individuals' cultural, demographic, personality as well as the characteristics of a

K. L. Chue (✉)
National Institute of Education, Nanyang Technological University, Singapore
e-mail: klchue@gmail.com

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classroom, subject matter, instructional efforts each contributes towards motivation levels. The last assumption presumes that students' cognitive abilities play a large role in mediating motivation and achievement. The three assumptions together suggest that it is possible to make a difference in motivating students for greater academic performance through the use of instructional strategies and the individual's active regulation of his own thoughts and behaviours (Linnenbrink and Pintrich 2002).

Following this movement towards social cognitive motivation models, Deci et al. (1991) proposed a continuum of motivation under self-determination theory (SDT). The continuum consists three categories: amotivation or lack of motivation at one end and extrinsic motivation and intrinsic motivation at the other end. Extrinsic motivation refers to externally regulated processes while intrinsic motivation refers to internally regulated processes. Intrinsically motivated behaviours are usually caused by interest, enjoyment and to satisfy an inherent need. Many empirical studies have shown that intrinsic motivation is a key predictor of academic achievement (Cordova and Lepper 1996; Deci et al. 1991; Niemiec and Ryan 2009).

Unsurprisingly, this has drawn emphasis to ways on cultivating intrinsic motivation in students. To achieve these ends, the SDT postulates that a greater sense of autonomy, competence and relatedness would necessarily lead to a higher level of intrinsic motivation (Ryan and Deci 2000a, b). Supports for competence and relatedness will only be effective in the presence of an autonomy-supportive environment (Deci et al. 1991). In this instance, an autonomy-supportive environment will enable students to feel a sense of control in their interactions with the surroundings. This has led researchers to devise and implement strategies to promote autonomy in the classroom and subsequently, Reeve (2009) proposed a framework which teachers can employ to create an autonomy-supportive environment.

However, empirical studies have revealed inconsistent responses among students when these strategies are employed (Furtak and Kunter 2012; Stefanou et al. 2004), thus pinpointing the possibility of moderating variables that influence students' behaviour. What are these likely variables? Possible moderators that influence self-determination suggested by Wehymeyer et al. (2011) include both contextual and personal factors. Contextual factors such as culture have been investigated at length. However, so as to ensure that intervention strategies to promote autonomy have maximum benefits, educators should also be aware of individual differences. Since it is widely acknowledged that the Big Five personality traits capture most of the individual differences in behavioural patterns (Digman 1990; McCrae and John 1992), there is a high possibility that the Big Five traits will moderate the relationships of autonomy and motivation/performance.

4.1.1 The Singapore Context

In 1997, the former prime minister, Mr. Goh Chok Tong, unveiled the 'Thinking Schools, Learning Nation' vision which aims to develop creative thinking, a lifelong passion for learning and nationalistic commitment in students, in view of nurturing

competencies that would be relevant to the twenty-first-century workforce. Along with the vision came a slew of education policy initiatives with the dual goals of promoting (a) greater diversity and choice in the educational landscape and (b) greater autonomy and innovation in schools (Tan 2008).

One of the key components of the vision was to embed in all students the notion of lifelong learning, hailed as an important tool enabling education to confront its many emerging challenges in the twenty-first century (Medel-Añonuevo et al. 2010, Foreword)

Researchers have argued that for lifelong learning to occur, individuals must first be intrinsically motivated (Nordgren 2013). In line with this approach, calls have been made for greater autonomy at the macro-level (educational landscape) and micro-level (in schools).

At the macro-level, more choices have been made available in the educational landscape that cater for various abilities, most notably the School of the Arts and Singapore Sports School. New private educational institutes have mushroomed to accommodate the number of students who wish to extend their education. At the micro-level, one only has to step into any school to find that a system of control still prevails in schools. The teachers strive to control the students' behaviour (as opposed to sustaining their engagement level), the heads of departments strive to control the teachers, the school management work diligently to control the teachers and heads of departments' and the Ministry of Education attempts to control the school management. All this is done through a system of accountability, i.e. the School Evaluation Model for school management and the Enhanced Performance Management System for teachers. In the classroom, it is not uncommon to observe teachers employing a teaching approach that completely overlooks the psychological needs of students, namely autonomy, relatedness and competence.

A similar scenario can found be found in private education institutions where most instructors instruct and students listen. Support for autonomy is frequently non-existent in these classrooms. One of the main reasons lies in the fact that educators in the private education sector lack the necessary teaching qualifications to conduct lessons. In view of this, the Council for Private Education was appointed by the Singapore government in 2009 to raise standards in private education through regulations and industry development. One of the new requirements under the Private Education Act was to ensure that more than half of the teachers in private institutions had the requisite educational qualifications, knowledge or experience in relation to the duties the person is required to perform (Private Education Act 2009).

Nonetheless, many educators in private education still have little knowledge in the area of motivation and learning. Although most would be aware of the benefits of intrinsic motivation, they may not have the necessary familiarity to develop it within students. Furthermore, even if instructors had employed strategies in their lessons, they could have been deterred from using them again due to variances in the students' responses. These differences in reactions are highly conceivable as the profile of students in private education is very diverse and heterogeneous. This chapter thus hopes to create some awareness of the impact of autonomy-supportive

strategies, and personality trait as possible reasons for the differences in student's motivation to learn and academic achievement.

4.2 SDT and Motivation

To conceptualize motivation, two sub-theories of SDT, cognitive evaluation theory (CET) and organismic integration theory (OIT), will be applied. CET and OIT postulate that motivation can be categorised into three regulatory styles, namely amotivation, extrinsic motivation and intrinsic motivation, along a self-determination continuum. Amotivation represents a complete lack of motivation. Extrinsic motivation can be further differentiated into four types: external regulation, introjection, identification and integration. External regulation is caused wholly by externally imposed rewards or punishment. For example, a student who does his homework purely to obtain his teacher's praise is externally regulated. Introjection involves a low degree of self-determination and occurs when individuals impose their own internal rewards or constraints (e.g. guilt, shame or obligation). A student who performs an activity so that he does not let his parents down exhibits introjected regulation.

Identification takes place with a higher form of self-determination when individuals identify with the reason for behaviour. For instance, students at the identified regulation stage carry out tasks because they appreciate the benefits and value of the tasks. Finally, integration occurs when individuals engage in behaviour because of its importance to their senses of self. Integrated regulation is characterized by a high sense of self-determination; however, it is still extrinsic in nature as behaviours motivated by integration are done for its instrumental value rather than for their own sake (Ryan and Deci 2000a).

Intrinsic motivation involves the highest degree of self-determination. Students with an intrinsic orientation display a preference for challenge, are driven by curiosity and interest, focus on independent mastery and have internal criteria for success. (Harter 1981). They are more prone to enjoy learning, understand concepts in depth and achieve a higher academic performance (Deci et al. 1991; Middleton and Spanias 1999).

4.2.1 Motivation and Academic Performance

Numerous studies have been conducted on the effects of extrinsic and intrinsic motivation in the academic context. Researchers have long maintained that intrinsically motivated students are more likely to have greater academic accomplishments. Being interested and engaged during the learning process should naturally result in better learning and achievement. Moreover, students who are extrinsically motivated tend to obtain lower achievement scores.

Empirical studies have long supported this view. Gottfried (1985) conducted three studies with elementary and junior high school students and determined that intrinsic motivation was positively related to school achievement. In addition, there was evidence that motivation is differentiated into subject areas such as reading, mathematics and science (Gottfried 1985). Lepper et al. (2005) did a study on ethnically diverse children and discovered that intrinsic motivation predicted better performance on standardized tests. Students who were not extrinsically motivated had a negative correlation to the same tests (Lepper et al. 2005). In a longitudinal study conducted to examine reading literacy development, it was determined that intrinsic and extrinsic reading motivation predicted reading literacy. In particular, there was a negative effect of extrinsic motivation that could not be mediated by other factors such as reading amount. On the other hand, intrinsically motivated students developed better reading skills as they progressed through school (Becker et al. 2010).

In the Asian context, a study conducted on Indian adolescents in Canada and India revealed that intrinsic motivation had a positive impact on achievement in both environments. However, while extrinsic motivation had a negative effect on Indian adolescents in Canada, it was not a significant predictor of academic achievement in India (Areepattamannil et al. 2011). Research on students in Hong Kong also showed that intrinsic motivation had significant predictive effects on academic achievement, although it was mediated by mastery goal orientation (Chan et al. 2012). An investigation into mathematics attitudes and achievement of junior college students in Singapore revealed that students who were intrinsically motivated scored higher in a mathematics written examination. Conversely, there were no clear relations between the achievement scores and extrinsic motivation (Yee 2011).

It would appear that the links between extrinsic motivation and academic achievement are ambiguous in the Asian context. On the other hand, it is clear that intrinsic motivation points to overall better achievement. What remains to be further explored are the links between motivation and performance in an Asian environment as well as methods and conditions that increase intrinsic motivation. This leads naturally to the next question: How can educators increase the level of motivation of students along the self-determination continuum?

4.2.2 Autonomy-Supportive Environment

SDT proposes that a greater sense of autonomy, competence and relatedness will indubitably lead to an increase in motivation. As such, the SDT is particularly relevant in explaining the needs and motivational orientations of twenty-first-century learners since the latter have a predisposition towards independent and experiential learning (need for autonomy), social networking as well as face-to-face interactions (need for relatedness) and opportunities to advance to higher achievement levels (need for competence).

In particular, supports for competence and relatedness are only effective in the presence of an autonomy-supportive environment (Deci et al. 1991). In a study conducted with fifth-grade adolescents, a noncontrolling environment resulted in greater interest and conceptual understanding as compared to a controlling environment. Children in the noncontrolling condition evidenced a higher sense of autonomy and this in turn predicted greater conceptual understanding (Grolnick and Ryan 1987). Similarly, in three field experiments with high school and college students, it was found that learning text material or physical exercises in an autonomy-supportive environment had high impacts on the depth of processing, test performance and persistence. These effects were significantly mediated by autonomous motivation (Vansteenkiste et al. 2004). Likewise, in a study of secondary school students in physical education classes, an autonomy-supportive climate positively impacted students' sense of autonomy, which in turn predicted their level of extrinsic and intrinsic motivation (Standage et al. 2003).

4.2.3 Autonomy-Supportive Teaching

One of the most radical changes that teachers need to embrace when teaching twenty-first-century learners is the shift from teacher-centred to learner-centred pedagogies, as new technologies enable students to have greater autonomy in knowledge acquisition and in designing their own learning. Teachers therefore need to have a better understanding and awareness of what constitutes an autonomy-supportive environment.

To identify the clusters of behaviours that will lead to an autonomy-supportive environment, Reeve (2006) tested a set of 21 behaviours on a group of pre-service teachers. Raters watched a video tape of instructional episodes carried out by the teachers. Eleven behaviours were scored to be autonomy supportive while ten were controlling behaviours. Students correlate the findings that eight behaviours lead to greater perceived autonomy (Reeve and Jang 2006). A possible framework was thus proposed that could assist educators in developing students' autonomy (Reeve 2009). The five main strategies included in the framework are:

- Nurture inner motivational resources
- Rely on informational, noncontrolling language
- Provide explanatory rationale
- Display patience to allow time for self-paced learning
- Acknowledge and accept students' expressions of negative affect

Inner motivational resources refer to the channels in which students energize themselves. Such means may include their interests, a sense of challenge, intrinsic goals, relatedness, personalisation or independent learning. To nurture these inner resources involves the educator being aware of what resources students possess and building lessons that focus on cultivating them. For instance, teachers can create collaboration opportunities for students, provide scaffolding for independent problem

solving and realign tasks to correspond more closely to student's interests (Reeve 2009; Stefanou et al. 2004).

Controlling language pressures students into achieving a specific preordained outcome and this in turn replaces their autonomous motivation with an external regulation. Common terms used are commands, e.g. 'hurry up', 'stop that' (Reeve 2006) or auxiliary verbs that invoke compliance, e.g. 'should', 'must' (Ryan 1982). Communication is rigid and evaluative and is a sharp contrast to noncontrolling language that is flexible and information rich. Teachers who use noncontrolling language offer hints, provide encouragement and are responsive to student-generated questions (Reeve and Jang 2006).

By providing explanatory rationale, the teacher aids students in mentally transforming uninteresting activities to one of personal value (Reeve 2009). It is virtually impossible that all forms of activities are inherently interesting to students. In reality, students are often asked to engage in mundane activities, such as doing worksheets and following organizational rules. Educators can however still support students' autonomy by offering rationales to explain the value of the activity and why it justifies the students' time and effort. Alternatively, teachers can frame the activity under intrinsic goals, e.g. self-improvement, rather than extrinsic goals, e.g. success in society (Vansteenkiste et al. 2005a).

Autonomy-supportive teachers need to display patience to allow time for self-paced learning. Students need time to assimilate, accommodate and change their conceptual understanding for learning to take place. Examples of such instructional behaviours include trusting students' capacities in the task, giving them opportunities for independent problem solving and providing time for them to work in their own way (Reeve 2009).

Expressions of negative affect occur when students complain about the task or rules that go against their preferences. For instance, they might protest about the difficulty level of the task or the unfairness of a rule. When teachers acknowledge and accept student's expressions of negative affect, they listen carefully and openly whilst trying to view the problems from the student's perspectives. This serves a dual purpose of (1) helping teachers better realign students' inner motivational resources and (2) signalling to students that their emotionality is equally important to the task.

These strategies were tested in an experimental study conducted by Reeve et al. (2004). An experimental group of classroom teachers in two separate high schools were trained to be more autonomy supportive in their lessons. Analysis found that they were able to engage students more effectively than teachers in the control group. Furthermore, when more autonomy-supportive instruction was used, students were more involved in their tasks and took more personal responsibility for their own learning (Reeve et al. 2004). These findings were replicated in a different high school which showed that autonomy support uniquely predicted individual student's engagement in learning activities (Jang et al. 2010).

Nonetheless, other empirical researches have shown mixed results. Stefanou et al. (2004) carried out a qualitative study with fifth- and sixth-grade students in a rural school district, observing and taping 84 mathematical lessons, and discov-

ered that a group of students were more academically engaged in low autonomy support environments. To account for this disparity, the researchers dissected autonomy construct into three further categories: procedural (choice in presentation of ideas), organizational (choice in environmental issues) and cognitive (opportunities to evaluate their own work). Upon further analysis of the lessons, the researchers concluded that autonomy support in organizational and procedural issues has no impact on motivation. Cognitive autonomy support may have a longer-lasting effect on engagement but other variables such as the ability of students and interpersonal feedback play a significant role in increasing the level of motivation.

Similarly, Furtak and Kunter (2012) carried out a 2×2 experimental design study to evaluate the effect of procedural and cognitive autonomy-supportive teaching on student learning and motivation. The results revealed that whilst procedural autonomy support has no significant effect, students in the low cognitive autonomy-supportive environment reported higher levels of achievement and autonomous motivation as compared to students in the high cognitive autonomy-supportive environment. Three possibilities were contemplated for the discrepancies in results: challenges are too overtaxing for students (intelligence level), unfamiliarity with teaching style (student's flexibility) and positive emotions cultivated by teachers (interpersonal style).

Results linking autonomy instructional behaviours to motivation have been observed only to a certain extent in eastern cultures (Chirkov and Ryan 2001; Liu et al. 2009; Zhou et al. 2009) and correlational results have yet to be replicated in the Asian context. Furthermore, it would appear that autonomy-supportive teaching behaviours have different effects on students. Baron and Kenny (1986) state that 'moderator variables are typically introduced when there is an unexpectedly weak or inconsistent relation between a predictor and a criterion variable' (Baron and Kenny 1986). This gap can addressed by examining, firstly, the relationship between autonomy-supportive teaching, autonomy needs satisfaction and motivation, and secondly, the possible impacts of moderating variables in these relationships.

4.2.4 Moderating Variables

A moderator variable is defined as a 'qualitative or quantitative variable that affects the direction and/or strength of the relation between an independent or predictor variable and a dependent or criterion variable' (Baron and Kenny 1986). Factors that modify responses to autonomy support and autonomy needs satisfaction fall largely under two broad categories: environmental context and individual differences. To further elaborate on this idea, Wehmeyer and colleagues noted that any intervention efforts to promote self-determination need to take into account moderator variables that describe differences in operationalizing these efforts and that all moderator variables would need to emphasize the relevance of the roles of personal capacity and context. A few potential moderators were discussed within these

two categories, namely culture, gender, age, cognitive ability, religious beliefs and personal experiences (Wehmeyer et al. 2011).

Many studies have explored the effect of contextual influences on increasing autonomy support. Some researchers have maintained that it is consistent throughout different cultures (Chirkov and Ryan 2001; Shroff et al. 2008; Vansteenkiste et al. 2005b), while others claim it is less congruent in collectivist societies (Markus and Kitayama 1991; Pan 2013; Volet 1999). Other contextual moderators such as task choice and designs (Patall et al. 2008) have also been investigated empirically. It would seem that most researchers have focused their efforts on investigating contextual influences, simultaneously agreeing that cultural factors are critical in promoting autonomy. Wehmeyer et al. (2011) even commented that 'it will be incumbent upon anyone developing, evaluating and implementing interventions to be cognizant of the unique strengths and characteristics of cultures that might have an impact on the intervention' (Wehmeyer et al. 2011).

Knowledge of the existing culture is obligatory, but in order to obtain maximum returns for implementing strategies in the classroom, teachers should also be aware of individual differences amongst students. Only a handful of studies have attempted to explore the relationship between individual level factors and autonomy support. Results describing differences in autonomy based on gender are mixed so it is difficult to consider gender as a moderator (Wehmeyer et al. 2011). Age, task choice and designs remain relatively constant amongst students in the same classroom, so it cannot account for the disparity in students' responses. Cognitive ability has been shown to have a moderating effect on motivational strategies but the correlation is relatively weak and does not appear to contribute much (Wehmeyer et al. 2011). Personal experiences and religious beliefs vary too widely to be effectively operationalized as a moderator variable. In summary, the current literature on moderating factors does not fully account for variances in students' responses to autonomy support. Hence, in order to explain students' behaviours, one can speculate that people are consistent in their actions, thoughts and feelings over time and situations, and that this consistency is conveyed in terms of their personality traits.

4.3 Personality Traits

The accepted consensus in the current literature is that personality traits involve five factors, hence the concept of the Big Five model. The trait theory assumes that people occupy different points on a continuum of varying characteristics and describes these trait dimensions in terms of extraversion, agreeableness, conscientiousness, neuroticism and openness to Experience (Digman 1990; Goldberg 1990; McCrae and John 1992). Extraverted individuals are energetic, sociable and assertive with the tendency to seek stimulation and the company of others. Agreeableness is a measure of compassion and cooperativeness. Conscientiousness reflects the qualities of planning and persistence with a tendency to show self-discipline.

Neuroticism refers to the degree of emotional stability. Openness reflects the degree of intellectual curiosity, creativity and preferences for novelty.

The essence of the Big Five traits originates from Cattell's 16 facets of personality factors. Cattell had based his system on factor-analytic studies of peer ratings of college students and this was welcomed in the middle of the twentieth century as a more objective approaching to describing individual differences. However, efforts to replicate his work by Fiske (1949), Tupes and Christal (1961) and Norman (1963, 1967) only managed to capture five factors (as cited in Digman 1990). It was followed by a brief lull in interest as attention shifted to other issues. In the 1980s, the interest in the five-factor model rapidly spread but it remained essentially a Western concept (Digman 1990).

To assess the generalizability of the Big Five traits, McCrae and Costa (1997) compared the American factor structures to structures obtained from Chinese, Korean, Japanese, German, Portuguese and Hebrew samples. Data from the studies revealed similar structures between the highly diverse cultures, suggesting that the Big Five traits are universal (McCrae and Costa 1997). In addition, McCrae and Terracciano (2005) tested the hypothesis that features of personality traits are common throughout all human groups. A large sample of students across 50 different cultures rated themselves on a personality scale. Data obtained supported the view that personality traits are similar in all cultures (McCrae and Terracciano 2005).

4.3.1 Personality and Autonomy

There has been relatively little research on the relationships between autonomy and personality. In the workplace, it has been consistently demonstrated that there is a correlation between a need for autonomy and the personality traits of openness to experience, conscientiousness and extraversion (Bipp 2010). Researchers had indicated that the effects of personality on motivational processes were more pronounced when participants had the freedom to set their own goals. In particular, autonomy in job positions moderated the effects of personality dimensions on contextual performance (Gellatly 1996) and supervisory ratings (Barrick and Mount 1993). In addition, some researchers have proposed that autonomy support predicts variations in the Big Five trait expressions (La Guardia and Ryan 2007). Whilst there has been little exploration in the classroom environment, it does not seem too unlikely to assume that personality constructs would have an impact on students' responses to autonomy-supportive teaching.

4.3.2 Personality and Motivation

Strong correlations have been uncovered between personality factors and motivation. Judge and Ilies (2002) conducted a meta-analytic review of 150 correlations from 65 studies pertaining to the relationship between the Big Five and performance

motivation. Results indicated that the traits of neuroticism and conscientiousness were the strongest and most consistent predictors of motivation, regardless of motivation theory. There was also a consistent pattern of correlations between extraversion and motivation. Although the other two traits displayed inconsistencies across the studies and motivation theories, the researchers concluded that there were 'strong multiple correlations between the traits and performance motivation' and that the results 'suggest important support for the trait perspective in motivation research' (Judge and Ilies 2002).

Further investigations into the relationship between achievement motivation and personality reveal that differences in student motivation levels in the classroom might be related to basic personality differences (Komarraju and Karau 2005) and that personality traits accounted for a significant amount of variance when motivation was conceptualized under the self-determinant framework of amotivation, extrinsic motivation (external, introjected, identified, integrated regulation) and intrinsic motivation (to know, to accomplish, to experience stimulation; Komarraju et al. 2009; Phillips et al. 2003). Specifically, in a sample of undergraduates, openness was positively correlated to intrinsic motivation, extraversion was positively related with extrinsic motivation and agreeableness was negatively related to amotivation. This suggests that students who are flexible and curious tend to enjoy learning more, outgoing students tend to be motivated by external factors which could be social in nature and agreeable students are more likely to cooperate in the classroom. Contrary to popular belief, neuroticism was positively related to extrinsic motivation but had no relation to amotivation. Conscientiousness emerged as a key predictor of all three types of motivations, being positively correlated with intrinsic and extrinsic motivation and negatively correlated with amotivation. This is not surprising as students who are diligent and organized tend to be more motivated (Komarraju et al. 2009).

These findings were replicated by Clark and Schroth (2010) who not only demonstrated the correlations between specific traits but also determined that students belonging to a similar motivation type shared a common trait profile. For example, extroverted, agreeable and conscientious students all tend to be either intrinsically motivated or extrinsically motivated by values and principles (identified regulation; Clark and Schroth 2010). Similarly, a study conducted at a university college in Belgium established comparable findings for conscientiousness and extraversion but no correlations were found for agreeableness. Openness even had a negative predictive validity for motivation (De Feyter et al. 2012). Overall findings indicate that conscientiousness, extraversion and neuroticism and are the most consistent predictors of academic motivation. Conscientiousness will be positively correlated with intrinsic and extrinsic motivation but negatively correlated with amotivation, extraversion will be positively correlated with extrinsic motivation and neuroticism will be negatively correlated with intrinsic motivation but positively correlated with extrinsic motivation.

4.3.3 Personality and Academic Achievement

The literature on personality and academic achievement is much larger and richer with strong correlations between agreeableness, conscientiousness, openness and academic performance. Poropat (2009) conducted a meta-analysis of the relationship in which cumulative sample sizes ranged to more than 70,000. Most of the studies came from tertiary institutes and used grade point average (GPA) as a standard measurement of academic performance. Conscientiousness is often associated with sustained effort and disciplined work, agreeableness is associated with teacher compliance, cooperative and collaborative learning and openness is associated with intelligence, flexibility and resourcefulness. Thus, these are the factors which are highly positively correlated with academic performance (Poropat 2009).

Additional empirical research serves to reinforce the findings. Besides the traits of conscientiousness, agreeableness and openness, researchers have determined that neuroticism plays a predictive role in academic performance as well (De Feyter et al. 2012; Komarraju et al. 2009). A possible explanation involves the mediating role of self-efficacy. Students high in emotional stability and self-efficacy have similar academic achievements to students low in emotional stability but high in self-efficacy. This could be due to the fact that emotionally stable students with high self-efficacy suffer from overconfidence, thus leading to a decrease in exam success (De Feyter et al. 2012). Another possible reason is that students who are keen to do well in exams will naturally experience some degree of anxiety (Komarraju et al. 2009).

The above findings indicate that the Big Five traits themselves are predictor variables of the outcomes academic achievement and motivation. However, the results mainly occur in colleges in the Western context. It is meaningful to ascertain if the relationships hold for students in the Asian context as this may affect the way teachers modify their instructional behaviours. Moreover, there is a high possibility that the Big Five traits could act as moderators in the various relationships between autonomy-supportive teaching, autonomy needs satisfaction, motivation and academic performance.

4.4 Future Research

In view of the gaps identified in the literature, future research can focus on three areas. The first is to re-examine the model of motivation based on the tenets of SDT in the contexts of the twenty-first century and a greater diversity of cultures. The model proposes that autonomy-supportive teaching leads to satisfaction of the needs for autonomy which in turn leads to higher level of motivation and academic performance. Although this model appears valid in Western cultures, the relations may not be as strong in other contexts. For example, Asian students are usually pressured into conforming to cultural norms whereas their Western counterparts are

encouraged to be individualistic in their approach (Hofstede 1986); hence, the importance of autonomy could be lower in Asian societies. Future research could thus investigate whether this aspect of the self-determination model is valid and relevant within the twenty-first-century Asian context.

The second focus in research could be to examine the relationships between personality traits, motivation and academic performance in students studying in an Asian context. It is conceivable that students from different cultures, but with a similar personality trait would have varying degrees of motivation and achievement. For example, high neuroticism may be positively correlated with academic achievement, and motivation. Asians place a high emphasis on academic achievement (Volet 1999) and it is likely that if students are stressed, they would be more concerned with their academic performance. Conversely, Asian students who are amotivated are more likely to be unperturbed about their surroundings. It is hypothesized that there is a significant relationship between personality traits and motivation. Specifically, conscientiousness will be positively correlated to intrinsic motivation, extraversion and neuroticism will be positively correlated to extrinsic motivation and conscientiousness will be negatively correlated with amotivation. Correspondingly, it is also hypothesized that there is a significant relationship between personality traits and academic achievement. In particular, high academic achievement would be positively correlated to conscientiousness, openness, agreeableness and neuroticism.

The third research focus is to examine the possible moderating impacts that personality traits have on the relationships defined in the proposed model of motivation. For example, since high neuroticism is characterised by high anxiety and low impulse control, students will have difficulties coping with academic challenges arising from an autonomous environment. Likewise, students who are not diligent, i.e. low in conscientiousness, will tend to use the least effort in their studies and will not enjoy the experience of high level cognitive tasks provided by autonomy teaching. Therefore, it is hypothesized that personality traits will moderate the impact of autonomy needs satisfaction on motivation, autonomy needs satisfaction on academic performance, and autonomy-supportive teaching and autonomy needs satisfaction.

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Chapter 5
Online Assessment and Learner Motivation in the Twenty-First Century

Cathy Gunn

5.1 Introduction

Learners in the twenty-first century are technology literate and connected to their peers in ways that were inconceivable a generation ago. These attributes offer unique opportunities to foster deep engagement and enhance learning in higher education. This chapter explores some of the ways that online assessment tasks, in particular those involving peer interaction, can be designed to activate learner motivation. Alignment with the core elements of motivation, i.e., attention, relevance, confidence, and satisfaction is a critical factor.

Educational researchers identified the pivotal role of these four elements of learner motivation more than 30 years ago (e.g., the attention, relevance, confidence, and satisfaction (ARCS) model, Keller 1987). However, the eLearning tools and pedagogical strategies available to activate them in the shifting circumstances of higher education in the 1980s were less versatile and less mature than they are today. Class size and student diversity were increasing while resources available for teaching were diminishing. Positive forces included rapid advances in both the knowledge base for learning and the affordances of technology in learning design. These factors combined to create new opportunities to apply emergent theoretical principles in teaching and learning to stimulate motivation for the current generation of learners. As the knowledge base expanded, researchers (e.g., Alderman 2004) identified the social dimension as a fifth core element of motivation. This "fifth dimension" is proving to be a powerful force in the era of blended and online learning.

Online assessment is an important feature of twenty-first century learning environments that can be used to activate motivation in various direct and indirect ways. Many developments in this area have resulted from implementation of strategies to promote active learning in large classes, and to meet the needs of learners with diverse educational backgrounds. Research shows that well-designed

C. Gunn (✉)
University of Auckland, Auckland, New Zealand
e-mail: ca.gunn@auckland.ac.nz

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assessment tasks can act as a catalyst for learning (Draper 2009) by focusing learner attention and demonstrating relevance, thus addressing two key elements of motivation. It also shows that students are using feedback in ways they previously did not (Fearn 2011), suggesting that they have come to appreciate the value of this part of the learning process as their lecturers always intended. One reason for this shift in learner perceptions is the timely and constructive nature of feedback delivered by online systems, and the way this addresses the confidence and satisfaction elements of motivation. The power of the social dimension is both greater and more accessible in the online environment. The learning processes triggered by online assessment are more complex and diverse than this brief outline can portray. Further research is needed to identify the full range of motivational influences at play. Initial studies reveal high potential, and the aim of this chapter is to illustrate just a few of the many examples.

The chapter begins with a brief outline of current theoretical perspectives on learner motivation and the affordances of technology for assessment practice. It then presents examples of online assessment designs to explain how they align with the elements of the ARCS model described by Keller (1987) and the social dimension of motivation identified by Alderman (2004). Design features of tasks to engage learner attention and demonstrate relevance are presented, along with ways to use system-generated responses, and peer and lecturer feedback to develop confidence and provide satisfaction.

The tools available for online assessment range from very basic to highly sophisticated. The examples in the chapter reflect some of this range. Options include student-generated content and tasks, rubric-driven peer reviews and marking assistants, along with more traditional multichoice and mastery learning designs. The affordances of the current generation of online assessment tools were not available when researchers first identified the core elements of learner motivation, and it is unfortunate that findings from early research are often written off as irrelevant to the current context. In fact, they are the foundations of evolving knowledge, and remain as relevant today as they were at the start. It is the range of opportunities to apply and extend these core principles that has changed beyond imagination. A critical factor now is to acknowledge the key role that these core elements play in the design and use of online assessment tasks to motivate and engage twenty-first century learners.

5.2 Perspectives on Learner Motivation

Motivation in learning is a difficult topic to research, because it is multidimensional, abstract, inconstant, and cannot be directly observed (Dornyei 2001, p. 185). However, Keller (1987) proposed that the challenge of stimulating motivation in learners could be made more predictable and manageable with strategies designed to address four basic requirements, i.e.:

- Attract and focus learner attention
- Demonstrate the relevance of activities to learning goals
- Build confidence by managing expectations
- Offer satisfaction through feedback on performance

It may be more appropriate to consider these requirements as interlinked elements of learning design than separate categories as Keller presented them in the ARCS model. Besides being a useful focus for learning design these are dimensions that designs can be measured against with a particular target audience in mind. This kind of measurement has become more of a challenge, as knowledge about target learners is less accessible in large or online courses and now, of course, in massive open online courses (MOOCs). While this challenge remains current, a broadly useful design aim is to offer flexibility to interpret learning and assessment tasks within a context of personal relevance. For example, a task to design a business plan may be based on common principles but allow a personal choice of focus, a website design project allow choice of content and purpose, or questions be chosen for difficulty or relevance to personal learning goals. This kind of flexibility can help to focus attention and foster relevance through a degree of choice.

Svinicki (2004) found power in the relationship of interest and attention as a force to direct learning effort. She described motivation as the force that helps learners to persist when they encounter obstacles, and to know when they progress past them. She believed that motivation is contingent upon the value attached to an expected outcome as a means to satisfy a need, either for its intrinsic value or as a contribution to achievement of a higher goal. She introduced further dimensions of learner choice and control, and the ability to influence or affect the opinions of others as part of an individually defined value proposition that underlies motivation.

This brief sketch only hints at the dramatic change in beliefs about motivation that has taken place in recent decades, and of the challenge in researching the topic. The chapter does not aim to present a full account of research on learner motivation for reasons of space and focus. For those wishing to explore the topic further, the work of Keller (1987), Dornyei (2001), Alderman (2004), and Svinicki (2004) provide useful insights. Many researchers have noted the importance of assessment as a source of motivation and a catalyst for learning. The chapter now moves on to explore the role of technology in this proposition.

5.3 Affordances of Technology for Assessment

Evidence of the benefits of various forms of online assessment has grown in both volume and scope in recent years (e.g., O'Reilly 2001; Gunn 2006). While the potential has been recognized for some time now, the affordances of emergent technologies have to be fully explored before skeptical faculty members are prepared to explore and adopt them. It is unfortunately common for hype and unrealistic expectations to accompany the launch of new technologies, and online assessment is no

exception. While early trials can produce quick and useful results, design for specific contexts and evaluation of strategies in use takes time. Many researchers use a cyclical process of design, implementation, and evaluation to produce evidence of educational value (e.g., McKenney and Reeves 2012). So there is usually a fairly long gap between publication of results of initial trials and widespread productive use of new technologies in a range of learning contexts. The situation is further confounded by constant change as new technologies continue to evolve, and by the interdependence of technology and other aspects of learning design. Transformation of practice is usually a slow and systematic process that lags behind the expectations created by overoptimistic media and technology providers.

O'Reilly (2001) illustrated this point by noting that online assessment had failed to produce the expected improvements in learning because assessment design had not adapted to the unique context of online learning. She concluded that learning objectives, activities, and assessments needed to be better aligned to maximize the potential of new tools. This was less a reflection on the quality or capability of the tools than a situation where emergent understanding of both learning design and the affordances of online tools was still being explored. Bull et al. (2002) reported similar findings in a review of online assessment practice across the UK higher education sector. While potential benefits were fairly widely recognized, challenges associated with the evolutionary nature of the field and an "ad hoc" approach to development at institutional level would be difficult to address. Both these sources acknowledge the challenge of integrating online assessment into course and learning designs. This adoption "problem" requires institutional action and professional support as well as changed pedagogy (Clark and Herd 2003). While contextual factors such as these are important, they are also too broad to address in a chapter focused on presenting evidence of motivational influence. Examples of such potential are now outlined.

5.4 Motivation in Mastery Learning Online

While mastery learning is sometimes judged to be "less effective" than learning based on, e.g., a social constructivist model, it is, like the core elements of motivation, an important building block for deeper and higher level learning in many subjects. Science and second-language learning are the two examples featured here. Students must learn complex vocabulary, basic rules, principles, and processes before they can proceed to apply this knowledge to more complex problems or tasks. Back in the 1990s, attempts to promote mastery through more conventional means were proving particularly challenging in the context of increasing scale and diversity in classrooms. The possibility of designing online systems to facilitate the acquisition of core knowledge through a mastery approach began to be explored. Such systems have been under development and in production for many years now, and some can be sourced in a package with textbooks from commercial publishers. They are also fairly easy to produce with basic development tools, or to acquire

free of charge from third-party sources. Like any learning medium, they are not designed to stand alone, but as an integral part of a multidimesional, active learning environment. Most of the online mastery learning systems are based on quizzes and multichoice questions. They come in varying levels of simplicity and sophistication, from basic drill and practice to intelligent adaptive systems that analyze learner behavior to develop better tasks and provide personalized feedback and pathways. The motivational influences of these systems are also quite simple, though very powerful (Table 5.1).

Gunn and Harper (2007) found the use of simple quizzes and feedback helped the students to form clear expectations of the level of knowledge and performance that was required. Online assessment helped to solve learning problems that had previously been identified when it was already too late to help students to lift their achievement levels. Fairly simple quizzes were used along with lectures and tutorials to allow them to reinforce learning in ways more likely to impact on long-term memory. O'Reilly's (2001) description of the benefits of well-designed online assessment promotes the use of this method and mastery learning approach. Similar findings have emerged from studies of language learners (Brussino and Gunn 2008). In both cases (science and language learning), the addition of dynamic multimedia resources further enhanced learner choice of task, and increased appeal to those students with more visual learning styles within a mastery learning system design. The articles cited in this section show how these activities impacted on learning and final grades.

Table 5.1 Motivational influences in mastery learning

Motivational aspect	How addressed
Attention	Learners can typically choose when, where, and how often to engage (voluntary attention), rather than having these aspects determined by a class schedule or teacher availability. They can move around topics and levels in a flexible and self-directed manner to focus on personal learning goals or challenges
Relevance	Learners may be able to choose a level of difficulty or a type of problem that best suits their abilities and learning goals. They may also be able to choose from a range of topics to align with their own interests
Confidence	Perhaps the most important feature of mastery learning online assessment systems is the immediate feedback learners receive on their performance, and the way this helps to build confidence and expectations. Feedback can direct them to the source of material or tasks that will address knowledge gaps or misconceptions that may be present. The range of learning design options is broad, and the choices considerable, even within highly structured mastery learning situations. This helps to build confidence and autonomy in learners in contrast to a teacher-centric model where they remain dependent on, and subject to an individual teacher's preferred approach
Satisfaction	Feedback allows students to monitor their own progress, and to gain satisfaction from measuring their progress towards higher goals
Social dimension	With the current generation of online systems, learners may also be able to see how their performance compares with that of their peers, to connect with tutors or peers to discuss study-related matters, or engage in peer reviews to evaluate their own understanding against other students' performance

5.5 Motivation and Peer Interaction

PeerWise is an online system designed to allow students to author, rate, and analyze multichoice questions (http://peerwise.cs.auckland.ac.nz/). In a typical assessment task, students write original questions, as well as answer, rate for difficulty and quality, and comment on questions authored by their peers. This form of "flipped assessment" truly acts as a catalyst for learning in the way that Draper (2009) describes. Writing good questions demands attention to course content and engagement with concepts. Rather than picking answers from a list of options in a task that could rely on surface learning, students generate questions and engage with possible answers in ways that promote deep processing. PeerWise also introduces an element of healthy competition to learning, as students earn badges for contributions and aim for high scores on quality ratings. Table 5.1 and Table 5.2 illustrate the alignment of typical tasks with elements of motivation.

The collaborative and catalytic affordances of the current generation of online peer assessment tools are an emergent phenomenon. The implications for learning are considerable, as researchers are in the process of discovering (e.g. Devon et al. 2012). The large volume of research outputs generated by the PeerWise user community contributes to a growing knowledge base for peer and online assessment. Points of particular note include the opportunity to apply what Collis and Moonen (2006) and Hamer et al. (2008) described as "contributing student pedagogy" and the use of highly visible and multidirectional patterns of peer interaction rather than "invisible" connections that are solely between learners and teachers.

Table 5.2 Motivational elements of a peer assessment task

Motivational aspect	How addressed
Attention	Attention is focused on the task of authoring or discussing the quality dimension of peer-generated questions. Pointers to study materials and course-related activities and resources guide learners to the various sources of learning on a particular topic as a precursor to writing a question or committing to an opinion on its quality and level of difficulty
Relevance	Determining the relevance of elements of content for authored or reviewed questions requires learners to make a number of critical decisions. The deep processing promoted by this kind of assessment task typically focuses on internal relevance, i.e., of components of a topic or task. External relevance, i.e., of the topic in the wider context of a course, is often addressed through other means, although this is not exclusively the case, as questions can address any aspect of a topic
Confidence	Feedback from teachers or peers allows learners to assess their own level of performance against highly rated answers or that of their peers, and to build confidence through that understanding. Furthermore, comments on questions and quality and difficulty ratings expose learners to multiple perspectives and reasoning that may contribute to their own learning. One does not have to be a high performer to learn from others in this way, and the visibility of thinking and knowledge at all levels of performance provides a sense of confidence of place

Table 5.2 (continued)

Motivational aspect	How addressed
Satisfaction	Satisfaction comes from knowing how others rate a learner's contribution, and the ability to choose to strive for higher performance with knowledge of what is involved in reaching that target. For high-performing students, satisfaction comes from knowing their level of achievement is endorsed by their peers. For others, it comes from having a clear target to aim for, and knowing that the means of achievement are available on demand
Social dimension	The social dimensions of motivation related to a system like PeerWise are complex, and designed to be supportive for learners at all levels of performance. The visible nature of reasoning and the responsibility to openly commit to an opinion on a learning task are relatively novel dimensions that reflect the rise of social networking among the current generation of learners. The open, collaborative nature of a system like PeerWise has multiple effects, which are still being explored

5.6 Feedback and Learner Motivation

Online marking assistants, such as GradeMark and Lightwork, are increasingly popular tools that show high-efficiency gains in handling of assignments, particularly for large classes. Many benefits of these tools are practical ones, e.g., easy handling with no paper scripts to be mislaid, fast turnaround, high legibility of comments, rubrics to define what a good assignment looks like and ensure consistency across markers, and less repetitive work for markers as common feedback elements can be stored and reused. The faster turnaround time for marked assignments is also having a positive impact on learner motivation, as more students check their marks and read feedback online than was the case with hard copies. One report (Fearn 2011) states that 90 % of students had accessed assignments to read feedback 3 days after marked work was returned, where in previous years, fewer than 25 % of scripts were ever picked up. Besides causing frustration for teachers who put so much time and effort into marking, the perceived usefulness of the opportunity to learn from feedback was also unreasonably low. Anecdotal evidence suggests that this is a common situation that online marking assistants are also helping to address in other contexts.

Regardless of the grade achieved for an assignment, all dimensions of motivation are addressed through this changed student behavior around online feedback as the following summary illustrates (Table 5.3).

The ways that the dimensions of motivation are addressed through constructive feedback are neither complex nor new knowledge. What is new is the ability of online marking assistants to facilitate the delivery of feedback in a timely manner. This makes it useful to students in ways that were previously not possible, particularly in contexts where class sizes have increased and resources for teaching diminished. The key factors are timing, ease of access, and legibility of feedback. Further research is required to explore more nuanced aspects of the impact and affordances of this type of technology, but the early signs are positive.

Table 5.3 Motivational elements of feedback

Motivational aspect	How addressed
Attention	Constructive feedback focuses learner attention on areas of good performance and on those where improvement is needed. Depending on how feedback is constructed, attention may be drawn back to particular topics, materials or concepts, or model answers. This helps to set realistic expectations, and timing is a critical factor if feedback is to be useful
Relevance	The relevance of work on assignments is obvious to learners as long as tasks are well aligned with learning objectives and content. Feedback reflects how well learners have performed against course objectives. Targeting feedback to particular aspects of student work can reinforce the points of relevance, and highlight key areas of knowledge or demonstrated ability
Confidence	Feedback builds confidence by allowing learners to know their level of knowledge and ability, and how this compares with peers. It also helps them to know what they don't know, and how to address future learning goals
Satisfaction	The ability to monitor and see progress in learning provides satisfaction. Feedback supports this ability on many levels
Social dimension	The social dimensions of motivation related to feedback vary according to type and delivery method. If peer feedback is a feature, then the ability to see things from other learners' perspectives can be a productive force. Discussion of feedback with peers and teachers facilitates deeper learning through reflection and follow-up action. This can take place in formal or informal settings

5.7 Principles for Online Assessment Design

The three examples outlined above reinforce the need to focus on core elements of motivation in learning design, and to use the affordances of technology as activators.

Experienced learning designers may take such requirements for granted. These are, however, features that were often overlooked as university classes became larger and more diverse throughout the last decades of the twentieth century. The growth of online learning was a further complicating factor, as learners in the transition phase between lecture based and blended learning became increasingly bored and isolated by learning design traditions intended for a different mode of study. Much has been written about the characteristics of the "net generation" of twenty-first century learners (Oblinger and Oblinger 2005; Kennedy et al. 2007). There is still some debate about the digital literacy capabilities of students in higher education. However, there can be no doubt that they are more advanced in this respect than the previous generation was, because of the increase in mobile and smart device ownership, and the growth of social media and networking online. The "digital native" student described by Prensky (2001) may not yet be ubiquitous, but numbers and capabilities are clearly on the rise. Teachers still struggle to separate hype from real potential, and to develop capacity to turn the potential of emergent social and technological trends into positive influences on motivation and learning. As always with new technologies and changing sets of circumstances, no one can really predict

where these trends will lead. Further research is needed to guide future developments in useful directions.

What is also clear at this point is the need to flip learning design as well as the classroom, as teachers of large diverse and sometimes remote classes cannot always know as much about their learners as they would like to. With little opportunity to address individual differences on a personal level, this can still be achieved at the level of course and assessment design. Principles of good practice include offering flexibility to capture attention and interest; choice to foster autonomy and learner control; timely constructive feedback to keep expectations on track and build confidence along with knowledge; and opportunities for social interaction to promote a sense of achievement and place within a learning community. If there is one overarching principle of assessment design to motivate the twenty-first century learners, it would have to be "stick to the basics" for learning theory and method. However, for the current generation of learners, the affordances of online assessment tools are far from basic. While design principles may be basic, the designs themselves are highly sophisticated and evidence based.

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Chapter 6
Motivating Learning and Skills Development in Netizens

Ashwini Datt and Trudi Aspden

6.1 Introduction

A significant concern of a contemporary teacher seeking to integrate Web 2.0 into education is how to motivate students to engage in meaningful learning experiences and develop transferable skills. The use of social technologies for communicating and networking does not directly translate to its effective use in education (Cigognini et al. 2010; Kennedy et al. 2007; Narayan and Baglow 2010; Schulmeister 2010). However, within well-established, sound pedagogical frameworks, Web 2.0 presents great opportunities for teaching and learning.

This chapter elucidates our approach to motivate and develop transferable skills in learners by leveraging the socio-constructivist inclinations of Web 2.0 tools. Intertwined in our approach is an awareness of the importance of scholarship in the digital age, such as copyright concerns and plagiarism, to encourage responsible use of technologies. An innovative learning design (see Fig. 6.1) based on a combination of the attention, relevance, confidence and satisfaction (ARCS) model of motivation (Keller 1983) and the personal knowledge management (PKM) skills model (Cigognini et al. 2010) is used to:

1. Purposefully integrate Web 2.0 technologies in assessment design to motivate access and increase flexibility.
2. Design an authentic task to motivate learner engagement.
3. Scaffold learning activities to motivate and facilitate the development of skills, such as communication and information literacy.

A. Datt (✉) · T. Aspden
University of Auckland, Auckland, New Zealand
e-mail: a.datt@auckland.ac.nz

C. Koh (ed.), *Motivation, Leadership and Curriculum design,*
DOI 10.1007/978-981-287-230-2_6

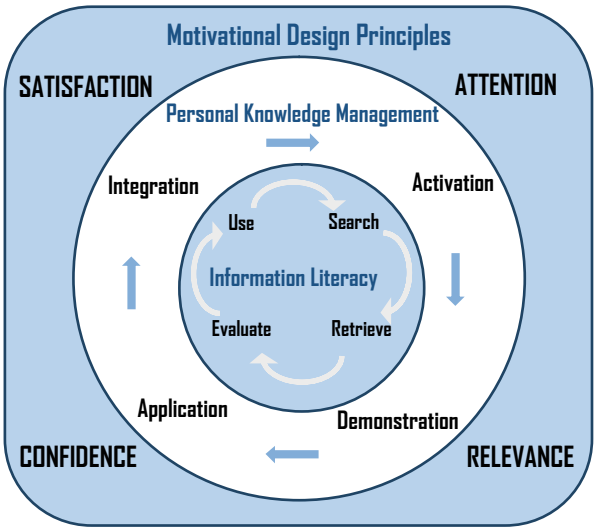

Fig. 6.1 An integrated model for motivation and skills development

6.2 Characteristics of Our Learner: The Net Generation

Citizens of the Internet era, netizens (Hauben and Hauben 1997) are also referred to as the Net Generation (Tapscott 1998), Millennials (Howe and Strauss 2000), Digital Natives (Prensky 2001), or Generation Y. It is often assumed that because they are born in the digital age and use social technologies in everyday life, the Net Generation: (1) are familiar with, and have the technical skills to use most technologies effectively (Barnes et al. 2007), and (2) prefer to learn with technologies that favour collaborative learning (Tapscott 2008).

Critical reviews of the evidence supporting the thesis of a Net Generation by Bennett et al. (2008) and Schulmeister (2010) dispute the existence of such a cohort, their unique characteristics, skills and learning preferences, based on the lack of empirical evidence. However, it is hard to ignore our students' familiarity with technologies and the importance they place on "peer groups" and social relations. Even those against the broad categorisation, such as Schulmeister (2010), have conceded that communication is the major motive for youth's engagement with technology and as such the social and experiential nature of Web 2.0 can be leveraged for education.

The categorisation of these individuals as a cohort with broadly generalised characteristics obstructs clarity in learning design endeavours because individual skills vary, as do learners' abilities and willingness to apply these skills in educational contexts (Bennett et al. 2008; Datt and Aspden 2011). While researchers like Don Tapscott are advocating changes to education in response to this distinct generation of multitasking, innovative individuals who are natural collaborators (Tapscott 2008), others such as Bennett et al. dismiss the need for a widespread change in educational approach as "moral panic" (Cohen 1972 cited in Bennett et al. 2008,

p. 782). However, the fact remains and is acknowledged in the literature that today's students were born in the digital age and most will have had exposure to the new social form of the web.

Task authenticity and skills development become integral parts of technology-integrated learning designs to address concerns of short attention spans (Oblinger and Oblinger 2005), digital literacy, copyright and plagiarism. Short attention spans are attributed to boredom (Tapscott 2008; Prensky 2001) because of inauthentic learning experiences, making task authenticity (Conrad and Donaldson 2004; Elton 1994) an important aspect of motivational design. Digital literacy—the ability to search, retrieve, critically evaluate and appropriately use and reference material from electronic sources—is crucial in the academic environment due to concerns of copyright and plagiarism. It has become a skill commonly expected of a contemporary university graduate and is valued by employers (Suleman and Nelson 2011). To facilitate the development of such skills, motivation for its development must be accounted for in effective learning designs as represented by our integrated model in Fig. 6.1.

6.3 Web 2.0 Integrated Teaching and Learning

Web 2.0, the read–write form of the Internet, is built on the concept of collaboration and takes to heart the socio-constructivist approach to education. Socio-constructivists believe that knowledge is co-constructed during active social learning experiences like group work (Smith and Ragan 1999, p. 15). Hence, the potential for active, engaging and personally relevant educational experiences afforded by Web 2.0 includes opportunities for educators to promote greater student participation, engagement and collaboration. Such uses, both current and potential, are well documented (Bates 2010; Bower et al. 2009; Datt and Aspden 2011; March 2007; Lee and McLoughlin 2010).

Web 2.0 tools alone do not teach or result in effective or meaningful learning. Poor use of such contemporary technologies means that the traditional methods of teaching and learning are being repackaged without adding any pedagogical efficacy (Laurillard 2002; Lee and McLoughlin 2010). A pedagogical framework (Pedagogy 2.0- McLoughlin and Lee 2010) addressing participation, personalisation and productivity, has evolved alongside Web 2.0, to equip those educators rethinking their practices. Since the focus is on communication, conceptual models, such as the conversational framework (Laurillard 2002) and the five-stage model of moderation (Salmon 2011), provide helpful frameworks for educational experiences that hinge on the social aspects of the web. These also reinforce the need to scaffold the learning experience to engage and motivate learners to move beyond social interaction to achieve collaborative cognitive gains.

Support and guidance are needed to enable successful transference of Net Geners' social interaction and networking skills to education (Bennett et al. 2008; Cigognini et al. 2010; Haythornthwaite and Andrews 2011; Kennedy et al. 2007; Narayan and Baglow 2010). Embedding information literacies into the curriculum is one of the ways in which this is being addressed (Gunn et al. 2011).

6.4 The Role of Motivation in Learning Designs

Motivation, in its simplest form, explains "what goals people choose to pursue and how actively or intensely they pursue them" (Keller 2010, p. 4). Detailing it within the various psychological theories is beyond the scope of this chapter. Instead, the focus is on the first principles of motivational design for e-learning, (Keller 2008; Keller and Suzuki 2004) underpinned by the ARCS model of motivation. ARCS was formulated by John M Keller (1983), and takes a holistic approach informed by the four major categories of motivational theory—physiological, behavioural, cognitive and emotional.

Motivational design is important because technology-integrated teaching and learning demands higher levels of student motivation than traditional forms of learning (Illeris 2007 cited in Haythornthwaite and Andrews (2011, p. 53). The differing levels of digital literacy and skills of Net Geners aside, a multitude of factors, including learning style preferences that influence motivation, compound the challenge of designing an engaging learning task. Therefore, it is common for educators to put this in a "too hard to tackle" basket and assume no responsibility for motivating their learners (Keller and Litchfield 2002, p. 86).

While students are ultimately responsible for the personal aspects of their motivation, educators can have a positive influence by incorporating motivational design principles into their learning activities (Keller and Litchfield 2002). According to Keller and Litchfield (2002, p. 86), this can only be achieved using the following assumptions: (1) various factors external to the learning environment can influence motivation (Haythornthwaite and Andrews 2011), (2) motivation is a means not an end and (3) systematic design can influence motivation irrespective of the learning or teaching style (Toohey 1999, p. 17).

6.5 An Integrated Model for Motivation and Skills Development

An integrated approach (Fig. 6.1) leverages the overlap between the principles of motivational design, the categories of the PKM skills model and the concept of information literacy. Components of ARCS represent the teachers' efforts in facilitating the development of PKM and information literacy skills. Actual skills are dependent on students' performance, which is consistent with Keller's macro model of motivation and performance (Keller 2010). Searching the web for accurate information is activated by capturing the learner's attention, e.g. a topic of interest or an inquiry. Retrieval depends on the demonstration of its relevance, e.g. an authentic task or a group's shared knowledge. Confidence to apply knowledge or skills, e.g. role taking for collaboration, develops through scaffolding. Satisfaction is gained from integrating skills and knowledge for benefits, e.g. transferable skills or rewards/marks in assessment. The extent of satisfaction is dependent on individual learners. The model is explained further in the next section.

Table 6.1 Principles and relevant motivational design strategies for P101

ARCS model	Principles of motivational design	Features of the course
Attention	Arouse learner's curiosity to stimulate a sense of inquiry	Learning task presented on an attractive, media-rich and user-friendly website
Relevance	Meaningfully relate the knowledge to be learned to learner's goals	Open-ended and authentic learning task
Confidence	Support learners to succeed in mastering the learning task	Learning activity designed and scaffolded in the form of a WebQuest to support the process of learning
Satisfaction	Make expectations and outcomes clear	Expectancies and criteria for outcomes were clearly outlined. Learning task was assessed with marks and rewards. Various assessment strategies ensure fair grading and feedback

ARCS Attention, Relevance, Confidence and Satisfaction

WebQuests that guide the search, retrieval and use of information from the web, based on an authentic task, are a useful strategy in this integrated approach. WebQuests were originally designed for K-12 courses by Berni Dodge (www.webquest.org). Its critical constructs—scaffolding, social interaction and constructivist problem solving—make it useful for motivational design (Abbitt and Ophus 2008; Datt and Aspden 2011; March 2007; Jonassen et al. 2003, p. 65; Zheng et al. 2008) and online teaching in higher education (Zheng et al. 2008). Its conceptual framework also "passes the ARCS filter" (March 2007).

6.6 Applying the Integrated Model in Principles-Based Motivational Design

The integrated model of motivational design depicted in Fig. 6.1 informed the design of the undergraduate pharmacy course summarised in Table 6.1. Carefully chosen Web 2.0 technologies were integrated in a collaborative task, aiming to provide students an opportunity to (1) consolidate and build on the medical information searching, referencing and communication themes introduced earlier in the course and (2) practice key skills and competencies of their profession.

The School of Pharmacy at the University of Auckland recruits around 100 students into their programme each year. Sometimes, the first year group assignment occurs over a university break causing logistical difficulties for some students. In response to this need, an appropriate blend of technologies (see Datt and Aspden 2011) was introduced to allow students to access and complete the assignment flexibly and collaboratively. The components of the assignment are described in Table 6.2. Design details based on respective principles of motivational design (given in Table 6.1) are explained below.

Table 6.2 Components of the assessed task in P101

Component and format	Requirements
Promotional website (developed using collaborative website development tool—Course Builder-based on an exemplar provided)	Students are randomly assigned into groups and asked to collaboratively design an educational website on the social implications of a chronic disease. The group website is assessed based on a rubric that every group member has access to
Oral presentation of the web resource (free use of props and different presentation tools)	Student groups present their website to the class and are assessed on the depth and breadth of their research through the quality of their presentation and ability to answer questions from the class
One page written summary of work	A referenced summary of the web resource representing the group's findings handed in during the oral presentation
Five web references, three of which are recommended (submitted electronically)	Students are required to submit five web references individually. They are encouraged not to duplicate references sent by their classmates

6.6.1 Principles 1 and 2: Arouse Learner's Curiosity and Meaningfully Relate Knowledge to their Goal

The whole assignment is presented as a WebQuest on attractive media-rich, user-friendly web pages located on the course website (see Fig. 6.2). The tasks are framed around a commission from a chronic medical condition associated charity to produce a fully referenced web page, an 8-minute oral presentation and a support hand-out. The real-world relevance of this well-defined collaborative assessment task consolidates its authenticity (Lombardi 2007).

Pharmacy students are aware of the increasing prevalence of many chronic medical conditions amongst the New Zealand population and indeed globally. Therefore, the tasks give students an opportunity to research conditions that many of their future clientele may have.

The assignment also aligns with the competence standards for the pharmacy profession in New Zealand, which include the abilities to research and provide information and to communicate with different stakeholders appropriately and effectively, both orally and in writing. Professional communication skills are practiced in the design of the web pages that aim to increase public awareness of the prevalence and social implications of a medical condition. Students also get an opportunity to apply this skill by eliciting donations to help further their charity's work. A self-reflection exercise, scaffolding students through thinking about and articulating their learning from the assignment, including the teamwork aspect, is included as part of the assignment. This mimics the continuing professional development process expected of pharmacists once in practice.

Fig. 6.2 P101 WebQuest webpage

6.6.2 Principle 3: Support and Guide Learner to Succeed

The WebQuest is designed to lead students through the assignment tasks and stages in a non-overwhelming, easy to follow, logical stepwise manner. Group members are announced during workshops and time is given for them to make initial introductions and swap contact details. The whole assignment is then introduced by the course coordinator during a lecture. The assignment web page is displayed on-screen and important tasks and resources are pointed out and initial questions answered.

Listening to a prerecorded online lecture is the first of the tasks in the assignment, which requires students to practice, refine and demonstrate competence in skills which build on concepts of communication, including health literacy and medical information retrieval, already introduced, discussed and practiced during earlier lectures and workshops in the course. Links to resources describing group

work processes and how to manage common problems arising during group work are also provided. The group process is described by Stefani and Tariq (1996) as more important than the product. Therefore, in addition to the online material, a face-to-face question and answer session to address any issues with the technical, academic and group work aspects of the assignment is held midway through the assignment. To ensure that this session provides maximum benefit, students are strongly encouraged to have attempted to use all the Web 2.0 applications provided for the assignment so that they are aware of areas of difficulty or uncertainty. At this session, examples of work created in previous years are also displayed.

6.6.3 Principle 4: Provide Feedback and Rewards

The assignment consists of individual and group-assessed components including a real-time student-evaluated competition at its culmination. Comprehensive rubrics describing the assessment criteria for web pages and oral presentations are provided on the website. Marks are awarded for the completion of some individual tasks, the quality of the major individual task and all the group tasks. Written feedback is given on all tasks by the assessor, once the assignment has ended.

Students are "motivated by the knowledge that there is an audience" McConnell (2006, p. 139). Peer feedback, congruent with the purpose of the charity's commission, is given on the day of the oral presentations. Each student is given imitation money (1 x $10, $20 and $50) and instructed to vote for the best presentations in their session, by donating their money accordingly. Students cannot vote for their own presentation but they can choose how to distribute their money. Students are also expected to listen attentively and ask questions at the end of each presentation. This is motivating as group marks are awarded by the assessor for response quality, which can also strongly influence student voting. "Students Choice" award certificates and small prizes of gold chocolate bars are then presented to members of the winning group at the end of each presentation session.

An incentive for equitable participation in the assignment is addressed by the requirement that at the conclusion of the assignment each student has to complete and submit a document detailing what they contributed to the assignment and estimating the overall percentage contribution of each group member to the group assignment with group marks allocated accordingly. Also, once the assignment has closed, students are given access to all the student group web pages created during the assignment to allow comparisons with those created by other groups with the same condition. It is also a self-directed learning opportunity for students to learn more about the different conditions presented.

Overall, the principles of motivational design are used to present a well-scaffolded, authentic assessment task that enabled students to learn what they needed to learn, while also encouraging them to develop transferable skills. "[G]iven the dynamics of motivation, there is an overlap between principles," (Pintrich 2003, p. 672) where implementing one may facilitate more than one component of

motivation. As highlighted by Pintrich (2003), the design principles are merely a general guide, and their implementation may be influenced by different contexts including the institution and the discipline.

6.7 Student Feedback

Feedback about many aspects of the assignment was sought from participating students for three successive years from 2011. Minor modifications to the design were made after each iteration—informed by both student and teacher comments and observations. Overall, however, the feedback regarding the assignment has been positive and most responding students have spent the expected number of hours completing the assignment, learned from and enjoyed the experience.

Responding students have consistently rated the collaborative space as the most enjoyable tool of the assignment, suggesting a preference for the use of collaborative technologies such as wikis. In the most recent survey, 69 % of responding students indicated confidence in the future educational use of collaborative spaces. In addition, the quality of the web pages produced by most groups was high. This supports the logic of including aspects of skills development into the course design as represented by our integrated model (Fig. 6.1). Use of the WebQuest strategy for structuring the assessment task has proved extremely useful. (72 %) of the same responding student cohort agreed or strongly agreed that the WebQuest contained enough guidance for them to complete the assignment without further instructions from the course coordinator. Although the response rate for the 2013 voluntary survey was low (25 %), a lack of e-mails and questions to the course coordinator about the assignment and the high standard of work produced by most groups suggests the usefulness of support and guidance in motivational design.

6.8 Conclusion

Though Netizens are considered to be tech savvy "natural collaborators", contemporary teachers seeking to integrate social technologies into education still face the crucial question of how to motivate their students to engage in meaningful learning experiences and develop transferable skills. Researchers present competing views on the need for educational change to accommodate Net Geners' skills, abilities and preferences. Our findings support the thoughts of Bennett et al. (2008) and others that the individual technological aptitudes, confidence and experience of the students vary substantially, and that successful learning designs need to cater for differences within cohorts by providing various methods for learning and achieving goals. Motivational design is relevant because technology-integrated teaching and learning demands higher levels of student motivation than traditional forms of learning (Haythornthwaite and Andrews 2011). Regularly

seeking feedback from students is strongly recommended to avoid teachers making learning-design decisions based on generalised assumptions about their students that may not hold true.

The social and experiential nature of Web 2.0 can no doubt be leveraged for education, but support and guidance are needed to enable successful transference of Net Geners' social interaction and networking skills to education. Digital literacy has become a skill that is commonly expected of a contemporary university graduate, so its development needs to be facilitated. This chapter presented an integrated approach that leverages the overlap between the principles of motivational design, the categories of the PKM skills model and the concept of information literacy. WebQuests that guide the search, retrieval and use of information from the web, based on an authentic task, are a useful strategy in this integrated approach.

While students are ultimately responsible for the personal aspects of their motivation, educators can have a positive influence by incorporating motivational design principles into their learning activities (Keller and Litchfield 2002). Overall, to influence Netizens' motivation, we must ensure that the learning tasks are authentic, well scaffolded, assessed and provide feedback and information about where skills can be transferred to beyond the actual learning environment. The integrated model presented here can be an effective way to motivate student engagement while encouraging the development of transferable skills in technology-integrated teaching and learning.

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Chapter 7
The Promise of Well-Being for the Net Generation

Collie W. Conoley, Beatriz Bello, Mercedes Oromendia, Elisa Vasquez and Jane Close Conoley

7.1 Introduction

A student's success in school and life beyond schooling is intimately influenced by the student's well-being. For example, high levels of well-being can counter most of the negative influence that poverty has on a child's achievement. In a large 23-country sample, Sznitman et al. (2011) found that well-being predicted one third of a student's achievement in school.

Research concerning well-being is the central focus of positive psychology. Although well-being is not a simple goal, educators may be empowered to know their efforts at improving student well-being which can be quite influential in instigating high levels of academic achievement. This chapter presents research on the importance of and ways to foster the components of well-being for increasing educational excellence. Beginning links to electronic teaching and learning strategies are highlighted as they intersect with elements of well-being.

Well-being can be understood as consisting of five elements: positive emotion, engagement, meaning, positive relationships, and accomplishment (Seligman 2011). A student who is thriving has attained high levels in each area of well-being. We assume that every educator has the goal of facilitating student thriving and well-being. Well-being provides an ideal educational focus. It can remind adults that childhood is both a time to be treasured for its own sake and an interval useful in readying a person for a good life in the future.

Strategies for promoting well-being can be enhanced by electronic approaches that appeal to many students in today's net generation (Williams and Chinn 2009; Prensky 2001). Indeed, net-generation students demand interactive learning environments that include experiential, engaged learning (active learning), interactivity, collaboration, immediacy, and connectivity (Williams and Chinn 2009). All of these expectations can be used to promote well-being through the use of highly interactive

C. W. Conoley (✉) · B. Bello · M. Oromendia · E. Vasquez · J. C. Conoley
University of California, Santa Barbara, USA
e-mail: cconoley@education.ucsb.edu

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electronic teaching and learning applications that are designed to branch, meet and challenge students' skills, allow for collaboration, and provide immediate feedback.

The following sections expand on each element of well-being with some special attention to how each can be promoted in classrooms via traditional and electronic mediums.

7.2 Positive Emotions

Happiness or positive emotions most often come to mind as the definition of well-being. A happy person has frequent small positive emotions. Common wisdom describes the importance of happiness as a rewarding experience resulting from receiving something of value or accomplishing something meaningful. Less widely known is the importance of happiness as leading to success. In other words, accomplishments can make us happy but happiness can also facilitate our accomplishment.

Central to educators' understanding the power of positive emotions is Fredrickson's (1998, 2001) theory of broaden and build. The theory describes how brief positive emotions create long-term beneficial growth. Brief, small positive emotions create openness and energy (i.e., broaden) that move students toward acquiring new thoughts and behaviors (i.e., build). The new thoughts and behaviors become long-term resources lasting well beyond the initial brief positive emotions. Growth continues as the new resources create more positive emotions, thereby facilitating an escalating growth cycle.

Positive emotions energize wider arrays of thoughts and behaviors than do negative emotions, thereby broadening students' opportunities for learning (Fredrickson 1998, 2000; Fredrickson and Branigan 2001). For example, the distinct positive emotions of interest, joy, and pride activate people to broaden in slightly different ways. Broadening due to experiencing interest can lead to exploring, as well as desiring new information and greater openness to new experiences (Williams and Chinn 2009; Ryan and Deci 2000). Joy can lead to creativity and play that fosters intellectual, social, and artistic behavior (Ellsworth and Smith 1988; Frijda 1988). A very different positive feeling—pride broadens a student by activating a desire to share news of an accomplishment as well as desire for new achievements (Lewis 1993). The more instances of small, brief positive emotions a student experiences, the better the enjoyment becomes (Catalino and Fredrickson 2011). While learning via negative emotions occurs, learning prompted by positive emotions has the advantage of making learning more and more enjoyable so that new opportunities to learn are sought out.

The importance of happiness or positive emotions for success in life has been supported by many research investigations (for a listing of the studies see Lyubomirsky et al. 2005). Positive emotions increase sociability, activity level, altruism, liking of self and others, immune system resilience, conflict resolution skills,

creativity, coping skills, fulfilling and productive work, satisfying relationships, longer life, reduced alcohol and drug use, and positive mental health.

Positive emotions in students have been found to facilitate overall motivation (Olafson and Ferraro 2001), intuitive thinking, creative problem solving and optimism (Bless et al. 1996). Students with higher positive affect were more involved in community service and wanted to contribute to society in the future (Magen and Aharoni 1991). Happier college students are more likely to graduate from college (Frisch et al. 2005).

Educators are challenged to create classroom environments that are rich with learning opportunities and that promote positive emotions. The following elements of well-being give a more focused understanding of the benefits and applications in the classroom.

7.3 Engagement

Student engagement includes behavioral, emotional, and cognitive components. Beneficial academic outcomes come from engagement defined by students' behavioral participation in academics and extracurricular activities, cognitions about educators and academics, and emotional willingness to exert effort to gain content mastery (Fredricks et al. 2004; National Research Council & Institute of Medicine 2004).

Unfortunately, estimates are that 40–60 % of students are disengaged in high school, meaning they are inattentive, exert little effort, and claim to be bored (National Research Council & Institute of Medicine 2004; Conner and Pope 2013). While boredom may result from non-challenging material, that may not be the whole story when engagement wanes in rigorous college preparatory courses (Lambert 2007). Simply working hard and obtaining good grades are not enough for student engagement and well-being (Conner and Pope 2013). High student engagement leads to higher grade point average (GPA), more advanced courses, less academic dishonesty, as well as less anxiety and anger.

A number of school-level practices have been conducive to increasing student engagement, such as teacher support, peer support, and small classroom size. Making learning interesting and enjoyable for students as well as being transparent about the value of assignments have been found to promote engagement (Conner and Pope 2013). The role instruction may play on student engagement requires further exploration as technology in educational settings continues to gain momentum and offers conditions (e.g., immediate feedback) that promote engagement.

Flow is a different type of engagement. Flow describes engagement in an activity in which self-consciousness disappears, time distorts, and the individual engages in complex, goal-directed activity motivated not by external rewards but simply for the exhilaration of the engagement (Csikszentmihalyi 1990). During flow, no thoughts or feelings are noticed; after the experience, flow is described as enjoyable (Delle Fave and Massimini 2005).

Flow requires a balance between an individual's skill and the increasing difficulty or challenge of the task (Keller and Bless 2008). The excitement of intrinsic motivation matched with the increasing knowledge required for accomplishing the escalating challenge provide a fertile learning experience (Keller and Bless 2008; Seligman et al. 2009). Intrinsic goals are associated with more thoughtful and creative engagement (Kaplan and Maehr 1999). Internally motivated students view difficult tasks as challenges, willingly engage in challenges, experience more positive affect, and respond better to constructive feedback (Dweck and Leggett 1988).

The research on flow is particularly relevant to education because the requirements for involved learning are clearly specified. Central to flow is the balance between the student's skill level and the learning challenge and prompt feedback regarding success (Keller and Bless 2008). Electronic teaching and learning strategies can generate activities at the appropriate challenge level and provide prompt feedback on performance. This level of individualization would not be possible, in fact, without the benefits of the electronic age.

Overall, engagement has been associated with positive educational outcomes. Engagement is associated with achievement and persistence in school. High levels of engagement are found in classrooms with supportive teachers and peers, challenging tasks, opportunities for choice, and sufficient structure (Fredricks et al. 2004). In particular, behavioral engagement (e.g., participation and work behavior) has been associated with greater achievement across ages, and cognitive engagement (e.g., regulating attention and effort) has been associated with greater achievement among middle and high school students (Fredricks et al. 2004). Fredricks et al. (2004) concluded that behavioral engagement is likely to be connected to higher test scores and grades, while cognitive engagement is likely to be connected with deeper-level understanding of concepts. More research is needed to explore the possible benefits of emotional engagement. Although the correlation between engagement and achievement may vary depending on how achievement is measured, it appears that most studies support the positive association between engagement and achievement.

While active learning has been promoted as an effective teaching method for decades (Elmore et al. 1996), the advent of computer-based learning is now promoting active learning through game-like activities that facilitate discovery learning. The use of computer technology allows students to explore and become active contributors (Prensky 2001). Historically, the use of technology in classrooms was not very conducive to experiences of flow because technology in the classrooms was primarily used in the form of assisted drills (Kiili 2007). Although assisted drills and similar uses of technology may provide immediate feedback, there is a lack of balance between skill and challenge, and task meaning that engages the student to explore and construct knowledge and/or problem solve.

Prensky (2001) asserts that digital natives crave immediate response to each and every action. He further states that traditional schooling does not allow for quick and immediate feedback to occur, which lowers the probability of students experiencing a flow state. Such lowered probabilities of flow may be problematic because experiencing flow predicts learning task outcome in the domain of computer game playing (Murphy et al. 2008), mathematics (Heine 1997), foreign languages

(Engeser and Rheinberg 2008), and computer-based statistics (Vollmeyer and Imhof 2007). By promoting the experience of flow, educators can promote learning.

Many researchers consider engagement an antecedent of health and well-being (e.g., Lewis et al. 2011). In particular, flow not only increases learning and motivation towards challenges but also explains why characteristics of academic work can promote psychological well-being among American college students (Van Schaik et al. 2012). Seligman (2011) suggests that the link between engagement and well-being results from promoting the use of an individual's strengths which, in turn, leads to positive emotions, an increase in meaning, more accomplishments, and better relationships with others, promoting overall well-being. Experiences of flow or engagement are correlated with feelings of autonomy, belongingness, competence, and self-worth (Shernoff and Csikszentmihalyi 2009).

Facilitating engagement fits well with the strengths of the technology revolution. Squire (2003) describes video game players as in control of their actions, actively pursuing their own goals, challenged to the optimal extent of their abilities, and given clear feedback on their performance. Some assert that "flow" is a rare experience in traditional schooling (Kiili 2007; Shernoff and Csikszentmihalyi 2009). Incorporating flow into classroom education could occur through technology that presents students with material based on their ability and which can be immediately branched (i.e., made easier or harder) according to student's responses and mastery of questions. Tasks in virtual environments created by computers can promote the balance of challenge and skill, clarity of goals, and feedback to create the flow experience to enhance the engagement and learning potential of students (Kristjánsson 2012).

Selecting and creating games that facilitate flow parallel Malone's (1981) research on the motivational appeal of video games. Malone found that educational games should have clear goals that students find meaningful, multiple goals with accompanying scores that can provide feedback on progress, levels of game difficulty that adapt to the player's skill, elements of surprise within the experience, and finally an emotionally appealing theme to provide meaning.

Game technology in education primarily consists of promoting the memorization of factual information which resemble digital exercise books (Kiili 2007). Too often computer-assisted learning currently used in schools does not promote flow and, thus, not promote high levels of engagement. Currently, technology-facilitated flow appears an untapped resource with potentially high payoffs for promoting education.

7.4 Relationships

Good relationships are central to well-being. Just being around people creates positive emotions (Pavot et al. 1990) and provides enormous coping advantages in life (Cohen and Wills1985; Lakey and Cohen 2000; Auerbach et al. 2011; Vaughan et al. 2010). Relationships advantage education as well. Positive social interactions between students increase their reading engagement (Guthrie et al. 1995) and overall academic achievement (Berndt and Keefe 1995; Brown 1990; Parker and

Asher 1987). Supportive relationships increase students' motivation leading to increases in academic and prosocial goals, intrinsic values, and self-concept (DuBois et al. 1992; Felner et al.1985; Harter 1996; Wentzel 1994).

Child and teen friendships serve as protective factors from the negative effects of bullying (Erath et al. 2010; Hodges et al. 1997, 1999), acculturative stress (Vaughan et al. 2010; Crockett et al. 2007), and maltreatment (Bolger et al. 1998). A peer support system reduces the likelihood of mental health problems and suicide attempts (Topol and Reznikoff 1982; Harter and Marold 1996).

Students benefit from supportive relationships with adult educators as well (Ryan et al. 1998). Conversely, students who do not perceive positive, supporting relationships with adults and peers are at risk of academic problems (Goodenow 1993; Midgley et al. 1989; Phelan et al. 1991).

When children and adolescents go to school, they are developing social as well as academic skills (Juvonen and Murdock 1995; Urdan and Maehr 1995; Wentzel 1993). Students who describe their overall school environment as caring and supportive are less likely to be involved in substance abuse, violence, and other negative behaviors (Hawkins et al. 1999; Battistich and Hom 1997; Resnick et al. 1997). Children who feel rejected are more likely to report feeling lonely, want to avoid school, and have lower academic performance (Buhs and Ladd 2001). A supportive school environment also promotes prosocial attitudes and behaviors in students and positive attitudes towards themselves (Schaps et al. 1997). Research suggests that in order for the environment of a school to be perceived as supportive, student must experience a sense of "connectedness" (Resnick et al. 1997), "belongingness" (Baumeister and Leary 1995), and "community" (Schaps et al.1997) during the school day.

Relationships among students as well as the relationship between the teachers and students can be directly established through the norms and rules teachers establish regarding the social environment of the classroom. The assignments teachers design, communicate the importance of connectedness, community, and belonging to the students. Group work may increase connectedness, while competitive, individual assignments may lessen the feeling of community (Webb and Palincsar1996; O'Donnell and King1999; Slavin et al.2003).

Low-technology interventions have been successful. Some schools organize into smaller units, such as houses and teams, to form supportive environment for student friendships (Pasi 2001). Space designated for students to access help in homework, problems with a bully, career planning, and other issues increase the sense of community and connectedness (Poedubicky et al. 2000–2001). Peer mediation and conflict resolution programs have been developed to improve students' sense of community, while reducing negative peer relationships (Johnson and Johnson1996; Espelage and Swearer 2003).

One of the most popular electronic pastimes for students is social media. The Internet can facilitate relationships, especially for people who find relationships difficult. For example, students with low self-esteem and low life satisfaction found beneficial relationships online via Facebook (Ellison et al. 2007). The Internet encourages social interactions that would not otherwise occur (Bargh and McKenna 2004). While the purpose of the social network sites for most surveyed students is

to stay in touch with old friends (Ellison et al. 2007), about half the teens report making new friends on social media (Lenhart and Madden 2007).

The Internet provides a unique forum for students because of the ability to be anonymous and to easily terminate contact. Self-disclosure facilitates the depth of relationships including online relationships (Bargh et al. 2002). Anonymity facilitates self-disclosure and intimacy avoiding societal pressures and social norms that can inhibit self-exploration (Bargh and McKenna 2004). Face-to-face interactions risk serious negative consequence when self-disclosing negative or taboo aspects (Derlega and Chaikin 1977). Social boundaries enforced by religion, culture, or nations can be circumvented to create new relationships and deeper understanding (Dubrovsky et al. 1991; Jessup et al. 1990; Kiesler et al. 1984). The effects of stereotypes based on disability, skin color, physical attractiveness, and sexual orientation can be avoided (Arnett 2000; Kang 2000; McKenna and Bargh 2000).

Avoiding harmful interactions online relies upon active planning. Educators could create school-wide forums where students can meet each other virtually at first and then optionally continue their relationships facetoface. One survey found that over 50% of people who frequented forums had developed a face-to-face relationship with people they met online. A 2-year follow up found that these relationships were equally stable over time as traditional relationships (McKenna et al. 2002). Sixty percent of college students surveyed reported that the Internet, mainly e-mail, had helped their relationship with classmates while only 4% said it had negatively affected those relationships (Jones 2008).

Another apprehension about social media addresses the concern that virtual relationships are less deep than the real-life counterparts, that is the online world provides only an illusion of community (Parks and Floyd 1996; Parks and Roberts 1998; Cummings et al. 2002; Gross et al. 2002). Others argue that online relationships are no different in substance when compared to face-to-face relationships (McKenna et al. 2002). Hong Kong researchers revealed concerns that support the lesser quality of virtual relationships. Face-to-face friends were described with more interdependence, breadth, depth, commitment, and understanding than online friendships. However, the differences between the two types of friendships decreased over time with both types deepening (Cheng and Chan 2006).

7.5 Meaning

Having meaning or life purpose contributes to well-being often in ways that complement positive emotions. Being committed to something considered more important than self can create meaning. Social relationships (Stillman et al. 2009), religion (Emmons and Paloutzian 2003) and virtues (Seligman et al. 2005) create meaning for adolescents. Philosophers, scientists, and theologians have long considered meaning a vital part of human existence. Aristotle (1992) philosophized that Eudemonia (i.e., human flourishing or happiness) came from a meaningful life created by virtuous acts. Adolescents who can describe their life's meaning tend to

exhibit greater valuing of academic success and increased academic intrinsic motivation (Kiang and Fuligni 2010).

Meaning has special significance for adolescent identity development (Ryan and Deci 2001). Meaning directs the formation of goals, beliefs, and purposes central to adolescent development (Damon et al. 2003). Establishing meaning benefits life satisfaction (Steger and Kashdan 2007) and greater overall psychological well-being (Rathi and Rastogi 2007). A coherent sense of meaning acts as a protective factor against a myriad of health risk behaviors, such as drug use (Addad and Himi 2008), heavy drinking (Newcomb and Harlow 1986), depression and suicide (Wang et al. 2007).

7.6 Accomplishment

Doing something well contributes to well-being (Deci and Ryan 2002). Accomplishment grows upon itself, that is, doing something well leads to seeking more accomplishments and so on. Central to experiencing well-being via accomplishment is self-efficacy, which is the belief in one's capacity to attain a designated goal (Bandura 1977, 1986). Self-efficacy predicts persisting longer on tasks, working harder, and having fewer negative emotional reactions when faced with difficulties (Bandura 1997). Students who are oriented toward gaining or perfecting a skill (mastery goals) or desiring deeper understanding tend to exert thoughtful, creative investment in a task (Kaplan and Maehr 1999).

Students with high self-efficacy exhibit higher rates of academic performance and persistence (Multon et al. 1991; Zimmerman 2000) and were found to approach difficult tasks as challenges to be mastered rather than threats to be avoided (Bandura 1994). Students who avoid performance goals can experience increased stress and depression (Elliot et al. 1999).

Students' self-efficacy increases with performance feedback (Bandura and Cervone 1983; Shunk 1991). Providing immediate feedback on performance via computers can be a convincing experience of accomplishment. Self-efficacy, like flow, benefits from immediate feedback and the balance of difficulty level with the student's skill level. In hybrid classrooms (traditional and online elements integrated), digital games and classroom apps that allow for guided data manipulation can provide such immediate feedback.

Most current electronic games begin below the level of the user and provide the user increasingly more challenging scenarios with immediate feedback. Educators are challenged to find well-made games that impart content relevant to the education goals. Lei and Zhao (2007)found that use of subject-specific classroom technology that required knowledge construction was related to increased GPA. Unfortunately, the authors found that the more focused learning technology used in their research was the least employed forms of technology. These results highlight the need to develop technology-based educational programs that are interesting to students and that have key functionalities, such as offering challenge-level problem solving, immediate feedback, collaboration, and interesting goals.

7.7 Interventions

Positive psychology research has examined many helpful interventions to increase well-being in educational contexts. Although numerous evidence-based interventions promoting positive emotions in students have been identified for classroom use, only a paltry few electronically mediated strategies have been researched (Layous and Lyubomirsky 2014).

The best-substantiated interventions teach virtues to increase positive feelings. Fifty-one interventions designed to increase positive emotions were examined in a meta-analysis revealing that the interventions significantly increased overall well-being and lessened depressive symptoms (Sin and Lyubomirsky 2009). The increase in positive emotions encouraged more positive thoughts, behaviors, and overall greater psychological satisfaction (Deci and Ryan 2000; Sheldon et al. 2001). Most of the interventions increase virtuous behavior to create positive feelings. Selecting high-valued positive emotions as a goal of the interventions is important because motivation is a key factor in the efficacy of the interventions and in contributing to a meaningful life (Layous and Lyubomirsky 2014).

Several interventions that use virtuous activities to increase positive emotions, thus enhancing well-being, are appropriate for educational settings (Sin and Lyubomirsky 2009). The following can easily be integrated into traditional education assignments. Unfortunately, the interventions have not been translated into electronic versions as yet, but each has the potential to be embedded into an electronic platform.

- Students are assigned to write a letter of gratitude to someone who has been especially kind to them. Students should specify in detail what the recipient did and how the student felt. Research suggests that reading or sending the letter to the recipient or simply writing the letter is effective in increasing well-being. (Boehm et al. 2011a; Layous et al. 2012a; Lyubomirsky et al. 2011; Seligman et al. 2005)
- Students are assigned to list things for which they are grateful three times each week. They are asked to reflect and write about five things and explain why they are grateful. These can range from the mundane (such as we are having my favorite food for lunch today) to the grand (I got accepted to the college of my choice; Chancellor and Lyubomirsky 2012; Emmons and McCullough 2003; Froh et al. 2008; Lyubomirsky et al. 2005; Seligman et al. 2005)
- Optimism can be increased by having students write about their best possible future life including desires about family, friends, career, hobbies, and so on. Students are further asked to spend time imagining that everything goes well in all these aspects of their lives (Boehm et al. 2011a; King 2001; Layous et al. 2012b; Lyubomirsky et al. 2011; Sheldon and Lyubomirsky 2006a).
- Performing acts of kindness increases well-being. Students can be assigned weekly to perform three kind acts for no personal gain and then reflect or write about the experience (Della Porta et al. 2012; Dunn et al. 2008; Otake et al. 2006; Sheldon et al. 2012).

- Meditating on positive feelings towards self and others is called loving-kindness meditation. Students are asked to sit quietly with their eyes closed, focus on their breath, and then focus on a person who causes them warm feelings. Students are then instructed to direct these warm feelings towards themselves and others in a nonjudgmental way (Fredrickson et al. 2008).
- The virtues of kindness and persistence can be increased by catching-the-child-being-virtuous (Spaventa-Vancil and Conoley 2012). Using embedded instruction technology (Johnson et al. 2004), parents praised actions or partial actions of children while labeling the behaviors as either "kind" or "hardworking." In classroom, teachers could select two virtues a semester to notice and comment upon. Additionally, students could be taught to notice and comment about virtues in their peers, thus, creating a virtuous community.

Cultural values may also influence the design of the interventions. Although few cross-cultural studies exist, evidence suggests that Eastern and Western cultures conceptualize happiness differently. Western cultures tend to emphasize personal achievement and reaching goals when describing positive emotions or happiness (Uchida et al. 2004), while Eastern cultures have a tendency to value collective harmony and relationships over their individual needs, and often do not see personal happiness as the ultimate goal (Diener et al.1999; Uchida et al. 2004). For example, Chinese individuals were found to value high-arousal positive emotions less than Americans, and instead valued more low-arousal positive emotions (Tsai et al. 2006).

Most often, children must be taught that performing virtuous acts function as both a road to happiness and to making the world a better place. In order to derive the full benefits of well-being from virtuous actions, Huta (2012) found that children must have parents who acted in accordance with the virtues they taught. For parents and educators, talk is not enough and the old slogan that "actions speak louder than words" has research support.

Addressing virtue[1] in schools has been helped immensely by Peterson and Seligman's (2004) research across cultures. They identify the virtues of: hope, zest, gratitude, curiosity, love, perspective/wisdom, persistence, delf-regulation, spirituality, forgiveness, social intelligence, humor, leadership, bravery, citizenship, integrity, kindness, fairness, prudence, love of learning, judgment, appreciation of beauty, creativity, and modesty/humility. Park and Peterson (2008) urge the use of a free website that identifies the strongest virtues of adolescents in many languages (https://www.viacharacter.org/surveys.aspx). Upon understanding the top virtues, the adolescent is urged to use the virtues in new ways to increase well-being. Researchers have found that the character strengths of perseverance, love, gratitude, and hope predict academic achievement in middle school and college students (Park and Peterson 2009).

[1] While character strengths are used in the literature, virtues will be used in the chapter for ease of understanding.

Although religious discussions are not common in most educational settings, religious beliefs have long been identified as a source of meaning. Religion can provide moral values that shape an individual's construction of a meaningful life (Johnson and Mullins 1990; Emmons and Paloutzian 2003). Additionally, religion is identified as a source of value and goal creation within the family unit, specifically when dealing with family conflict (Mahoney 2005). Families should be urged to discuss about values that might not be allowable in public school settings because of religious connotations. When modeling and discussions occur regularly then foundational values, virtues and attitudes can be formed that shape the youth's creation of life meaning.

7.8 Summary

Enhancing well-being can benefit a student's quality of education and quality of life. Well-being increases productivity, health, citizenship, and length of life. The electronic game industry has not yet embraced the educational marketplace in a manner that compares with their fascination with warfare, but the promise is there. Characteristics of gaming technology make it a good match for the expectations net-era learners have for fast-paced, high interactive experiences that grow in complexity and difficulty. The elements of well-being can be programmed into novel, engaging games, puzzles, competitions, and creative expression. Perfect technology from the well-being perspective would provide avenues for virtuous student action, increase challenges in steps that begin at the individual's level, provide timely feedback, create contexts for meaningful relationships, and identify goals that serve higher meanings. The perfect educational experience may never be incorporated into a single electronic game but an array of electronically enhanced experiences that match the developmental trajectories of youth could be invaluable in building on children's strengths for the present and the future.

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Part II
Leading Twenty-first Century Learning

Chapter 8
A Closer Look at Developing Positive Learning Climate in the Twenty-First Century: The Role of Instructional Leadership Practices

Irene Ng

8.1 Introduction

What makes a "good" school? In Singapore, though the Ministry of Education (MOE) does not release a school rank list, the public is aware that MOE recognizes schools that have done well academically through the various awards received at the national level. Going by the description of "successful" or "good" schools as set by international standards such as the McKinsey Report (2010), Trends in International Mathematics and Science Study (TIMSS) and Progress in International Reading Literacy Study (PIRLS), and also locally by MOE and the public, "good" primary schools are defined, in this chapter, as schools which have done well academically in the Primary School Leaving Examinations (PSLE). Consequently, principals who are able to lead their schools to do well in the PSLE are described as effective or successful school leaders.

Research carried out on effective schools have pointed out that school leadership is ranked as the second most important influence amongst school-related factors that affect student learning (Harvey 2011; Leithwood et al. 2008). Since the early 1960s, various models of leadership have been identified. These include collaborative leadership (Hallinger and Heck 2010), distributed leadership (Ronald and Hallinger 2009; Spillane 2006), instructional leadership (Bamburg and Andrews 1990; Bossert et al. 1982), teacher leadership (Lambert 2002; Mangin and Stoelinga 2010; York-Barr and Duke 2004), transformational and transactional leadership (Leithwood and Doris 2006; Robinson et al. 2008) and strategic leadership (Crowther and Limerick 1997; Ng 2008). However, amongst the competing leadership theories, instructional leadership has emerged as one of the most prevalent and found to have the greatest impact on student achievement (Robinson et al. 2008; Leithwood and Montgomery 1982).

I. Ng (✉)
National Institute of Education, Nanyang Technological University, Singapore
e-mail: Irene_NG@moe.gov.sg

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Nonetheless, Hallinger (2010b) cautioned that while research does serve its purpose in informing practices and "some parts of the 'global' (i.e. Western) knowledge base may be highly relevant across national and cultural contexts, we know little about which theories and findings are 'universally' applicable and which are context dependent" (p. 83). Other studies, such as those done by Bossert et al. (1982) and Hallinger and Heck (1996a, b), have also highlighted the need for researchers to take into consideration the contextual influences of the school, such as the school culture and student background. Indeed, a common remark from Singapore teachers is that certain theories, originating from the west, cannot be applied within the local context because both the systems and the cultures are different. Nevertheless, since research such as those done by Bossert et al. (1982), Dwyer (1986) and Hallinger and Murphy (1986) have indicated that successful school principals habitually engage in instructional leadership practices, it will be worthwhile investigating these practices in the context of Singapore so that policies and programmes such as the Leadership in Education Programme, attended by all would-be principals, can focus on the type of training that would bring about positive school outcomes.

8.2 A Brief History of Instructional Leadership

Though the concept of instructional leadership emerged in the early 1950s, it was not until the 1980s that the construct of instructional leadership evolved (Hallinger and Heck 1996a; Robinson et al. 2008). In their extensive review of literature, Bossert et al. (1982) coined the term instructional management as the researchers inferred that the role of the principal had to do with the management of curriculum matters and classroom instruction. Over time, the term instructional leadership was gradually accepted and used by scholars and practitioners (Hallinger 2010a). Instructional leadership gained ground as an influential leadership model then when research showed that schools were turned around by strong and directive leaders who practiced instructional leadership (Bossert et al. 1982; Dwyer 1986; Edmonds 1979; Hallinger and Murphy 1986).

Over the years, researchers have presented various definitions of instructional leadership. For instance, The National Association of Elementary School Principals (2001) defined instructional leadership as leaders of learning communities while Blasé and Blasé (2000) provided a series of seven principal behaviours such as giving suggestions, providing feedback, role modelling effective pedagogical instructions, gathering opinions, supporting teamwork, providing professional development opportunities and praising teachers for good teaching practices. Other researchers such as Glickman et al. (1995), Smith and Andrews (1989) and Marzano et al. (2005) have also presented their versions of instructional leadership. However, a common thread that ran through most of the listings presented, is the focus on leadership functions, had to do with the core of what goes on in the classroom—teaching and learning.

In this chapter, the model developed by Hallinger and Murphy (1985) is adopted, on the grounds that it caters most directly to the needs of school leaders with respect to their role in managing educational institutions in the context of the twenty-first century and of the integration of new technologies in teaching and learning.

8.3 The Three Dimensions in Instructional Leadership

Hallinger and Murphy (1985) delineated the three dimensions in instructional management as: *defining the school's mission, managing the instructional programme* and *developing a positive learning climate* in school. Under the dimension of *defining the school mission* are two functions: frame the school goals and communicate the school goals. These functions had to do with the principal's role in developing, with input from the staff, a set of school goals that are focused on the academic development and progress of the students. Such goals must also be discussed regularly and communicated clearly to all the staff. This is especially important when it comes to introducing organizational, structural and developmental changes to the institution in response to twenty-first-century needs and in alignment with nurturing and managing Net Gen students and teachers. Thus, according to Flanagan and Jacobsen (2003, p. 130), "the introduction of technology is accompanied by opportunities for staff, students and parents to develop a common vision and shared purpose".

The second dimension, *managing the instructional programme* incorporates three functions, namely supervise and evaluate instruction, coordinate the curriculum and monitor student progress. This dimension requires the principal to be totally involved in the school's instructional programme in stimulating, supervising and monitoring teaching and learning in school though in real-life scenario there may be other members of the staff involved as well. To coordinate effectively as an instructional leader includes attending to matters related to teaching and learning such as managerial, political, institutional and human resource. Flanagan and Jacobsen (2003) recommend that school leaders should aim to improve "student ability to solve problems, collaborate, and use technology to support the construction of knowledge" (p. 134). These authors further advocate that school leaders should be involved in the preparation of program plans for students and discuss with teachers the use of technology and information and communications technology (ICT) outcomes when doing so.

The third dimension, *developing a positive learning climate* consists of five functions. These functions comprise the protection of instructional time, promotion of professional development, the high visibility of the principal, provision of incentives for teachers and provision of incentives for learning. This dimension encompasses a much wider range than the first two dimensions. Included in this final dimension are factors that are commonly associated with features from transformational leadership (Hallinger 2003; Leithwood et al. 2008; Marks and Printy 2003), such as creating and fostering a climate that rewards and celebrates achievement,

while promoting continuous learning. In the context of twenty-first century teaching and learning, effective school leaders organize timely opportunities for professional development to build staff capacity and competencies in both ICT and non-ICT domains. They motivate their staff by encouraging risk-taking and innovation, while providing adequate software and hardware support for the realization of such projects (Flanagan and Jacobsen 2003).

8.4 Developing a Positive Learning Climate

Of the three dimensions, the creation and promotion of a positive school learning climate was found to have the greatest impact on school achievement (Fulmer 2006; Horton et al. 2009; O'Donnell and White 2005; Ruff and Shoho 2005; Stein and Nelson 2003). This dimension requires the principal to be deeply involved in creating an environment that nurtures high expectations and standards for both staff and students (Mortimore 1993; Purkey and Smith 1983). However, in an actual school situation, the principal may not be the only one involved in this. Glickman (1991) aptly describes the work of a principal in a successful school as one who is not the instructional leader but the "coordinator of teachers as instructional leaders" (p. 7). To coordinate effectively as an instructional leader, in and of itself, is highly complex as it includes attending to matters related to teaching and learning such as managerial, political, institutional and human resource. Moreover, Barth (1986) and Cuban (1988) noted that instructional leaders have to work within the opportunities and constraints of school context such as the student background, organizational structure, the school culture and teacher competence—each of these, a mutually influencing process. In order to deeply understand the impact of the principal on teachers' instructional behaviours, it is crucial to investigate how the principal's leadership is translated to and re-enacted by members of the staff. As observed by Lambert (2002), it is a "mistake to look to the principal alone for instructional leadership when instructional leadership is everyone's work" (p. 40).

8.5 Instructional Leadership in Western Contexts

While instructional leadership has been in circulation some 50 years back, recent literature on principal leadership (Hallinger 2000; Hallinger and Heck 1996a; Waters et al. 2003) suggests that the instructional leadership construct is still very much in practice and that increasing worldwide focus on accountability seems to have rekindled interest in instructional leadership (Gewertz 2003; Hallinger 2005; Huber 2003; Marzano et al. 2005). Reviews on school effectiveness such as those conducted by Hallinger (2003), Leithwood et al. (2004) and Robinson et al. (2008) suggest that successful school leadership must include the fundamentals in leadership practices that pay specific attention to pupils' learning and pedagogical instructions.

Indeed, recent studies, such as those done by Leithwood et al. (2010), Robinson et al. (2008) and Waters et al. (2003), have confirmed early findings of the relationship between instructional leadership and student achievement. The reason was simply because instructional leadership captures the variation and skills needed to drive improvement in teaching and learning (Robinson et al. 2008). As Hoy and Miskel (2008) have pointed out, the technical core of school leadership is the focus on the process of teaching and learning of the school. It is this focus on the core business of education that has reignited the interest in instructional leadership which is centred on students' acquisition and achievement of essential skills and knowledge (Day et al. 2008; Fuller et al. 2007; Leithwood et al. 2008).

In one of the studies on the impact of leadership on student outcomes, Robinson et al. (2008) systematically did a meta-analysis of 27 published studies to find out the relationship between leadership and student achievement. Recognising that different leadership styles have varying effect on student outcomes, the authors opted to take a different approach in their meta-analysis. Rather than focusing on the overall impact of leadership on student outcomes, Robinson et al. (2008) turned their lenses on principal's leadership practices instead. The authors dedicated their analysis on transformational and instructional leadership as both of these leadership theories "dominate empirical research on educational leadership" and have research programmes that are sufficiently established to yield adequate evidence for analysis (Robinson et al. 2008, p. 638). Their analysis revealed that the impact of instructional leadership was three to four times greater than those characterized by transformational leadership. The authors found that the "closer educational leaders get to the core business of teaching and learning, the more likely they are to have a positive impact on students' outcomes" (Robinson et al. 2008, p. 664).

In another analysis grounded again on two of the most popular styles of leadership—transformational and instructional, Marks and Printy (2003) investigated both concepts of leadership and their connection to school performance. They found that "instructional leadership can itself be transformational" (p. 393). Quoting Sheppard (1996), the authors noted that when teachers observe principals' leadership actions to be appropriate, they become more committed to their work, involve professionally and show the willingness to innovate.

Though there has been much research done on instructional leadership, most of the knowledge base stems largely from the theoretical and empirical research from western contexts (Cheng 1995; Hallinger and Leithwood 1998; Walker and Dimmock 2002). As discussed in their paper, Fuller and Clarke (1994) noted that policy makers tend to generalize empirical findings from one country to another though the settings might be quite different. The authors stressed that "future work in the policy-mechanic tradition will be fruitless until cultural conditions are taken into account" (p. 119). Hence, for a better understanding of how instructional leadership is exercised in non-western contexts, it is pertinent that research work is conducted within the country itself to inform future leadership training programmes which prepares would-be principals for their roles in local schools.

8.6 Research on Instructional Leadership

Even though research has pointed to the critical role that principals play in turning schools around, evidence of what makes successful leaders remains elusive, especially in contexts outside Europe and the USA. One of the main reasons why research in the domain of leadership is not done extensively is that access to the group of principals can prove to be a daunting task, since there are as many principals as there are of schools. Unless principals themselves embark on research studies to find out more about their own craft, educators and researchers tend to focus on issues that they are more familiar with, such as classroom based issues, rather than school leadership. As noted by Hoy and Miskel (1982), teachers will be more motivated to work in a school climate that is more humanistic. Hence, future studies should aim to contribute to the dearth of knowledge on principal instructional leadership outside western contexts. Along this line, a large-scale, cross-cultural collaborative study on Instructional Leadership in Singapore and East Asia (ILSEA; which involved coresearchers from Hong Kong, Mainland China, Vietnam, Malaysia, Taiwan and Thailand) is currently underway. Aimed at the systematic and progressive development of the knowledge base on instructional leadership within each country, each team informed by a common set of research questions, frameworks and methodologies, embarked on the same study within the respective countries. Such a method enabled the teams to generate hypotheses that can be employed in building theory (Glazer and Strauss 1967) about how instructional leadership is exercised within Singapore and across the countries participating in the research. The findings of this research will provide the foundation for future contextualized quantitative studies.

8.7 Concluding Remarks

The fundamental purpose of research is the quest for new knowledge so that there will be an enhancement in practice, a creation of a knowledge base for the development of policies and increased accountability (Pring 2000). This chapter was conceptualized based on the theoretical assumptions that research is neither for predictive purposes nor control but to explain human behaviour by uncovering its significance. Through this, it is hoped that a common set of actions or activities will be established to shape how school leaders can govern schools to bring about positive changes.

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Chapter 9
Leadership Influence on the Twenty-First Century Teacher's Motivation for Professional Development

Maria Sit

9.1 Introduction

In a country with no natural resources other than her people, Singapore has continually invested about 20 % of the country's annual budget for the Ministry of Education (MOE), second only to the budget for the Ministry of Defence. This investment in the human resource is also reflected in schools where a healthy proportion of the school's financial resources is allocated to teacher professional development (TPD). Every teacher in an MOE-managed school is entitled to 100 h of professional, including full or partial, subsidy in terms of payment of course fees. Furthermore, teachers who attend TPD courses enjoy full pay, while they are away from their classrooms. The recently updated Teacher Growth Model (TGM), guides teachers in their TPD journey, following a professional development framework, 'The Learning Continuum'. The framework provides structured levels of gradation in learning areas that caters to the different experience levels of teachers; from the beginning teacher to the master teacher and beyond. The objective is to promote and support life-long learning that is 'meant to be across the span of…[a teacher's]…teaching career' (Academy of Singapore Teachers 2012). This is of particular importance in view of the changing landscape of twenty-first-century educational contexts, where there is a constant need for upgrading competencies and skills and to keep abreast with new technologies and developments in information and communications technology (ICT) developments.

The TGM also guides the teachers in planning their professional growth, charting out the different responsibility roles that teachers may assume in the course of their teaching career. The definition of TPD as defined by the TGM is 'a long-term process that includes opportunities and systemic experiences planned to foster growth and development in the teaching profession…. Professional development is a provision of sustained and extensive opportunities to develop practice that goes

M. Sit (✉)
National Institute of Education, Nanyang Technological University, Singapore
e-mail: mariasit@yahoo.com

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well beyond traditional workshop approaches and aimed at improving teaching and learning' (Teacher Growth Model 2012). TPD, thus, provides an avenue for teachers to acquire some of the IT skills that come naturally to their Net Gen students, and thus to gain a better understanding of the latter and their concerns.

Teachers have the option of attending professional development opportunities that are fully funded or partially funded by the MOE. They also have the option of attending 'self-funded' courses, many of which can be paid from their learning development fund, an individual entitlement based on the number of years as an MOE teacher. In other words, the cost of engaging in TPD in Singapore is almost negligible to the teacher as MOE is the main body funding most of the courses directly or indirectly. While many teachers are grateful for the opportunities afforded to them, they are at times, in a dilemma as to whether to engage in their professional development. In a study of Singapore teachers conducted by Dixon and Liang (2007), teachers maintained a traditional view of their role and shared that their main objectives were to prepare their students to pass examinations, so that they are better prepared for the future (p. 28). When these teachers engage in TPD, they perceived that they had less time to complete the syllabus, less time for marking and preparation for assessments and examinations (p. 23). In the study, it was reported that preparing students to do well in their examinations was a way for teachers to show care and concern for their students. It was also a manifestation of the teachers' commitment to the job. Engaging in TPD then creates the tension on the demand for the teachers' time.

Due to this reason, there is some tension observed when teachers are sent for TPD by their schools. From the perspective of the school leaders, there is no intention to create this tension, which is a cause for concern, especially in the utilization of school funds. Funds are allocated for teachers to engage in TPD, and the responsibility lies with the principal to ensure that these funds are judiciously utilized, with teachers benefitting from their training and applying the learning after the training. When teachers are distracted and resist being involved in TPD activities, this investment in TPD is deemed to have been wasted. However, what is even more pressing is the stress caused to the teachers. There are other factors leading to this tension and dilemma faced by the teachers; and this study highlights some of the reasons, as shared by the teachers.

There is much research conducted into the impact of school leaders on teacher motivation and the school environment. With reference to the work of Frederick Herzberg (1966) on the 'two-factor theory', hygiene and motivating factors, as explained in Sergiovanni (2009), both extrinsic and intrinsic rewards are important to teachers. Do teachers then view TPD as a 'hygiene' factor—one that is a given, a common and expected practice found in any school; or do they view it as a motivating factor—one that is accorded to a privileged teacher or even a recognition of the effort invested in their students? How teachers view TPD will influence their attitude towards TPD and their engagement level. There would be repercussions on the school and its students in terms of funds allocation and in the application of learning, respectively. For schools to function optimally, the 'participation investment' has to be made and continued by teachers (p. 329). In the context of education,

'participation investment' refers to the teachers going beyond their minimum expectations as teachers and, instead, sees them investing time in improving their own practice, moving beyond extrinsic motivation of a fair wage for minimum expectation, to that of wanting to 'perform'. Sergiovanni (2009) equates this 'performance' to going beyond the minimum expectation of a job. In the numerous narratives presented by Sergiovanni (2009), it is evident that this 'participation investment' is supported by 'recognition, achievement and the feelings of competence' (p. 329). In the Singapore context, all of these could be fulfilled with teachers engaging in TPD.

What then can school leaders do in order to encourage 'participant investment' in their schools? Research studies have illustrated how school leaders are influential in creating this driving force. Barends (2004) describes the role of the principal as one who transforms the school culture in order to have collaborative teachers who organize and conduct learning…without the presence of the principal (p. 1). This is but a confirmation of the role of a principal described by Fullan (1991) as the key person in creating this collaborative atmosphere in a school. Mulford (2007) in his findings, summarized that 'successful leadership was underpinned by the core values and beliefs of the principal…[that]…that informed the principals' decisions and actions regarding…capacity building at the school level, including school culture' (p. 20). The role of the principal as school leader in influencing the school culture still holds over the years. However, many of the studies quoted are situated in a context foreign to Singapore. This chapter aims to understand the beliefs and perceptions of primary school teachers about TPD as they grapple with work demands and their professional training. Minott (2010) shared how he grappled 'with the daily challenges of teaching' while at the same time seeking 'to refine…[his]…professional practice' (p. 325). He believes 'that ultimately professional development depends very much on the personal initiative of each individual teacher educator' (Minott 2010, p. 326). The TGM adopts a 'Learning Continuum' as its framework, encouraging teachers to take ownership of their professional growth.

Teachers' perceptions on TPD can be surfaced by uncovering the teachers' decisions to participate in TPD vis-à-vis the role that their principal or the school leadership team had in influencing their decision. This leadership team manifests its influence in the support provided for TPD and purposeful charting of the direction for training. This belief is supported by Leithwood et al. (2008, p. 32), who are of the opinion that 'a key task for leadership…is to influence pupil learning and achievement, is to improve staff performance', and this can be seen in the motivation level of staff, commitment, capacities and in the working environment (p. 32).

The challenge is in uncovering what school leaders actually do to motivate TPD and how teachers perceive these actions; and teachers' perceptions can be very different from that of the school leaders. This information is useful for school leaders in checking that what they perceive as "motivating" factors function as intended, failing which, may result in frustrating their teachers. However, the worst-case scenario is one where the school leaders are not even aware there is a misperception and continue to implement their 'motivational' strategies.

In order to understand the school culture that influences teacher motivation for TPD that exists within the school environment, one must study the school climate.

This is in accordance with Sergiovanni's belief (2009) that 'the interpersonal life of the school as represented by the concept of school climate is an important artifact of culture' (p. 158). By surfacing assumptions and a common understanding that are shared by the teachers, it may uncover the belief system of the teachers, that, in turn, affects their motivation for TPD and provide an insight into part of the TPD culture. Understanding the school environment will shed light on the practices of teachers and give an indication of their areas of need for TPD. At the same time, school leaders will also understand how a culture can become 'so entrenched that it becomes a constraint on innovation' (Sergiovanni 2009, p. 161).

In this study, the terms 'principal' and 'school leaders' both refer to the person and persons responsible for leading and managing the TPD plan in schools. In Singapore schools, the vice-principals and a school staff developer (SSD) support the school principal. Together, they form the school leadership team and plan the school's professional training plan. The SSD is usually tasked with the execution of the plan and works closely with the teachers, also acting as the link to the school leaders.

9.2 The Need for Teachers to Engage in TPD in Schools

In Singapore, the focus of education is to prepare our human resource to manage themselves and the challenges of the twenty-first century. With the changing education landscape and the need to meet the needs of the economy, there is also a need to constantly upgrade teacher competencies in order to engage the current students in learning. With globalization and the fast-changing environment that we live in, it would appear that teachers are playing 'catch up' with the different ways that students are learning. By establishing a professional learning culture among the teachers, 'schools may produce teaching that is more knowledgeable and responsive to student needs' (Darling-Hammond 1988, p. 55).

School leaders have the responsibility of planning TPD for the school and always aim to do what is best with the students in mind. TPD, therefore, is a means to enhance the learning of the students, through honing the skills and competencies of the teachers. The school principal is ultimately held responsible for the overall school management, including TPD, although he/she may not always be directly involved in the operational process. The belief systems of these school leaders will have an impact on the culture of TPD in their school. However, Cooper (1988) believes that teachers are responsible for creating this culture in spite of the school principals' belief systems. Following from this, Barth (1988) posits that 'the relationship between the teacher and principal…affects the character and quality of the school and the accomplishments of its students, more than any other factor' (p. 146). This relationship may well be the principals' attempts in motivating the teachers to attend TPD and the teachers' response to this, which will give an indication of whether teachers and principals share a common understanding for the need for professional development. While the study focuses on the school leadership and

the teachers, the beneficiaries of this study are still the students. It is then so important that school leaders create and contribute to a positive relationship between the teachers and themselves. This positive relationship will make communication easier between the teachers and school leaders, and help in encouraging teachers to attend TPD. The identification of these factors lie within the narratives of what the teachers articulate in the course of the study.

9.3 Leadership Styles

Four broad categories of basic leadership practices, as determined by the leadership styles, in the managing of effective schools were identified; and three as labeled by Hallinger and Heck (1998) are 'purposes', 'people' and 'structures and social systems'; Conger and Kanungo (1998) spoke about 'visioning strategies', 'efficacy-building strategies' and 'context-changing' strategies. Leithwood's (1994) categories are 'setting directions', 'developing people' and 'redesigning the organization' (Leithwood and Day 2007, p. 6). The fourth category of leadership practices, 'managing the instructional programme', is unique to schools and explicitly reflects concerns about the principal's role in improving instruction, resulting in research on models of instruction leadership. Successful leaders engage in all the four categories (Leithwood and Day 2007, p. 6).

Much has been researched about the influence of leadership styles on organizations. For example, the traditional belief that 'what gets rewarded, gets done' has a converse side to it, what is not rewarded will not get done. This is a form of 'transactional leadership' style operating in a bargaining environment where leaders and the people they lead are engaged in the exchange of goods and services for their own selfish reasons (Sergiovanni 1990, p. 23). If school leaders reward teachers for engaging in TPD, it may come to a point, where these rewards are seen as 'hygiene' factors and teachers will not be motivated to engage in any TPD anymore! This situation is less than ideal in the current education environment where many school leaders pride themselves to be instructional leaders part of the time, while adopting an eclectic leadership style. Depending on the situational contexts the school leaders find themselves in, they have the repertoire to apply themselves as the need calls for it, and this includes the traits of the instructional leader, the transformational leader and even the transactional leader.

The structures that are put in place in an organization reflect the prevailing leadership style of its leaders. As working conditions are dynamic, the impact of the different styles of leadership may affect the teaching environment within the school, as well as the teachers' motivation for participation in TPD. In the work of the Far East Lab as quoted by Sergiovanni (2009), the behaviours of school principals have a direct effect on the school's overall climate and on its instructional organization (p. 196). However, this begs the questions of how the teachers identify with their school leaders' style and work together towards the school's vision, or not. Sergiovanni (2009) suggests that school leaders assume different roles when

leading in different contexts. They can assume the role of an expert during training or that of a colleague when engaged in professional development with their staff. Teachers would then view their school leaders accordingly. Both leadership roles assumed by the school leaders, do not compromise the attention to honing teacher competencies and meeting the students' needs; yet the former promotes collegiality through the sharing of expert knowledge, while the latter may build on the level of trust between the school leaders and their teachers. Having said that, studies such as that conducted by Ben-Peretz (1998) has shown that 'teacher collegiality is considered to be a critical element of school cultures which, foster collective learning' (p. 53). Future research could focus on how teachers interpret 'collegiality' and whether it is a critical element in their schools' TPD culture.

9.4 Instructional Leadership and TPD

In the Singapore context, where academic achievement is a major component in the measure of school success, school leaders are held accountable for student outcomes, especially so by the parents. However, even if parents do not hold the school leaders responsible, these school leaders take responsibility for their students' academic performance and will do whatever it takes in their power to ensure that their schools succeed. School leaders have a tendency of adjusting their leadership styles to ensure that positive student outcomes are improved, or, at the least, sustained. In such instances, the school leaders adopt the stance of a coach with the purpose of building teacher capacity 'in such a way that each encounter results in reciprocal learning' for both the teacher and the school leader (Sergiovanni 2009, p. 309). According to Louis and Wahlstrom (2012), 'leadership practices targeted directly at improving instruction have significant effects on teachers' working relationships and indirectly on student achievement' (p. 25). The three areas of leadership practices are setting direction, developing people and redesigning the organization. Focusing on the practice of people development specifically, school leaders would have to stimulate their teachers intellectually, provide teachers with individualized support and providing teachers with an appropriate TPD model to guide them. In the Singapore context, the TGM guides teachers in all schools. In the area of people development, Louis and Wahlstrom related their work to that of Hallinger's instructional leadership and the principal's role in providing guidance that improves the teachers' classroom practices.

Hallinger (2011) affirms that 'both education and school improvement are about the development of human capacity' and that 'leadership for learning' is a component of this capacity building (p. 137). It is, therefore, no wonder that many school leaders in Singapore are observed to hone their instructional leadership and pedagogical knowledge; and engage in joint learning with their teachers, so as to better engage with their teachers in having shared experiencing a common instructional language for the school. It is common for Singapore schools to organize annual staff retreats that incorporate professional development as well as activities for

staff bonding. This practice of whole-school approach to TPD is best explained by Darling-Hammond (1988), 'that shared knowledge and shared commitment to extend that knowledge depend in large part on shared membership in a group, that articulate and supports their pursuit' (p. 68).

Robinson et al. (2008) found that the largest effects of instructional leadership were derived through the principals' support of and involvement in the professional learning of the teachers. 'Involvement' in the Singapore context in TPD, points to team learning where both the principals and their teachers attend the same training. More often than not, one of the objectives of such sessions is to short-circuit the process of jointly familiarizing with a same vocabulary for a particular initiative. However, principals also use these training sessions as platforms to reinforce a common vision and shared experience to foster unity. In aligning schools to MOE's focus of a student-centric education, the moral purpose of education cannot be dismissed, that of 'making a difference in the lives of students' (Fullan 2010, p. 414). It is thus important to examine the link between moral purpose and leadership. For changes to be sustained and teachers to be engaging in TPD, the moral purpose would have to be understood and shared by all in school.

Louis and Wahlstrom (2012) also found that both principal instructional leadership[1]—and shared leadership[2]—have significant effects on teachers' working relationships, with particular reference to the 'professional community', and on focused instruction (p. 37). 'Professional community' refers to the learning teams within a school consisting of teachers addressing a common concern. Professional community is closely associated with organizational learning, and the term 'professional learning communities' (Louis and Wahlstrom 2012, p. 33). Many schools in Singapore have embarked on their professional learning community (PLC) journey, and embracing the presence of a professional community appears to foster collective learning of new practices, especially so, when there is principal leadership (Louis and Wahlstrom 2012, p. 33). Louis and Wahlstrom (2012) 'emphasized' the importance of professional community, largely because accumulating evidence shows that it is related to improved instruction, student achievement and shared leadership. When viewed in the light of 'shared values, a common focus and collective responsibility for student learning, reflective dialogue about improvement, and the purposeful sharing of practices', building the professional community 'may be thought of as distributed leadership' (Louis and Wahlstrom 2012, p. 33). Leithwood (2005) in an earlier study 'identified "professional development experiences" as one of the factors that stimulate successful leadership' (p. 622). Following the results of the two studies cited, principals have a significant role in leading TPD as a means of ensuring that schools grow increasingly more effective in delivering positive student

[1] Instructional leadership as defined by Louis, Dretzke and Wahlstrom (2010) refers to those actions that a principal takes, or delegates to others; to promote growth in student learning.

[2] Shared leadership, used interchangeably with distributed leadership, as defined by Louis, Dretzke and Wahlstrom (2010) refers to the broad support for expanding teachers' participation in leadership and decision-making tasks.

outcomes; and this role may involve the principals' relinquishing their leadership role and empowering their teachers instead to take over this role.

Leithwood and Day (2007) identified four essential components of a school leader's repertoire classified as 'setting directions, developing people, redesigning the organization and improving the instructional programme. Almost all leadership practices considered instructionally helpful by principals and teachers are specific enactments of these core practices' (p. 57). Teachers and principals agree that the most instructionally helpful specific leadership practices are:

a. Focusing the school on goals and expectations for student achievement.
b. Keeping track of teachers' professional development needs.
c. Creating structures and opportunities for teachers to collaborate (Leithwood 2012, p. 57).

9.5 Transformational Leadership and TPD

Gurr and Drydale (2007) found that 'the "strong" leaders used a combination of influence and support strategies to achieve their school goals'. The source of the support strategies may be either top-down or bottom-up, but it was established that principals were characteristically 'hands-on' and acted as role models. The leadership style was inclusive in the way they were able to bring people along (p. 44). By adopting the inclusive and participative leadership style 'cleared a pathway for people to be involved and achieve by removing blockages and providing a clear vision serviced by adequate resources. Staff felt empowered within a structured yet supportive environment' (Gurr and Drydale 2007, p. 44). The principals established good relationships with a range of stakeholders that allowed them to develop strong networks and alliances.

The study conducted by Gurr and Drydale (2007) in Victoria, Australia, principals acted purposefully and strategically in three areas identified as student outcomes, teaching and learning; and school capacity building (p. 45). The principals in the study noted that they were the 'curriculum leaders' and purposefully aligned teachers to a particular teaching pedagogy (Gurr and Drydale 2007, p. 45), and engaging in TPD to put the whole school on the same journey.

TPD is a means to building school capacity and as explained by Gurr and Drydale (2007) refers to the development of the personal, professional, organizational and community; while teaching and learning refers to the quality of instruction as seen through the pedagogy, curriculum design, assessment and student learning (andragogy; p. 47). It is thus no surprise that TPD can be categorized under these areas.

'The primary aim of these practices is capacity building, which is understood to accomplish organizational goals, but also the disposition that staff members need to persist in applying such knowledge and skills. People are motivated by what they are good at. And mastery experiences, according to Bandura (1986), are the most powerful sources of efficacy. Building capacity that leads to a sense of mastery is

therefore highly motivational as well' (Leithwood 2012, p. 60). It is paramount that TPD must be meaningful to the teachers and meets the purpose of the school. In that way, teachers will experience that their commitment to the school is further enhanced by the TPD they are engaged in. It is then a spiral effect with success building upon past successes and reinforcing it.

Wahlstrom (2012) discovered that 'principals engage in two complementary behaviours to influence instruction. One behaviour aims to set a tone or culture in the building that supports continual professional learning (instructional ethos). The second behaviour involves taking explicit steps to engage with individual teachers about their own growth (instructional actions)' (p. 68). According to Gurr and Drysdale (2007), culture building in a school invokes 'a sense of confidence; providing a positive direction through their vision and enthusiasm; holding high expectations of staff and students; focusing on student and families; empowering staff; aligning the community, staff and school goals; promoting change in teaching and learning; and building capacity' (p. 42). The reason why school leaders spend much time in culture building is explained by Leithwood and Jantzi (2012) who found that 'school leaders have an impact on student achievement primarily through their influence on teachers' motivation and working conditions' (p. 1). Sergiovanni (2009) views 'cultural leadership' in terms of manipulation and control (p. 18). The challenge for school leaders is how they impress upon their teachers that TPD is a form of motivation, not manipulation; and that some form of control is necessary in the school, as with any other organizations.

On the other hand, transformative leadership sees both the leaders and their followers 'united in pursuit of higher-level goals common to both' (Sergiovanni 1990, p. 24). In such environments, both the leaders and their followers build on each other's successes. The psyche of collective achievement as a team effort eventually converges; and leads to better working relationships among the staff. Sergiovanni (1990) found that 'leadership by bonding' is a response to 'human needs as the desire for purpose, meaning and significance in what one does (p. 24) and is the 'cornerstone…in inspiring extraordinary commitment and performance' (p. 27). This finding is especially useful when planning TPD.

Transformational school leaders create a climate in which teachers engage in continuous learning and in which they routinely share their learning. These leaders also work with other teachers in the school community to identify personal goals and then to link these to the broader educational goals (Hallinger 2010, p. 338). In the long run, the objective is to create an environment that will motivate teachers to take responsibility for their TPD and work towards school improvement without much direction from the principal. The principal's role in TPD is to foster group goals, and modelling desired behaviour (Hallinger 2010, p. 339). Despite the principals' attendance at training sessions together with the teachers, the knowledge gleaned from these sessions remain as information until it is transformed and applied or shared with fellow teachers for application in the context of the respective schools (Fullan 2010, p. 410). In my opinion, it would be beneficial for schools to adopt Fullan's 'Knowledge Sharing Paradigm' (Fullan 2010, p. 411) so that the information interacts with the school environment and is then transformed to knowledge critical for school improvement.

9.6 Learner-Centred Education and TPD

The shift in results-oriented approach to that of a more student-centric focus in the recent Singapore's education landscape has seen many school leaders also shifting to a more learner-centred education (LCE) for their schools. This approach builds on the school leaders' knowledge as an instructional leader. The areas to be further honed include that of guiding, supervising and evaluating of teachers (Barends 2004, p. 1). How the school leaders relate to the teachers becomes an area of attention, as there has to be a balance between the evaluative role and the developmental role of the school leaders.

Related to the transformational leadership approach, is the shift of the learning culture within the school. By encouraging teachers to be leaders to develop their areas of learning, leaders within these areas will emerge, recognized by their peers. The school leader's role is then more of a collaborative leader, linking the different areas of learning into meaningful segments that will serve the school's needs.

As the students are central to this approach, teachers have to be cognizant of the emerging and new literature on motivating and managing present-day children. This will involve much reading and searching for innovative techniques to engage students in their learning. While technology can assist with the tools to facilitate learning, the teachers and the school leaders must have a more open mindset to experimenting with technology and new methods of teaching that may not be sufficiently supported by empirical research. Teachers must therefore possess an updated set of facilitation skills, as they must be prepared to learn alongside their students, as they may not possess all the answers.

The above practices have implication on TPD as teachers must adopt a more adventurous stance to teaching while remaining focused on a learner-centred goal. Having said this, teachers' knowledge in instructional pedagogy must be of a level sufficient to facilitate student learning and also to recognize opportunities for innovation. The challenge of being an effective teacher just became even more challenging, and teachers must be convinced in their foundational beliefs of their students, that all children are able to learn, despite them requiring new skills. Perhaps in keeping with the preparation of the students of the unknown future, the LCE is an approach that brings educators back to the basics of 'people needing to think and learn for themselves' (Carl Rogers, as quoted by Barends (2004), p. 3).

The role of the school leader in supporting LCE is then of helping to 'establish, develop and maintain a teaching staff, which will provide the best possible opportunities for teaching and learning' (Chetty 1993, p. 89). TPD can help in facilitating the shift from a teacher-controlled instruction style to that of LCE. The challenge is how the school leaders communicate this to their teachers and inspire them believe that LCE will benefit their students, and how engaging in TPD will help the teachers expand their repertoire of teaching competencies.

9.7 Importance of Trust and Collegiality in TPD

Much of the success in school leadership has been attributed to the level of trust in a school environment (Sergiovanni 2009; Hallinger 2003; Handford and Leithwood 2013). In examining the relationship between school leaders and their teachers, trust has been identified as 'a critical concept for leaders to understand and develop because it serves as a "lubricant" for most interactions in their organizations' (Handford and Leithwood 2013, p. 194). 'Teachers highlighted the importance of building mutual trust between students, between students and teachers, and between teachers and leaders. Mutual trust and respect were at the core of what they thought should count as a successful school' (Møller et al. 2007, p. 82). However, as to what constitutes 'trust', it appears that this definition is context specific and differs from school to school, depending on the relationship that the principal has with the school and the time that the principal has been with the school. While trust takes time to build, it also takes time to unpack; ironically, depending on the level of trust between the principal and their staff.

An alignment of beliefs between principals and teachers would be a good place to start in their trust relationship. It is, therefore, paramount that teachers be given an opportunity to clarify their doubts and check their understanding of the communication between the principal and the school. This would establish the shared values of the school community and promote understanding among the staff. A sense of community is important as it strengthens the school's commitment and efforts toward improving connections, coherence, capacity and collaboration (Sergiovanni 2009, p. 119).

In promoting teachers' commitment to the school, principals are encouraging continual TPD, vital to keep the staff nimble and adaptive to the changes in the wider community (Sergiovanni 2009, p. 120). Commitment, when linked to loyalty, points to the trust that teachers have in the school and the school leadership. As described by Sergiovanni (2009), 'leadership play by different rules' (p. 123), referring to the contextual factors that impact and influence school-based decision. Therefore, in order to understand the local context of the antecedents of successful leadership practices, more research has to be conducted in the local schools.

In unpacking what constitutes 'trust', Handford and Leithwood (2013) identified among other components, the traits of competence, openness, consistency and reliability. In their study, the teachers surveyed indicated that the trustworthiness of principals had much influence in their work; and that the perceived competence of the principals' ability to lead affected the level of trust (p. 201). The same teachers also associated trust with the principals' personal dedication to the school and actions in leading the school to some desired shared outcome. Conversely, the teachers do not trust a principal who appears to be consistently pursuing his own narrow self-interests (Handford and Leithwood 2013, p. 197).

Collegiality is an indication of the level of trust within the school. Collegial conversations and support involves the teachers helping each other in addressing issues and concerns related to their teaching practice. It is not to be confused with congenial conversations that deliberately avoid discussions of existing problems (Nelson et al. 2010, p. 176)

A platform that many Singapore schools use to promote collaboration among the teachers, is that of the PLC. As many schools already have this platform in place, it will be used as a point of discussion on demonstrations of collegiality when teachers are engaged in TPD.

9.8 Future Research

Cindi Rigsbee, a North Carolina Teacher of the Year (2009), shared that effective principals are those who equip their teachers to be leaders in the classroom and strongly encourage their teachers to engage in TPD. Her principal, who made her 'want to be a better teacher', inspired her. This points to the relationship between the teachers and the school leaders as a source for motivation for teachers to engage in TPD. Leithwood and Jantzi (2012) findings in shared leadership between teachers and school leaders, affirms Rigbee's personal sharing. Future research could thus focus on exploring issues related to school leadership styles that influence and impact teachers' outlook toward TPD. Further to this, the investigation can extend to finding aspects of the relationship between school leaders and their teachers that could support the latter in their active pursuit of professional development.

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Chapter 10
Using Technology to Scaffold Problem-Based Learning in Teacher Education: Its Tensions and Implications for Educational Leaders

Bee Leng Chua, Oon Seng Tan and Woon Chia Liu

10.1 Introduction

Learning in the twenty-first-century classroom is about equipping students with the knowledge, skills and attitudes that allow for independent learning and problem solving in all aspects of their lives. It is about developing intelligence for independent learning, creative thinking and real-life problem solving (Tan 2003). Therefore, the focus of education must shift from knowing to thinking, with a greater emphasis on actively involving students in the processes of meaning making and knowledge construction.

Problem-based learning (PBL) is an innovative pedagogical approach whereby real-life problems (rather than direct instruction) are the focal points for learning (Boud and Feletti 1996). Having originated from the medical profession, it involves learners working on authentic problems through an iterative cycle of collecting, connecting and communicating information. The experience of engaging in the solving of authentic problems harnesses and develops learners' ability to deal with novelty and complexity (Tan 2003). Through solving "real-life" problems, students are able to activate their prior knowledge, integrate their learning across different disciplines and develop cognitive skills, attitudes and reflective practices that nurture them to be independent lifelong learners and creative problem solvers.

Prior studies in PBL showed that learners who went through PBL viewed themselves as being more equipped with problem solving, information gathering, reflective and self-directed learning skills (Albanese and Mitchell 1993; Vernon and Blake 1993). Other positive effects include greater knowledge retention and greater motivation towards self-directed and collaborative learning (Albanese and Mitchell 1993; Wheeler et al. 2005). Within the context of professional teacher education, PBL is deemed to be able to trigger the cognitive, reasoning, motivational

B. L. Chua (✉) · O. S. Tan · W. C. Liu
National Institute of Education, Nanyang Technological University, Singapore
e-mail: beeleng.chua@nie.edu.sg

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and collaborative processes that are crucial in today's teaching and learning environment (Barrows and Myers 1993; Chrispeels and Martin 1998). Indeed, PBL is seen to have a positive impact on pre-service teachers' cognitive skills, self-directed learning skills, problem-solving skills, motivation and self-efficacy (Chua 2013; Etherington 2011; Koray et al. 2008; McPhee 2002).

As a constructivist, learner-centred approach to learning, PBL is seen as a promising pedagogy at the National Institute of Education (NIE) to satisfy the dual roles inherent in teacher education (Howard 2002). First, NIE's teacher education program aims to equip pre-service teachers with the pedagogical knowledge of designing PBL environments for their future classrooms. Second, through PBL, pre-service teachers would be able to experience and facilitate their students' transfer of learning from the classroom to their future lives.

10.2 Overview of the PBL Component in the Educational Psychology Course

It is pertinent that we give an overview of PBL in the educational psychology course before we demonstrate how technology can help to scaffold pre-service teachers' PBL. The educational psychology course in NIE provides the foundation for understanding learners, the development of learners and the psychology of learning. The learning objectives of the course are (i) understanding the concepts of learning theories, (ii) synthesising the concepts of student development and learning theories and applying this knowledge in teaching and designing learning experiences and (iii) nurturing pre-service teachers' professional and personal competencies. The topics covered include the cognitive, social, emotional, personal and moral development of learners, learning theories, motivation and assessment. From the array of topics, a decision was made by the coordinators to utilise the PBL pedagogy for the teaching of learning theories. The topic was chosen because past cohorts of pre-service teachers found the taught content too theoretical and abstract and failed to see its applications within the classroom. The use of the PBL approach allows the pre-service teachers to apply theories to real classroom issues thus deepening their understanding of the learning theories.

In this research, the PBL component was designed to last 7 weeks out of the 13 weeks of the educational psychology course. Pre-service teachers went through the PBL cycle (Fig. 10.1). There were structured weekly sessions of 2 hours each for the first three stages of the PBL cycle to facilitate group discussions and to enable tutor facilitation. PBL is often conducted under the guidance of instructors and facilitators, and pre-service teachers in the educational psychology module were similarly assisted by their respective tutors. During the first session of PBL, pre-service teachers were given an overview of PBL, its philosophy, objectives and evaluation process. The pre-service teachers were then divided into groups of three to five and were presented with the problem scenario and the PBL portfolio. The PBL portfolio comprised a set of question prompts for each stage of the PBL cycle

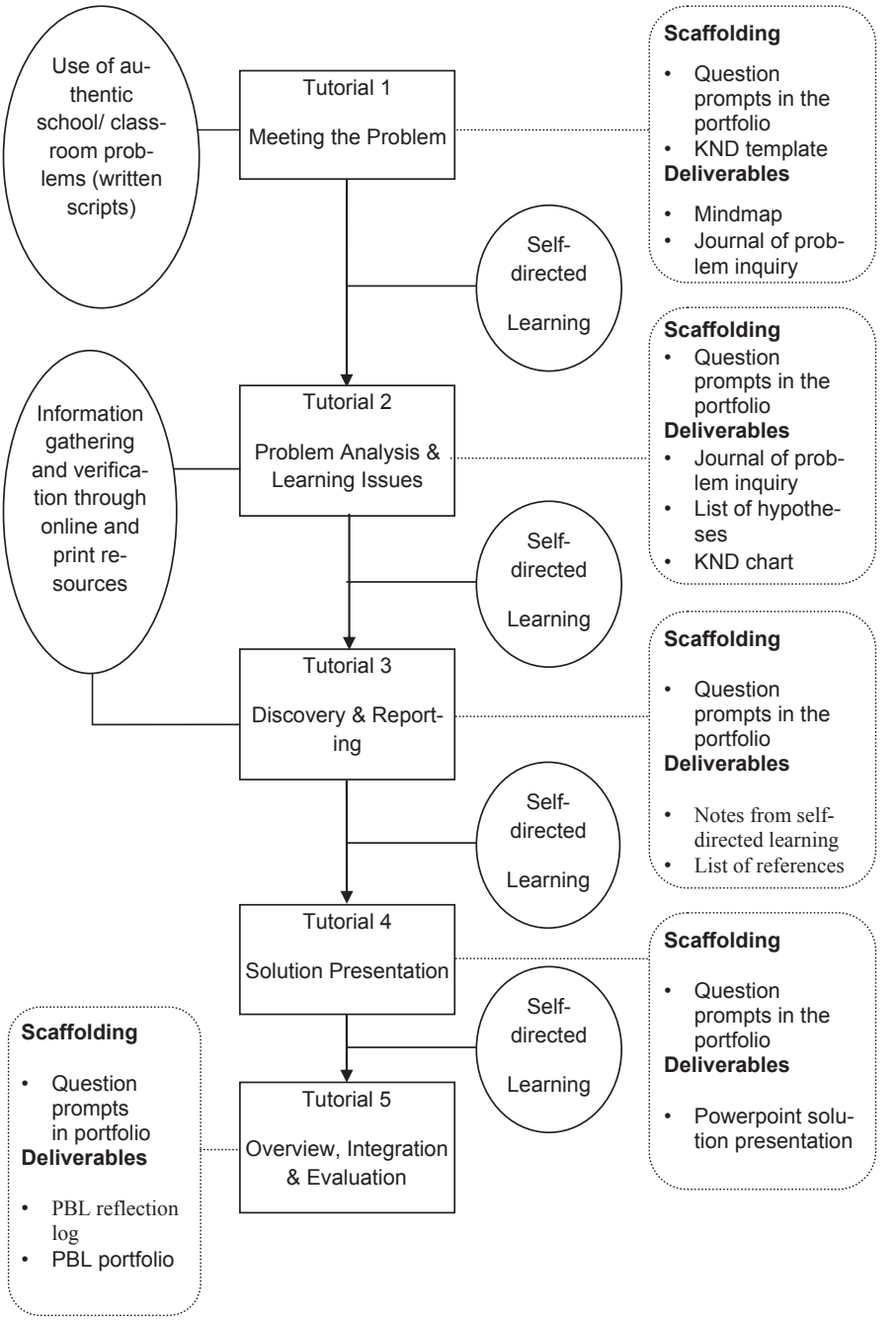


Fig. 10.1 The PBL Cycle

to initiate and sustain pre-service teachers' inquiry process. After the first three sessions of PBL, the pre-service teachers had the autonomy to decide on the number of face-to-face meetings needed to complete the group project. The role of the tutor was to clarify expectations of the group project, scaffold the learning process, to manage group interactions and if necessary, to maintain the group's focus. The last two tutorial sessions lasted 2 hours each, and were dedicated to the presentations of the various PBL groups, followed by their reflections of the PBL learning process. This PBL group project constituted 40 % of the overall assessment.

10.3 The PBL Model

The following five sections explain in detail each stage of the PBL cycle.

Stage 1: Meeting the Problem At this stage, pre-service teachers were introduced to their problem scenarios. The problem scenarios were all written by teachers in schools. They were contextualised to reflect the challenges faced by teachers in typical Singapore schools. Issues and problems from the school environment were "brought" into the university curriculum to strengthen the learners' theory-practice link, thus demonstrating how their learning can be transferred to their professional practice in the future. Pre-service teachers in their respective PBL groups were given their authentic problem scenario in a written script format. Problems were all unstructured and complex to trigger "good questions" from the pre-service teachers. Below is an excerpt of one of the problem scenarios:

> *SCENE 1 (In the staffroom)*
> Ms Jia is sitting at her table, staring into space, drained of every bit of her energy after class, and then with a sigh writes a to-do list
> Items on the to-do-list:
> (as she is listing the items to be done, she mutters and mumbles to herself)
> Ms Jia (muttering): "How am I going to manage…. One after another…. Endless meetings…. (sigh) Should I even have signed up for teaching?" (puts her pen down, looks into space), "Does the problem lie with me or the students?", "How can others teach for so many years?" Maybe, I should have…
>
> *SCENE 2 (In classroom)*
> The class is sitting for a maths test and in the midst of it, John drops an eraser on to the floor and while he is attempting to retrieve it, his teacher, Ms Jia walks up to him. (She suspects him of cheating).
> Ms Jia: John (raising her voice), You think I'm blind? Don't try cheating.
> John: (looks puzzled) Teacher, what do you mean?
> Ms Jia: I've eyes behind me. Don't pretend, I saw you trying to look at Annie's paper. It's shameful that you would actually try to copy her answers.
> John: (angry at being accused) Oy! What nonsense! I was just trying to pick up my eraser!

A PBL portfolio, which contained question prompts, course resource materials, templates, mind maps and expected deliverables in PowerPoint slides (see Fig. 10.2), was used to scaffold the pre-service teachers' learning at each stage of their PBL experience. Placing appropriate question prompts at each stage of the PBL cycle has

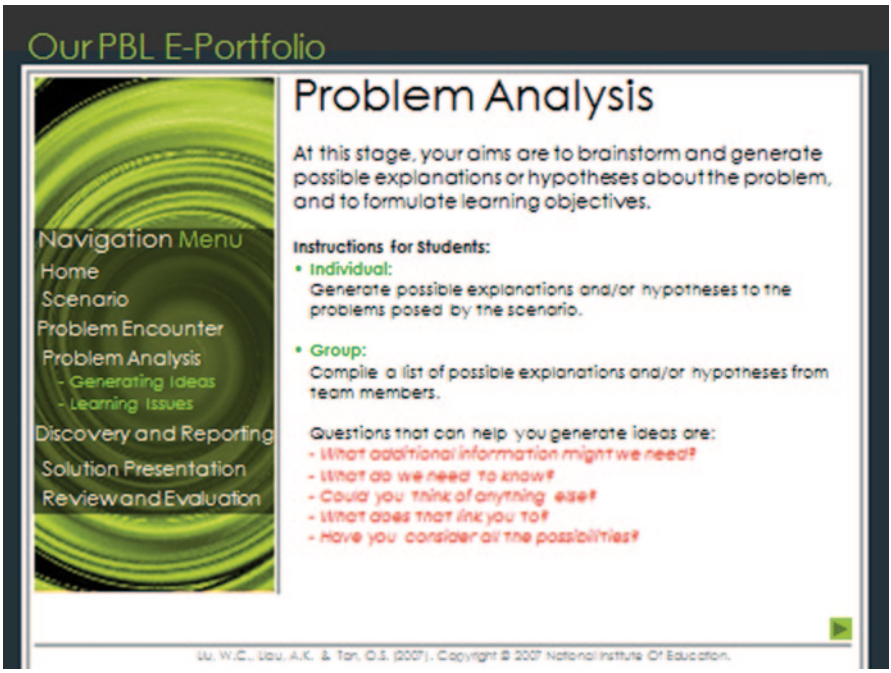


Fig. 10.2 Question prompts at problem analysis stage

been demonstrated to enhance cognitive, metacognitive and self-regulatory abilities (Ge and Land 2003; Ge et al. 2005). Past research has shown that question prompts promote cognitive strategies such as analysing, elaborating, synthesising, evaluating, planning, monitoring and self-reflection (Chi et al. 1989; King 1991, King 1992; Lin and Lehman 1999; Scardamalia and Bereiter 1989). The prompts also serve as milestones for the PBL problem-solving process (Ge and Land 2003; Ge et al. 2005). In this way, the complex PBL problem-solving process was broken into manageable tasks and pre-service teachers were assured that they were on the right track.

Collaborative teamwork is an important feature of PBL as pre-service teachers gathered, reviewed and shared information. Pre-service teachers did their own individual learning, reflection and inquiry of the problem scenario after which they would come together as a group to brainstorm and identify specific problems in the scenario and generate questions of inquiry that considered the application of learning theories. Mind maps, [1]KND charts and journals of problem inquiry were tools introduced to help pre-service teachers connect and document their thoughts.

Stage 2: Problem Analysis and Learning Issues At this stage, the pre-service teachers in their PBL groups brainstormed and analysed the problem scenario, while generating hypotheses and possible explanations. The group embarked on the iden-

tification of learning issues, learning objectives and the formulation of a problem statement, with the help of scaffold templates. Additional templates like the work plan template and KND chart template[1] were also made available to learners. Pre-service teachers assumed ownership of their learning as they gathered information and verified the reliability and validity of the information obtained. Learners' deliverables included a journal of problem inquiry, list of hypotheses, possible explanations and KND chart which identify the learning issues and learning objectives. The focus for the pre-service teachers at this stage was to ask good and relevant questions that would facilitate their problem-solving process.

Stage 3: Discovery and Reporting At this stage, the pre-service teachers individually prepared notes and pointers to share and peer teach each other. Pre-service teachers' thinking was made visible as they come together to co-construct knowledge. Statements on sources of learning, information and research were reported. During this stage, pre-service teachers constantly advanced the group's collective understanding through seeking clarification, questioning and challenging one another. Solutions were developed based on multiple perspectives, which required individual pre-service teachers to justify their particular viewpoints. In this PBL approach, tutors' facilitation after the first three sessions was done mainly through emails or meetings initiated by the PBL groups.

Stage 4: Solution Presentation At this phase, pre-service teachers articulated their group's problem statement, research hypotheses and proposed solutions. Mind maps, KND chart, journal of problem inquiry, theories and other relevant information, which led to their proposed solutions, were part of the presentation. The main purpose of the presentation was to explain and justify their group's proposed solutions to their peers and tutor. After the presentation, during the Question and Answer session, their classmates analysed and compared the proposed solutions with that of their peers, and those recommended by experts. New learning and understanding in the class was constructed as such presentations "allow learners to relate course content to prior knowledge and experience through the analysis, synthesis and evaluations of others' understanding" (Gilbert and Dabbagh 2005), p. 6). It was at this stage that the theory-practice nexus was strengthened as pre-service teachers were using theories to support their proposed solutions.

Stage 5: Overview, Integration and Evaluation After embarking on a collaborative knowledge-building process in the earlier PBL stages, pre-service teachers synthesised, reflected, evaluated and internalised their individual learning at this final stage of the PBL journey. The PBL portfolio contained a set of questions that helped structure the pre-service teacher's reflections on his/her PBL experience. This reflective experience encourages higher-order cognition, such as analysis, synthesis, evaluation and clarity of thoughts (Garrison 1993) as well as metacognition and self-regulated learning. Each PBL group submitted a set of PowerPoint slides

[1] KND is a template with "**What** you Know", "What you **Need** to know" and "What you **Do**" as column headings.

which documented the group as well as individual learning processes. This set of PowerPoint slides comprised pre-service teachers' journal of problem inquiry, list of hypotheses, problem statement, mind map, KND chart and reflection logs.

10.4 Technology-Enhanced PBL (e-PBL)

According to Tan (2007), p. 232), "it is essential to recognise that educators today need to be able to design and make use of e-learning environments as a tool not only to vary the mode of learning but more importantly to scaffold and enhance thinking and problem solving". However, it is always a challenge to develop an e-learning environment with scaffolding systems which comprise learning objects, e-tools and e-platforms to facilitate the inquiry-learning process, metacognitive awareness and self-regulatory abilities (Tan 2007). These challenges include the perceived ease of use and usefulness of technology as an educational tool, the cost of developing the e-learning environment and faculty's competencies in developing and facilitating technology-enhanced learning environment. In the technology-enhanced PBL (e-PBL) model, the essential stages and characteristics of the PBL cycle were similar to those of the PBL model. However, in lieu of the PowerPoint slides that contained questions for each stage of the PBL process, an e-learning platform was used to provide the scaffolding. In the year 2009–2011, PBworks was selected as the e-learning platform for all student teachers undergoing the core educational psychology course. PBworks serves as a web-based cognitive system which integrates learning objects, e-tools and e-platforms to promote online collaborations between team members. With the introduction of a web-based scaffold system, the traditional PBL was enhanced in the following ways:

Embedded learning objects allowed pre-service teachers' access to essential information about the group project such as the overview of PBL, course and project information. Navigation support videos and a list of frequently asked questions (FAQs) provided pre-service teachers with the technical help needed to navigate the PBworks platform (refer to Figs. 10.3 and 10.4). The availability of easily accessible technical information assisted pre-service teachers in their inquiry-based learning. In empowering the pre-service teachers to take ownership of accessing relevant information whenever required, this set-up promotes self-awareness and self-directed behaviours.

Use of video technology for the problem scenarios in e-PBL provided a richer perceptual experience for pre-service teachers. According to Tan and Looi (2007), p. 148), "multimedia enables rich contextualised problem cases to be represented realistically and digitally, which means that learners can review the problems as many times as necessary, and scrutinise the problem in its rich context". Figure 10.5 depicts an example of the authentic classroom video footage:

Use of E-question prompts at every stage of the PBL cycle sequentially structured and facilitated pre-service teachers' problem-solving process in PBL. An example is shown in Fig. 10.6:

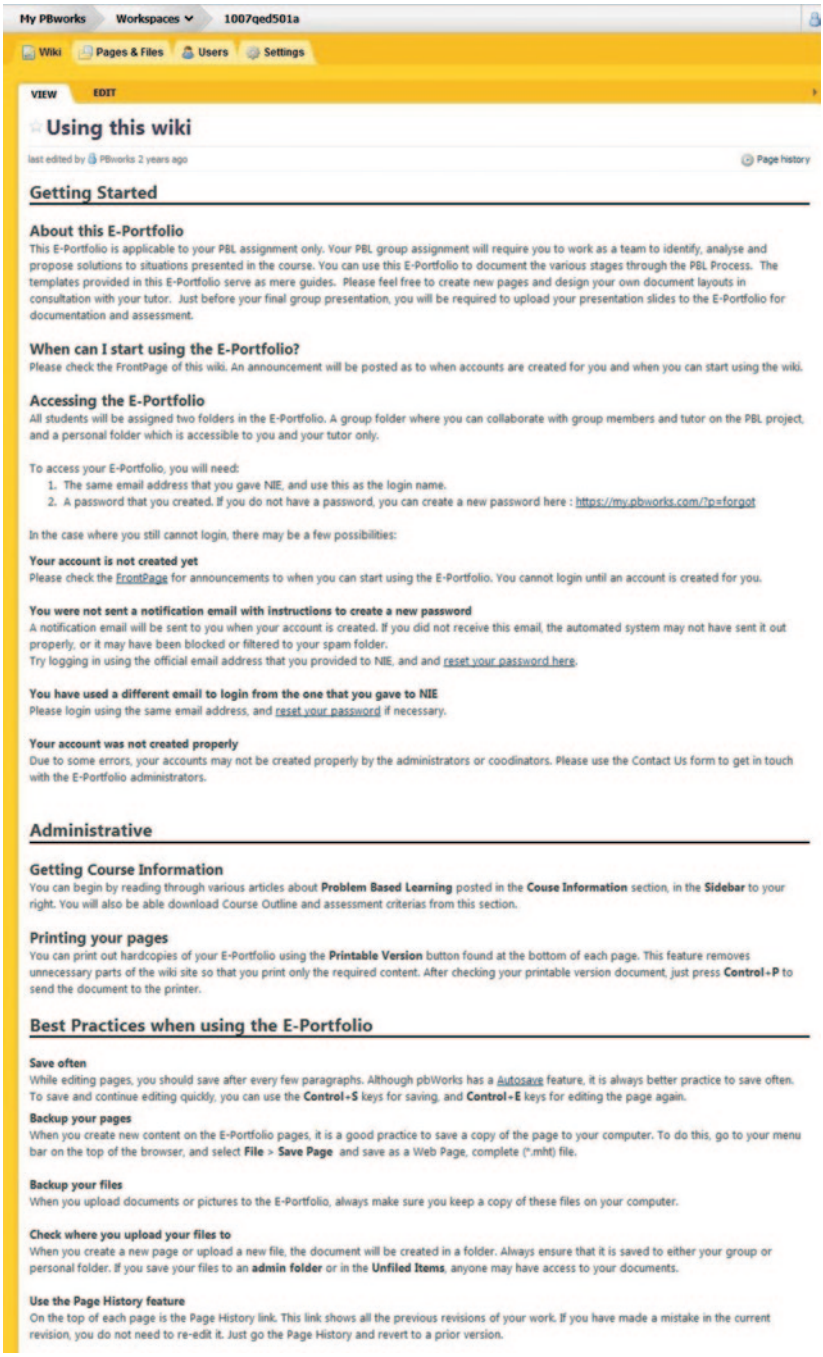


Fig. 10.3 Navigation support for portfolio

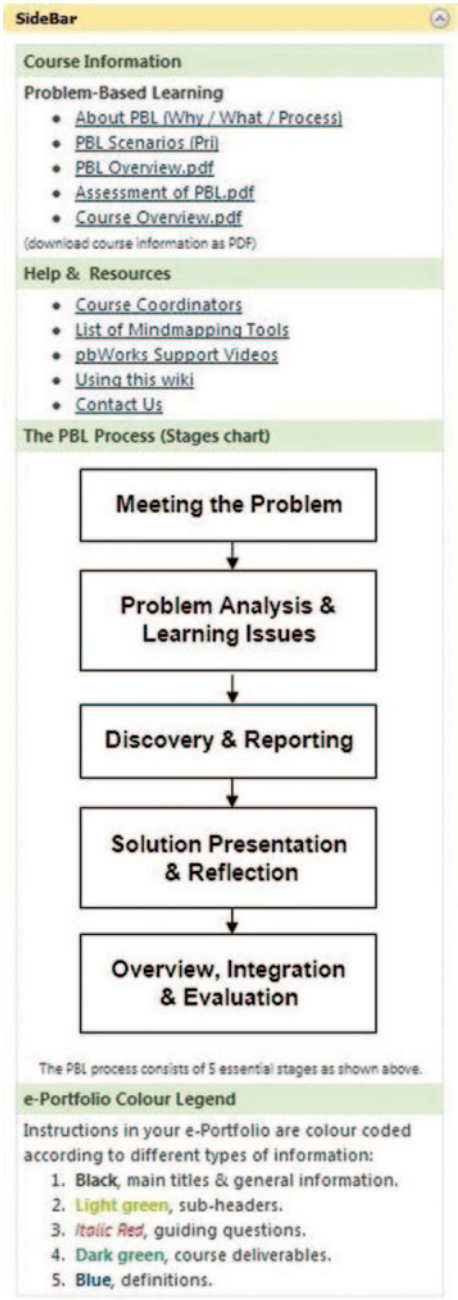


Fig. 10.4 Course and PBL overview

Fig. 10.5 Video footage of classroom scenario for e-PBL

Use of E-tools and E-templates such as mind maps and KND charts (refer to Figs. 10.7 and 10.8) provide the anchor for online collaboration and are useful physical representations that would guide pre-service teachers' discussion and development of shared perspectives, artefacts and solutions (Jonassen 1997).

E-discussion forums such as asynchronous discussion threads and synchronous online collaborations bring forth meaningful negotiation between peers and active seeking of opinions from the tutors at any place and time (refer to Fig. 10.9). Asynchronous discussions have the advantage of allowing contributors to pace the

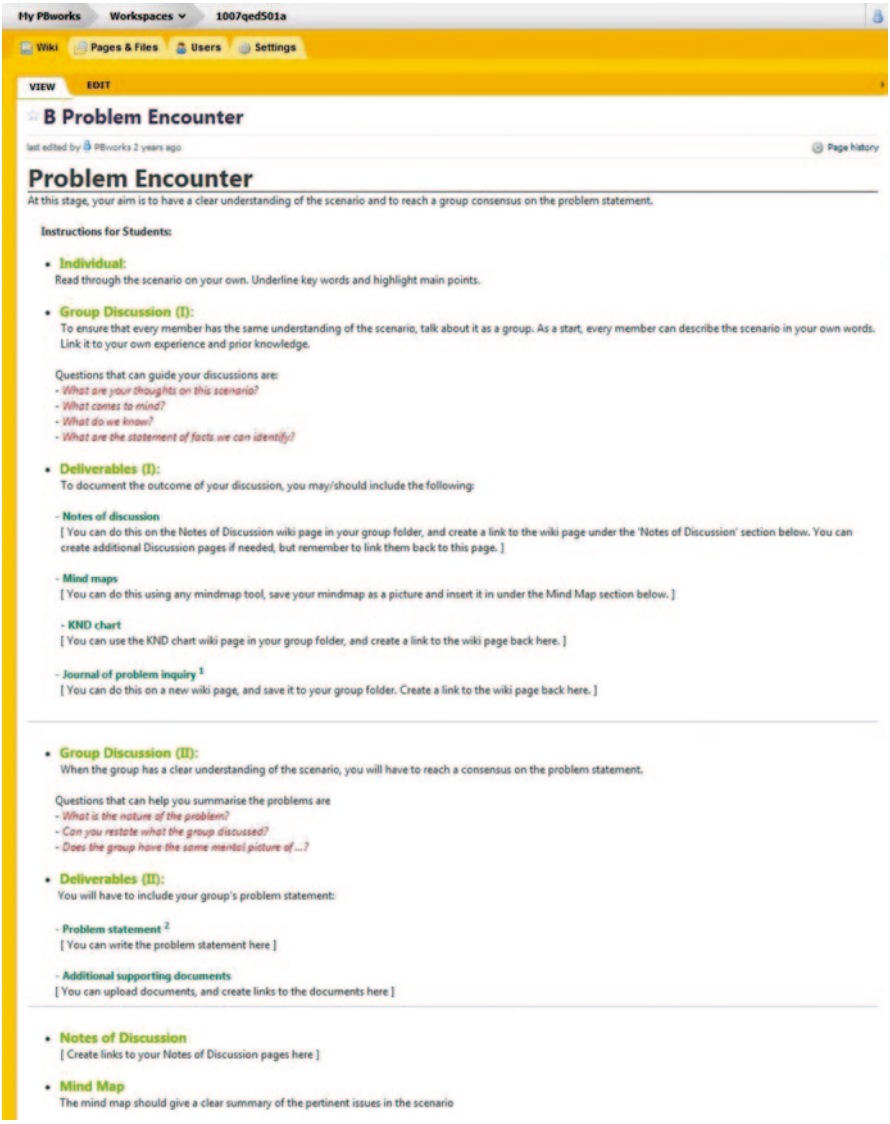


Fig. 10.6 E-question prompts at problem encounter stage for e-PBL

communications (Leeman 1987), thus allowing learners to have time to think and be more critical and reflective in their responses. In addition, learners can participate simultaneously in multiple discussion threads without the fear of being interrupted (Hammond 1999). Thus, technological advancements have allowed collaborative learners to overcome the time and spatial constraints normally associated with face-to-face meetings and collaborations.

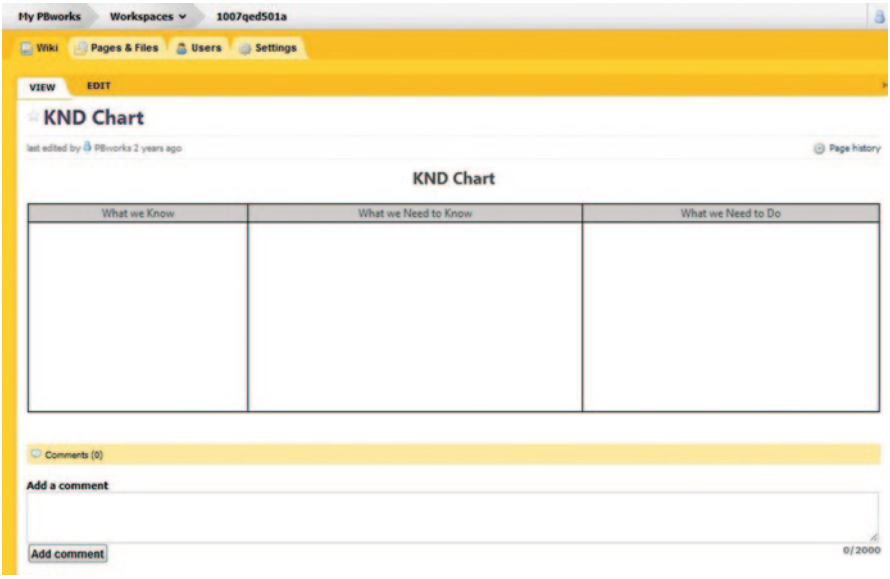


Fig. 10.7 KND chart in e-PBL environment

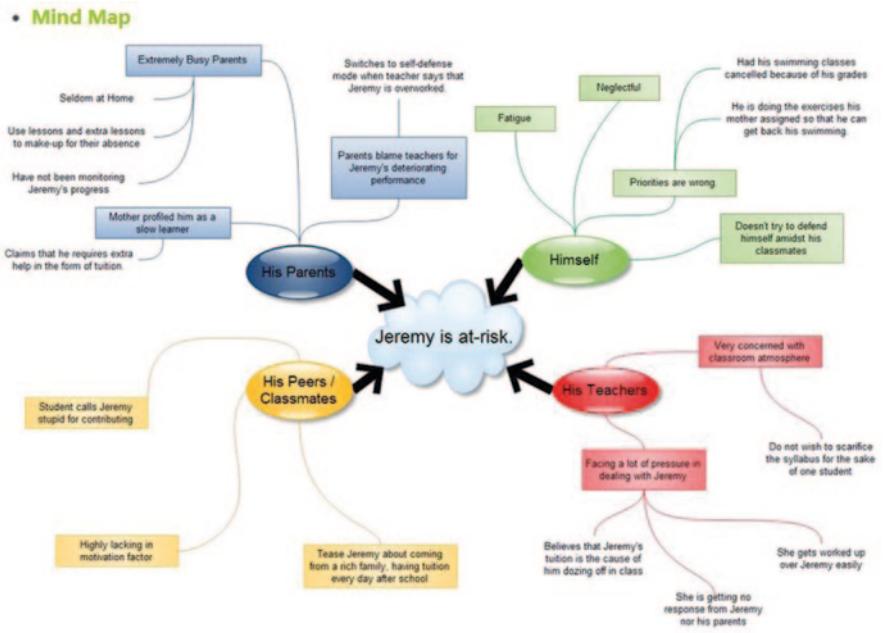
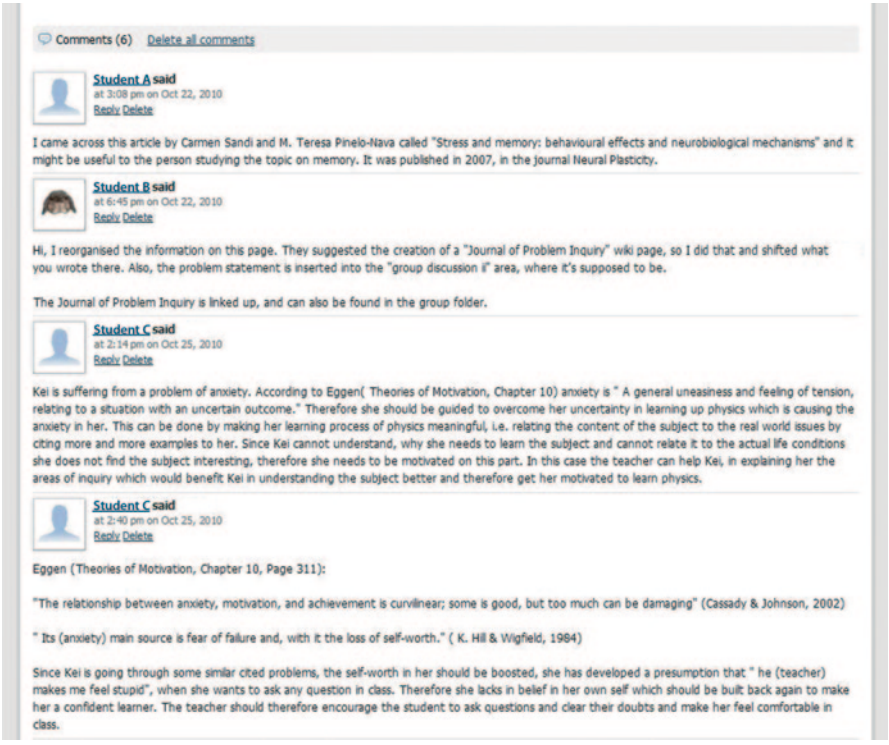


Fig. 10.8 Example of pre-service teachers' mind map


Comments (6) Delete all comments

Student A said
at 3:08 pm on Oct 22, 2010
Reply Delete

I came across this article by Carmen Sandi and M. Teresa Pinelo-Nava called "Stress and memory: behavioural effects and neurobiological mechanisms" and it might be useful to the person studying the topic on memory. It was published in 2007, in the journal Neural Plasticity.

Student B said
at 6:45 pm on Oct 22, 2010
Reply Delete

Hi, I reorganised the information on this page. They suggested the creation of a "Journal of Problem Inquiry" wiki page, so I did that and shifted what you wrote there. Also, the problem statement is inserted into the "group discussion ii" area, where it's supposed to be.

The Journal of Problem Inquiry is linked up, and can also be found in the group folder.

Student C said
at 2:14 pm on Oct 25, 2010
Reply Delete

Kei is suffering from a problem of anxiety. According to Eggen(Theories of Motivation, Chapter 10) anxiety is " A general uneasiness and feeling of tension, relating to a situation with an uncertain outcome." Therefore she should be guided to overcome her uncertainty in learning up physics which is causing the anxiety in her. This can be done by making her learning process of physics meaningful, i.e. relating the content of the subject to the real world issues by citing more and more examples to her. Since Kei cannot understand, why she needs to learn the subject and cannot relate it to the actual life conditions she does not find the subject interesting, therefore she needs to be motivated on this part. In this case the teacher can help Kei, in explaining her the areas of inquiry which would benefit Kei in understanding the subject better and therefore get her motivated to learn physics.

Student C said
at 2:40 pm on Oct 25, 2010
Reply Delete

Eggen (Theories of Motivation, Chapter 10, Page 311):

"The relationship between anxiety, motivation, and achievement is curvilinear; some is good, but too much can be damaging" (Cassady & Johnson, 2002)

" Its (anxiety) main source is fear of failure and, with it the loss of self-worth." (K. Hill & Wigfield, 1984)

Since Kei is going through some similar cited problems, the self-worth in her should be boosted, she has developed a presumption that " he (teacher) makes me feel stupid", when she wants to ask any question in class. Therefore she lacks in belief in her own self which should be built back again to make her a confident learner. The teacher should therefore encourage the student to ask questions and clear their doubts and make her feel comfortable in class.

Fig. 10.9 Example of pre-service teachers' discussion threads

Riding on the PBworks platform, the portfolio in e-PBL was a knowledge-building tool that facilitated the traditional PBL process by providing opportunities for pre-service teachers to assume cognitive responsibilities to advance each other's knowledge through problem solving (Hewitt-Taylor 2001; Scardamalia 2002) at any time and place. This is because the pre-service teachers were better supported as they could locate, retrieve and interact with resources, tools and engage with teachers and peers whenever needed, without being constrained by time or location. This is especially favourable because PBL is an iterative problem-solving process. Indeed, according to Tan and Looi (2007), p. 159), "a knowledge-building tool mediates the process of collaboration among learners; promotes inquiry, sense making and reflective thinking; facilitates knowledge building and provides record keeping".

10.5 Tensions and Implications

Riding on the advent of technology, we can harness the potential and viability of e-platforms to increase students' engagement in learning. As reflected above, the authenticity of the problem scenario could be enhanced through its presentation in

video format. In addition, with the use of distributed scaffolding through e-tools (i.e. question prompts, mind maps, templates), e-objects (i.e. resources on PBL philosophy, content matter) and e-platforms (i.e. asynchronous discussion threads, synchronous editing), the constraint of human, time and physical resources can be alleviated. Furthermore, the effect of detrimental human factors on pre-service teachers' learning processes (i.e. insufficient or excessive guidance) is minimised, as there is more control over the amount and appropriateness of the scaffolding through the design of the e-PBL environment. However, as elaborated below, there are tensions and implications for leaders to consider before championing the use of technology to enrich students' learning experiences.

Pedagogy Drives Technology As educational leaders, we recognise that it is the pedagogy that drives students' learning in the classroom and technology is a tool for collecting, connecting and communicating information that enriches and facilitates students' knowledge construction. Educational leaders and instructors should have clarity on the pedagogies and strategies that they would adopt to engage and motivate their learners and on how the affordances of technology, such as easy accessibility to information and connectivity with people globally, could be harnessed to empower students in their knowledge creation and acquisition. Even with the understanding and knowledge on how to integrate technology seamlessly into the curriculum to support pedagogies, educational leaders may find themselves facing the dilemma of simplicity versus sophistication. For example, as mentioned in the preceding sections, an e-learning environment riding on PBWorks was designed to ensure the timelines of delivery and ease of access to learning objects, question prompts, templates and e-platforms to facilitate the pre-service teachers' inquiry-learning process. Educational technologists and administrators are needed to design, implement and support the e-learning environment. As such, finance resources must be set aside for the implementation of such an initiative.

The key question for educators would then be: "What are the value propositions of designing and building an e-learning environment to facilitate learners' thought processes versus broadcasting the question prompts and templates via email? Do these value propositions justify the costs of the technological initiative?" Indeed, despite being surrounded by rapid technological advancement, educators have to keep a level head regarding the cost-effectiveness of adopting more sophisticated technologies. They should be constantly mindful of the effectiveness of simpler alternatives.

Technological Pedagogical Content Knowledge In the designing of e-learning environments, educators must be mindful of the role of technological pedagogical content knowledge. Technological pedagogical content knowledge is the knowledge of the integration of technology and the teaching of the subject and it highlights the interactions and connections between technology, pedagogy and content (Mishra and Koehler 2006). Educators need to understand how the introduction of technology may influence the teaching of the subject content and how the associated learning outcomes will vary based on the technology and pedagogy being used.

Time, Human and Physical Resources In any initiative, it is imperative to set aside time, human and physical resources to support the initiative. Different initiatives implemented in different contexts will face different sets of constraints. It is unrealistic to expect an initiative to be immediately successful on its initial trial. Thus, time must be set aside to pilot the initiative to allow the staff to learn through experience how to further improvise and refine the program before a full-scale implementation. Clear timelines and milestone checks have to be established and articulated. Selection of the right pool of staff with the relevant expertise, mindset and attitude to spearhead and scale the use of technology-enhanced environment is crucial to the success of the implementation. In addition, the leaders have to ensure that there are the necessary physical resources, in this case, technology hardware such as computers, iPads, smartphones, software and infrastructure (e.g. wireless Internet) to support teachers' use of technologically enhanced learning environment.

Staff Competencies Effort and financial support must be set aside to level up staff competencies both in the area of design and the use of innovative classroom pedagogies as well as the appropriate use of technology to support students' learning. It is important to have a careful selection of an initial pool of tutors with the commitment, attitude and mindset to bring innovation in learning. These teachers are agents of change in the school—they spearhead and refine the classroom practices and mentor and guide the rest of the staff in the initiatives. For them, "believing is seeing", and they begin with confidence in the efficacy of the initiative. For the rest of the staff, "seeing is believing"—the results of the implementation will demonstrate to them the viability of the educational approach. In any experimentation of pedagogical approaches, leaders must be cognizant that the teachers will go through the three stages of implementation namely, the awareness, implementation and internalisation phases. The first phase is to create teachers' awareness that (i) technology is here to stay and that inevitably, teachers have to tap on it to enhance students' learning and (ii) there are different ways that technology can enhance teachers' pedagogical approaches in the classroom. Next comes the implementation stage, when teachers experience and tease out learning points while carrying out the pedagogical approaches. Finally, the teachers would internalise their learning and start to innovate further in their pedagogical approaches. This further reinforces the need for a group of curriculum experts in the school to guide and mentor the staff in their implementation of the innovative practices.

10.6 Concluding Remarks

This chapter describes how, riding on the advent of technology, the authenticity of a problem could be enhanced through the presentation of the problem scenario in video format. Additionally, with the use of distributed scaffolding through e-tools (i.e. question prompts, mind maps, templates), e-objects (i.e. resources on PBL philosophy, content matter) and e-platforms (i.e. asynchronous discussion threads,

synchronous editing), the constraints of human, time and physical resources can be alleviated. Furthermore, there may be a reduction of the effect of detrimental human factors on learning processes (e.g. insufficient or excessive guidance), as there is more control over the amount and appropriateness of the scaffolding through the design of the e-PBL environment.

Technology is changing our lives and the way we learn. It is thus imperative that, when designing e-learning environments, educators understand that technology can be a useful tool to support their pedagogical approaches towards engaging and motivating their learners. In addition, they must be mindful on how the introduction of technology may influence the teaching of the subject content and how the associated learning outcomes may vary based on the technology and pedagogy used. School and institution leaders, on the other hand, must possess the willingness and enthusiasm to provide the time, physical and human resources to support and explore new educational technologies that enhance students' learning.

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Chapter 11
Motivating Twenty-First-Century Learners: The Impact of an Online Reciprocal Peer-Tutoring Initiative for Foreign Language Learning

Constanza Tolosa, Martin East and Helen Villers

11.1 Introduction

Members of the so-called Net Generation are characterised as intuitive, multitasking and digitally literate, and their expectations of learning as immediate, experiential and social (Oblinger and Oblinger 2005; Warschauer 2011). The arrival of this generation coincides with efforts in education systems around the world to design learning and teaching with the technology to develop twenty-first-century competencies such as collaboration, critical thinking, adaptability and autonomy. In this new educational environment, schools are having to rethink their pedagogies to develop the potential of this generation of students (Calkins and Vogt 2013; Wright 2010). This chapter presents key findings from a 4-year research engagement with a school in New Zealand that has embraced the opportunity to teach the Net Generation. We have followed the school's implementation of the foreign languages (FL) curriculum for its Year 7 and 8 students (age 11+ to 12+) through a combination of forward-thinking leadership and technologically rich programme design incorporating a blended model that has included video conferencing and specialised language software. A key component of the programme has been technology-mediated written exchanges between students in different countries who took part in an online reciprocal peer-tutoring programme. Our research aimed to investigate both the ways in which the school's language-teaching programmes have been designed and the impact of the online programme on learners' linguistic proficiency and motivation. This chapter focuses on implications of the programme for Net Generation students' motivation to engage with learning an FL.

C. Tolosa (✉) · M. East · H. Villers
Faculty of Education, The University of Auckland, Auckland, New Zealand
e-mail: c.tolosa@auckland.ac.nz

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11.2 Background

The term 'Net Generation' primarily describes those born roughly between 1980 and 1994 (McCrindle 2006) who, having grown up in an era when personal computers (PCs) and the internet became essential components of mainstream culture and society, may be described as being 'technologically savvy' (Australian Learning and Teaching Council 2009), exhibiting greater interest and skills in using information and communications technologies (ICTs) than previous generations (Oblinger and Oblinger 2005). It might be suggested that those born *in* the twenty-first century represent a *post*-Net Generation who, in addition to PCs and the web, have embraced a range of mobile technologies such as smartphones and tablets. A common element of these technologies is the ability to step outside of the confines of the traditional classroom learning environment and to interact with a range of people and sources not confined to a single location. Although Oblinger and Oblinger observe that this does not do away with the necessity for teachers and for immediate (real time and real life) social interactions, today's school students recognise that ICTs are 'part of our world', 'embedded in our society', enabling learners to 'connect with friends either to get help or to help others' (p. 2.3).

According to Oblinger and Oblinger (2005), members of the so-called net and post-Net Generations (hereafter netizens) are characterised as those who embrace learning opportunities that are connected, immediate, experiential and social. That is, netizens display 'a striking openness to diversity, differences, and sharing… [t]hey seek to interact with others, whether in their personal lives, their online presence, or in class' (p. 2.6). Each of these characteristics is arguably highly pertinent to FL programmes, the essential focus of which is learning to communicate effectively with others in different contexts and of different backgrounds through interactions involving language.

Netizens also display learning preferences that are closely related to their characteristics (Oblinger and Oblinger 2005). As a consequence, according to Calkins and Vogt (2013), the so-called next generation learning must focus on engaging today's students through interactive and motivating 'next gen' teaching and learning designs. Such designs would capitalise on 'twenty-first century competences' such as the ability to co-operate and learn together, abilities that traditional educational approaches do not always adequately address (Dumont et al. 2010). These realities are also arguably highly pertinent to FL programmes which, for many years now, and despite having authentic communication as an end goal, have commonly been delivered in teacher-fronted ways where systematic attention to rote-learning and grammatical rules has taken precedence over learner-centred and experiential models that focus on language in actual use (East 2012). As Long (2000) argues, such a teacher-dominated and grammar-focused approach 'tends to produce boring lessons, with resulting declines in motivation, attention, and student enrollments' (p. 182), challenges that many FL teachers commonly face. Certainly, teacher-led approaches do not appear to capitalise on the skills, characteristics and motivations of netizens.

Nevertheless, as Boekaerts (2010) asserts, 'motivation and emotion are essential to education because—together—they ensure that students acquire new knowledge and skills in a meaningful way' (p. 92). Boekaerts goes on to say:

> If all classroom activities were interesting and fun, students would engage in them naturally. … Teachers thus need to be aware of how to adapt the curriculum and their teaching so that students find the classroom activities more interesting, purposeful and enjoyable, and feel more competent to do them. (p. 92)

If student motivation is a crucial component for successful *language* learning, as suggested by, for example, Dörnyei (2001b) and van Lier (1996), FL programmes are required that enhance 'motivation to engage in an activity because it is enjoyable and satisfying to do so' (Noels et al. 2000, p. 61). In Lightbown and Spada's (2006) words:

> Teachers can make a positive contribution to students' motivation to learn [a language] if classrooms are places that students enjoy coming to because the content is interesting and relevant to their age and level of ability, the learning goals are challenging yet manageable and clear, and the atmosphere is supportive. (p. 64)

In the New Zealand context that is the focus of this chapter, twenty-first-century technologies have been acknowledged as fundamental to students' positive engagement with learning (Wright 2010). According to Wright, the so-called e-learning can create rich environments that generate peer and collaborative opportunities, thereby enhancing students' cognitive, affective and social interactions. E-learning also facilitates authentic audiences for students' work. E-learning therefore has the facility to create learning approaches that, in the words of Johnson, Levine, Smith and Stone (2010) are 'hands-on, purpose-driven, authentic' (p. 2) and that tap into the 'increasing connectedness of people around the globe' (p. 3).

Crucially, Wright (2010) asserts that use of e-learning tools can be motivating and engaging for students and may thereby be critical in contributing to improved educational outcomes. For FL teaching and learning programmes in which motivation and engagement may be critical to their ongoing success, e-learning tools may therefore provide valuable resources for tech-savvy netizens. In the context of considering motivating twenty-first-century learners of FLs who belong to the net or post-Net Generations for whom characteristics such as openness to diversity and difference, seeking out interactions with others and co-operative learning are deemed to be characteristics, a technology-mediated FL intervention that capitalises on these characteristics may provide a way forward in terms of delivering a motivating and engaging learning experience. That is, the 'best motivational intervention' may simply be 'to improve the quality of our teaching' (Dörnyei 2001a, p. 26) by capitalising on twenty-first-century technologies.

One important study into the motivational impact of an e-learning intervention in the FL environment was conducted by Thurston, Duran, Cunningham, Blanch and Topping (2009). Building on the arguments and claims of prior research (Thonus 2004; Thurston 2004; Ware-Paige and O'Dowd 2008; Wong and Fauverge 1999; Zahner et al. 2000), Thurston et al. developed a reciprocal role peer-tutoring intervention using participants drawn from five classes of primary and intermediate

school students (9–12 years of age) in two schools, one in Catalonia, Spain, and the other in Scotland, UK. The reciprocal role peer tutoring involved pairs of students in each country who held a different first language (L1) that paralleled the FL being learnt by the learner (i.e. one Spanish L1 speaker matched with one English L1 speaker, for purposes of 'tutoring' in Spanish or English as FL). The peer tutoring enabled the learners to act as both 'tutors' and 'tutees', with one seen as the 'expert' or 'more capable peer' in one language, and the other similarly viewed in the other language.

The intervention incorporated 4 hours a week of technologically mediated exchanges (O'Dowd 2007) during class time, with students interacting in a managed online environment over a period of 8 weeks. Groups of students sent each other basic reciprocal written messages in the FL they were learning (Spanish or English). In the course of the intervention, five sets of messages in English/Spanish were sent, covering the topics 'me', 'my town', 'my week', my favourite things' and 'summer holidays'. Peer feedback was offered on each initial message, and students were then able to make corrections to their messages before resending the message in final form.

As part of a broader study to investigate different dimensions of the impact of the intervention, including impact on learners' attainment, both in their own and in the target language, processes of peer tutoring, and impact on learners' attitudes, Thurston et al. (2009) developed a 20-item attitudinal survey adapted from one constructed to measure learners' attitudes towards science (Pell and Jarvis 2001). Participants completed the survey at the start of the intervention, and an identical survey at the end. Each statement was scored on a five-point scale, and surveys were completed in English by the Scottish group (experimental, $n=15$; control, $n=27$) and in Spanish (direct translation) by the Catalonia group (experimental, $n=17$; control, $n=23$).

Survey data were subsequently analysed using two-way within-subjects analysis of variance (ANOVAs) with a view to identifying changes in attitudes towards FL learning, with condition (experimental or control) used as a predictor of change. It was found that, by the end of the intervention, both experimental groups demonstrated significantly more positive attitudes towards languages than at the start. Thurston et al. (2009) conclude that their findings indicated that 'motivation was enhanced in modern language learners during the initiative' and that students 'found peer tutoring a motivating real context that gave their communication meaning' (p. 470).

Seen in the light of Long's (2000) assertions regarding the negative impact of teacher-fronted FL programmes, the findings of Thurston et al. (2009) add support to the argument that technologically mediated learner-centred and authentic interactions in the FL which put the learners in control can be motivational. The study that is the focus of the remainder of this chapter sought to build on Thurston et al., and to further investigate the motivational benefits of e-learning for netizens.

11.3 The Study

Our investigation into motivation was part of a broader 4-year study (2009–2012), instigated at the invitation of the principal (leader) of the school in question, into its technologically focused initiatives to enhance its FL programmes. There were three key phases to the research:

1. In Phase I (2009), we investigated the initiatives taken to promote FL learning in the school. With the agreement of the school principal, this phase involved observation of the blended learning programme in operation in order to provide understanding of its different elements. It included a 1-hour semi-structured interview with the principal, the purpose of which was to gain insights into the principal's leadership role in programme implementation.
2. In Phase II (2010), the research team developed an intervention study involving a reciprocal peer tutoring arrangement with paired students in Colombia. This was repeated, with some amendments, in 2012. The study sought to provide empirical evidence on the impact of technology on the New Zealand students' proficiency in and attitudes towards the FL they were learning (Spanish). Our aim was to contribute to the body of research that seeks to understand the relationship between online communication and FL learning by assessing the potential of online reciprocal role peer tutoring to enhance the language-learning experiences of school-aged students.
3. Subsequent to Phase II (Part 2) in 2012, the teacher of the Spanish group who took part in the 2012 peer-tutoring initiative was invited to a semi-structured interview (2013) and was asked to comment on her perspectives on the experience.

Findings from different dimensions of the study have been disseminated in a range of publications (East et al. 2012; Tolosa et al. 2013; Villers et al. 2010, 2011). In what follows, we provide glimpses into the motivational potential of the programmes, gleaned from the three stages of the entire project referred to above, and then discuss them with reference to the characteristics of netizens.

11.4 The View from the School's Leadership (2009)

The interview with the school's principal and overall leader revealed a strong commitment to the promotion of e-learning in his own institution as 'part of what we're trying to do here' to develop internationalisation and global citizens.

Having recently established links with schools in Korea, the principal's vision was to establish an 'e-school', aligned to peer-tutoring approaches that could be set up anywhere in the world, enabling reciprocation across a whole range of languages. The model would enable full exploitation of available technology and an exploration of partnerships with overseas schools so that students could enjoy authentic

interactions. In the context of discussing what the principal saw as a 'twenty-first-century imperative', he explained:

> We had to look at how we could develop collaboration…not just collaborating within our school and in our own communities [but also] collaborating with ideas across the world… and the more opportunities we provide for that then clearly we're going to be able to collaborate far more effectively in the future.

That is, a key question the principal reflected on in his interview was, in his words, 'what does success look like in the twenty-first century?' His own answer included 'language and languages [as] a big part of being international'. Working on the principle that 'we think that any child should access any language of their choice within a structured environment so that we can monitor their progress at any time, any place, anywhere, 24/7', the principal was committed to facilitating a 'blended learning model'. This model would be 'partly teacher-facilitated language and partly online resourcing as well so we can get the best of both worlds' whereby students 'would be able to pursue that language, not only in school but at home in their own leisure time as well'.

The principal admitted that, at the time of the interview, the blended learning model, both as a concept and as an operationalised component of the school curriculum, was at an early stage. The immediate goal was 'to build teacher capacity', recognising that 'as we build teacher capacity it provides us opportunities…using the technology that's available…developing relationships here and afar so that we can put the jigsaw puzzle together'. Nevertheless, at this early stage in the process, the model was perceived as successful. The principal concluded:

> The biggest success is seeing how the capacity of teachers for this [is developing] and the benefit the children are getting out of their teachers engaging in the learning. … what we're noticing is that the kids are so motivated that they're going home and spending up to 40 hours extra a term on their second language.

11.5 An Intervention Study (2010)

In order to substantiate the principal's assertion that his students were becoming highly motivated to learn an FL, we conceptualised an intervention study. We established an online peer-tutoring project between one class of 11-year-olds (Year 7) learning Spanish as FL ($n=28$) and peers of the same age learning English as FL in Colombia ($n=30$). The study was framed as exploratory and investigated the academic, social and motivational outcomes for students in New Zealand as a result of the online peer tutoring.

Following several principles used by Thurston et al. (2009), we adopted a quasi-experimental approach. The New Zealand students had been learning Spanish for approximately 10 weeks and were therefore beginners in the language, equivalent to Basic User level (A1) on the Common European Framework (Council of Europe 2001). A control group ($n=29$) did not take part in the intervention. There were therefore two parallel classes that followed the same FL curriculum, with one group

involved in peer-tutoring relationships with the members of the partner group in Colombia. It was planned that groups would exchange written messages in the target language with others via Moodle over a 10-week period, receiving feedback, and then correcting and resending the messages.

To measure shifts in attitudes and motivation, we replicated the attitudinal questionnaire used by Thurston et al. (2009), with minor modifications, and administered the questionnaire to all participants at the beginning and at the end of the intervention. Although Thurston et al. had not differentiated between constructs in their questionnaire, we decided to group statements according to two constructs: students' *attitudes* towards FL learning and FL culture (Construct 1, Statements 1 to 10), and students' perceptions of their proficiency or *aptitude* in Spanish (Construct 2, Statements 11 to 18). Participants were asked to indicate the extent of agreement or disagreement with the statements, scored on a five-point scale.

Additionally, nine students from the experimental group took part in an individual one-on-one semi-structured interview with one of the researchers. Interviews were digitally recorded. They lasted approximately 10 min, and each participant was asked to comment on different aspects of the intervention, including perceived changes to their attitudes towards learning Spanish.

11.6 Questionnaire Findings

Students who did not complete either the first or the second questionnaire, or both, were removed from the data set, resulting in smaller group sizes (experimental, $n=25$; control, $n=22$). It was also found that some participants did not provide a response for some statements. Missing responses accounted for approximately 1% of the data and appeared to be completely random. Following East (2009), we incorporated responses for the missing data using the hot-deck imputation method (Ford 1983). That is, the missing responses replicated observed responses from randomly chosen participants whose other responses were comparable.

Descriptive statistics revealed negligible differences between the pre- and post-intervention means for both the experimental and the control group (Table 11.1). A one-way between groups ANOVA indicated no significant difference between

Table 11.1 Pre- and post-intervention means (experimental and control groups)

	Pre-intervention		Post-intervention		
	M	SD	M	SD	Difference in means
Experimental group					
Construct 1	3.71	0.54	3.4	0.53	−0.31
Construct 2	3.23	0.76	3.09	0.75	−0.14
Control group					
Construct 1	3.36	0.63	3.12	0.73	−0.24
Construct 2	2.97	0.82	2.8	0.82	−0.17

groups ($p = 0.704$). That is, the experimental group had not 'moved' in perceptions in any way differently to the control. It appeared that taking part or not taking part in the online tutoring had not made any meaningful difference to learners' attitudes and perceptions of proficiency as measured by the questionnaire.

Our finding that the intervention appeared to have had had no effect on participants' attitudes was in contrast to Thurston et al. (2009). Bearing in mind that our sample size was comparable to theirs, this finding was intriguing, and we were curious to understand what might be going on with our sample of learners. The interviews with participants in the online peer tutoring ($n = 9$) provided an opportunity to explore further what the intervention had meant to them.

11.7 Interview Findings

The interviews revealed several perceived benefits of the intervention. It appeared that several students valued the opportunities to enhance their knowledge and understanding via social interaction. That is, participants 'weren't just being taught' (Student 9). Rather, 'we're given a new word, and we're trying to figure out how to put it into other sentences, not being told what sentence [to put it in]'. The requirement 'to figure it out for ourselves' was thus viewed as a helpful challenge that encouraged autonomous decision making. This 'learning angle' was occasionally commented on in positive terms: 'I like being corrected' (Student 1); 'I felt pretty good' about being corrected (Student 2); 'I thought that it was good for me' to be corrected (Student 6).

Eight out of nine students acknowledged in one way or another that they had enjoyed learning Spanish via the intervention, with several commenting on how the learning opportunities through the intervention differed from normal classroom work. For Student 3, for example, 'it was fun and it was, like, cool' because 'it isn't like learning in class'. Students 2 and 6 noted the peer reciprocation as a contributing factor to their engagement: Student 2 'enjoyed working in this project probably more than in class because it's with someone of our age, just partner work probably'. Student 6, who described the intervention as 'really fun', noted that 'probably the most cool thing was that we were actually being corrected by another student who is like us'. Student 3 summed up neatly a shift in attitude by virtue of participation: 'I used to think Spanish was a little bit boring, but now it's kinda fun, it's, yeah, it's cool'.

Alongside positive views on the intervention, several comments revealed perceived limitations (and frustrations) which appeared to relate to ineffective reciprocal interactions. Student 4, for example, focused on minimal feedback. Noting that '[w]hen you write something to her she's meant to edit it and then send it back to you', the reality for this student was that 'there was never anything changed about what I said, so I just thought I [had] got all the things right, or she just forgot to edit things'. He concluded, 'I suppose it would've been better if she had corrected me'. Student 1 argued that 'we're not really talking to them, we just have messages from

them…and sometimes the messages are, like, really small, and we don't get to learn much'. Arguing that, as a consequence, the intervention 'didn't help me as much as I thought it would've', Student 1 went on to assert that Skyping might provide a better avenue for interaction. This possibility was also noted by Student 2 who suggested that he might maintain his relationship with his peer via Skype after the project had ended. However, limitations of time zone differences might mean that Skyping would not necessarily be available 'in school hours, because when we're at school, they're sleeping', and its use would require autonomy and self-motivation to maintain.

Our analysis of the qualitative data revealed a conflicting picture about the perceived value of the intervention which may serve to explain the lack of significant differences in the quantitative data. In terms of testing the view of the principal that students were becoming highly motivated to learn an FL by virtue of technological innovation, further evidence was required. An interview with the teacher for Spanish who co-ordinated the second phase of the intervention in 2012 sought to investigate the impact of the intervention from the teacher's perspective.

11.8 The View from the Classroom Teacher (2013)

The interview with the normal classroom teacher of the intervention Spanish class of 2012 (referred to here as Susan) provided a valuable account of her perceptions of the benefits and limitations of the peer-tutoring initiative as currently operationalised.

Susan observed that 'for the most part when we went to the ICT lab they were really excited to go in'. In the teacher's perception this was because the students would have the opportunity to interact with 'other people in another world' and 'they got to use the language in a real and authentic way'. As a consequence, 'I felt like my kids' [written] confidence went up quite a bit in using Spanish'.

Asked about the potential of the intervention on students' further engagement with the language, Susan observed, 'I have noticed the ones I considered more 'engaged' in the project have elected to continue extended Spanish with me this year'. She went on to explain that '[w]hen we talked in the Spanish Extension Group about what we'd like to achieve and how we can do this, they suggested having a buddy in another country'. Susan related this directly to the intervention, noting that 'I think the project lasted long enough for them to enjoy Spanish more'.

For this teacher, therefore, there was a direct correlation between the intervention (notably its duration) and heightened motivation to continue with the language and to seek further interaction with overseas peers. It is, however, also implicit in her account that not all students were necessarily as motivated as the new 'extension' students.

Indeed, while Susan 'enjoyed the fact the children were able to see "real Spanish" in action', she noted that 'some students disengaged after a while'. This was when, for example, school holidays came around and the reciprocal peer was not

there: 'sometimes they would sit there and they would say "oh, my buddy hasn't given me feedback"' Susan went on to speculate:

> That, I think, is the biggest [negative]…the time they would be the most disappointed because they felt like their buddy hadn't given them feedback…maybe they took it kind of personally because they worked so hard to give feedback to their buddies.

Allied to this was the sense that written messages were not sufficiently 'real-time' for genuine and meaningful interactions to take place. Susan reflected that 'in an ideal world, a project such as this would be really, really successful if it could be instant, you know, if they could have instant exchanges'. The teacher recognised the genuine constraints of this, including time differences and limited access to technology (on the part of the Colombians). She noted, however, that her students 'engaged the most when pictures accompanied text[1] so they could see their buddy's world through images', and that an initial Skype meeting, in which all the pairs had had the opportunity to engage "face-to-face" with each other, had been a huge success. This appeared to make more immediate and tangible the interaction with "a real life person that spoke the language we were learning in the class'. For Susan, authentic interaction was 'not just the translation of words and phrases', which might have been achieved by the written messages. Rather, authentic interaction 'actually incorporates and embodies a whole culture, a whole way of being, a whole way in expressing yourself'. It was through the Skype meeting that 'I think that they really, really saw that, and I don't think they would have gotten that if we didn't have the Skype meeting'.

11.9 Discussion

We believe that our findings present an informative emerging picture of the benefits and limitations of a technology-mediated reciprocal role peer-tutoring initiative in the context of a school whose leader is clearly committed to pushing forward e-learning initiatives for FL learning.

With particular regard to the motivational potential of this e-learning initiative, findings from our intervention study, the core of our investigative work in the school, present a somewhat mixed picture. Quantitative questionnaire data suggest that the intervention made no meaningful difference to participants' attitudes towards FL learning. Qualitative data from interviews with participants with regard to attitude and motivation shed light on why this may have been. On the one hand, it was apparent that the majority had enjoyed the intervention, choosing words such as 'fun' and 'cool'. One perceived benefit focused on the opportunity to work with a peer who could provide appropriate feedback to support learning. On the other hand, there was evidence of disappointment or frustration. This was also linked to

[1] One interesting example of this, noted by a student in the 2012 cohort, was the opportunity to share images of each other's lunchboxes, and compare and contrast them.

learning, and related to receiving inadequate or no feedback, and lack of any 'real' opportunity to interact. Skyping was mentioned as a potential remedy to this. The data derived from the post-intervention interview with Susan, although relating to the second cohort of students (2012), underscored the strengths and limitations of the intervention as identified by the first cohort (2010).

Seen in the light of the literature regarding netizens and their characteristics, a number of issues emerge. Oblinger and Oblinger (2005) make it clear that netizens typically embrace learning opportunities that are connected, experiential and social, displaying a marked openness towards diversity, difference and sharing, and seeking to interact with others. These characteristics facilitate authentic audiences for students' work, and peer and collaborative opportunities (Calkins and Vogt 2013; Wright 2010). In essence, netizens wish to 'connect with friends to get help or to help others' (Oblinger and Oblinger 2005). The peer-tutoring initiative facilitated the realisation of these characteristics and wishes by fostering an environment of genuine collaboration with learning potential. The experience was hands-on, goal oriented and authentic, and facilitated connection with others in an overseas context (Johnson et al. (2010). In turn, this made the experience more motivating for some than the teacher-led classrooms to which they may have been exposed prior to the intervention (Long 2000). In the words of Thurston et al. (2009), several students 'found peer tutoring a motivating real context that gave their communication meaning' (p. 470).

Nevertheless, it was evident that the intervention lacked immediacy (Oblinger and Oblinger 2005) thereby limiting the social dimension. This limitation was most in evidence in comments relating to Skype (student and teacher interviews). Allied to lack of immediacy was perceived lack of collaboration at times (as evidenced by comments regarding lack of feedback). If, as Boekaerts (2010) argues, motivation and emotion are essential to effective learning, the limitations of the intervention hindered somewhat its motivating and emotive potential.

The words of the teacher are pertinent here. Susan argued:

> Even though we live in quite a 'text-heavy' world with facebook, texting, emails etc. surrounding us, the most effective way to express ourselves is through spoken language accompanied by gesture. Skype was a fantastic way for the kids to attempt spoken Spanish…creating movies or using technology to record voice/create stories etc. would provide more avenues to use the language in a more realistic context.

11.10 Conclusion

Through interviews with the school's principal and one of the lead teachers for languages, we have documented the influence of the school's leadership in shaping and enacting the school's twenty-first-century-focused vision for effective FL courses. Following a quasi-experimental pre-test/post-test approach, we collected data to measure the effects on students' FL proficiency and motivation as a result of a dedicated peer-tutoring initiative. Our study enabled us to consider the interplay

between motivating the learner, educational leadership and curriculum design, and our data provided evidence of students' engagement in meaningful and authentic written interactions. Pre- and post-intervention questionnaires and summative interviews with students indicated benefits in terms of motivation towards language learning, and engagement with peers as tutors and tutees.

Our findings demonstrate that, although not without its limitations, this school, under careful leadership, has aimed to implement a vibrant language-learning programme in line with the expectations of the Net Generation. For several learners, learning a language online optimised conditions for authentic interaction and genuine collaboration with others while learners co-constructed new knowledge. Although working under the guidance of their teachers, students exercised agency in the nature and form of the interactions, becoming the drivers of their own learning as they embraced the opportunity to connect with others.

When it comes to motivating netizens to learn an FL, there is considerable potential in technology-mediated peer tutoring, as evidenced both from our study and from Thurston et al. (2009). There are, however, limitations when the primary focus is on written interactions. Incorporating the visual, the spoken and the immediate and investigating their impacts on motivation are aspects yet to be explored and provide avenues for further valuable research.

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Chapter 12
Leading Technology-Enhanced Learning: Upgrading the Digital Immigrants and Stretching the Natives

Caroline Koh

12.1 Introduction: The Role of Leaders

Research on educational leadership invariably professes the crucial role of administrative leaders in the development of effective and innovative programs and initiatives, such as the oft-mentioned technology integration in the curriculum (Fullan 2003; Dinham 2005; Wilmore and Betz 2000). Some, like Prensky (2001) believe that "today's students think and process information fundamentally differently from their predecessors" and thus "are no longer the people our educational system was designed to teach" (p. 1). They thus advocate the role of educational leaders as "reinventing schools and classrooms in a society that has been transformed by digital technologies" (Flanagan and Jacobsen 2003, p. 124).

A number of authors have proposed criteria for a leadership model for technology integration. Some suggest that such leadership should cater for interrelationships amongst key players involved in the process (Neuman and Simmons 2000; Schultz 2000). For instance, there should be close synergy between technology experts, school administrators, teachers, students and parents for new technology-based initiatives to be successfully and effectively established. Yet, others propose that leadership should demonstrate the ability to adapt to the complex changes brought about by twenty-first century developments (Fullan and Stiegelbauer 1991), while ensuring a culture of continuous learning (Senge 1990).

Such a techno-leadership model implies that technology leaders should "view their school as a learning organization, set goals and coordinate activities, but will design and participate in the learning processes themselves" (Anderson and Dexter 2000, p. 2; Louis 1994). In the same voice, Afshari et al. (2008, p. 83) stated that "effective administrators must have knowledge, dispositions and performance". Translated to leadership in technology, this implies knowledge of new technologies,

C. Koh (✉)
National Institute of Education, Nanyang Technological University, Singapore
e-mail: caroline.koh@nie.edu.sg

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beliefs in and appreciation of the value of technology as a tool for learning, and actions or measures undertaken for the sustained implementation of information and communications technology (ICT)-supported teaching and learning.

The above criteria impose heavy demands on the educational leaders, many of whom may not have been adequately prepared for the changes they are currently experiencing and that they will encounter in the future. This chapter aims to explore the challenges faced by leaders in the implementation of technology integration within their institutions. It moves on to consider the issues faced by those for whom the technology integration is being carried out and who would directly experience its effect, namely the digital native students and their digital migrant teachers. This chapter concludes with some suggestions on how technology integration may be more effectively implemented.

12.2 Challenges Encountered by School Leaders

In the early days of technology integration, many school leaders held the belief that their task was merely to ensure that the relevant resources and infrastructure were in place. Thus, many schools went into a shopping frenzy, buying computers and hardware to furnish their classrooms and setting up computer labs. Yet, in many cases, those facilities remained largely underutilized, with teachers continuing to teach in conventional classrooms and students using their home computers rather than those in school (Flanagan and Jacobsen 2003, p. 124).

School leaders then realized that leading technology integration required their active involvement in the envisioning and design of the technology-enriched curriculum, their modelling of technology use and their participation in the monitoring and evaluation of the implementation of the initiative. Many school leaders, though they had good intent, felt inadequately prepared for their new tasks. Like their teachers, most school leaders are digital migrants, struggling to master the use of new technologies. It may seem paradoxical to have a techno-leader who is a novice in technology usage, but the advantage of this situation is that such a school leader may be in a better position to understand the challenges at hand and be able to provide more support to teachers in their use of technology.

There is also the question of how to ensure equity in the use of technology. This involves making new technologies accessible to all within the institution, irrespective of race, gender or ability. More important is the challenge of how to ensure that teachers and students who are not so adept in the use of technology are given opportunities to upgrade their computer skills and do not end up feeling further alienated in a techno-enriched environment.

12.3 Challenges Encountered by Teachers

The challenges faced by teachers vary widely depending on contexts, the resources available to them and the kind of support they receive from their school administration. Where schools experience financial constraints, teachers find it difficult, albeit impossible, to infuse technology in their lessons for the simple reason that the technologies are inadequate or not available. The literature, however, shows that by far and large, technology integration has proven to be ineffective for reasons other than lack of resources. For instance, a number of authors suggested that there was no shared vision and belief amongst teachers, with regard to technology as a potential tool for improving teaching and learning, or on how it can be used to cater to the diverse needs of different learners. Furthermore, school leaders did not ensure that teachers had a common understanding of the relationship between technology, pedagogy and learning. There was inadequate professional development for teachers and whatever training that was available focused on how to manipulate technology rather than how to apply and make use of technology to enhance learning (Bailey 1996; Hughes and Zachariah 2001, Flanagan and Jacobsen 2003, p. 124).

12.4 Challenges Encountered by Students

Prensky (2001) described the "digital natives" as youths who grew up in the digital era and are therefore technologically proficient and engaged. He claimed that these young people think and learn differently from their forefathers. However, Bennett (2012) argued that Prensky's claim was an overgeneralization and that his original definition of the digital native only applied to a small percentage of youths. Her research showed that even amongst the digital natives, there was a great diversity of users showing a wide spectrum of technological skills, knowledge and interests. As such, one cannot assume that the young "natives" are not in need of professional training and skills upgrading, nor can one presume that all "immigrants" are old and technologically helpless.

Research on technology use by young people also showed that while some technologies are universally adopted (e.g. computers and cell phones), others were used selectively for specific purposes depending on user factors (e.g. age, gender, socioeconomic status, education). Lei (2009) investigated the technological competencies and usage of a group of Net Generation (Net Gen) pre-service teachers to find out the extent to which they demonstrated the characteristics of "digital natives", and whether the integration of technology in teaching should still be included in the teacher education curriculum. The participating pre-service teachers showed characteristics of the digital native in terms of their access and usage of technologies. Nearly all participants began using computers before sixth grade and all owned a personal computer and a cell phone in the least, and about half of those surveyed

owned four or more devices. Most participants spent between two to four hours on computers on a daily basis, and reported positive views on technology, with strong beliefs on the reliability of computers and that the technology promotes teaching and learning. Thus, in terms of technology exposure, usage and beliefs, the participants showed characteristics of digital natives. However, they showed differences from digital natives in terms of their confidence in the use of technology. For instance, with regard to their self-report of confidence, only half of the participants felt that they did well, and while they were proficient with the use of basic technologies, they lacked expertise and experience in using the more advanced and complex systems and software applications. They also had reservations about the actual use of technology in the classrooms, citing reasons such as the possibility of students' over-reliance on computers and distraction from the tasks at hand.

Many authors have posited that the technology should be used as a tool for a more constructivist, student-centred approach involving collaboration and authentic learning experiences (McKenzie 2000; Bailey 1996; McCombs 1997; Hughes and Zacharia 2001). However, the evidence from Bennett (2012) and Lei (2009) shows that there is perhaps a more pressing need for school leaders to even out the differences in technology competencies amongst the digital natives themselves, before one can begin to consider stretching their technological prowess.

12.5 Future Considerations for Technology Leaders

Research in the domain of leadership in technology surfaced several models for the improvement of systems currently in operation (Anderson and Dexter 2000; Yee 2000; Hughes and Zacharia 2001; Flanagan and Jacobsen 2003). In general, these models posit that techno-leaders should focus on three main areas: leadership role, school structuring and community engagement.

12.5.1 Leadership Role

Leadership styles and ideologies are important in determining the success or failure of technology integration (Hughes and Zacharia 2001). First and foremost, the technology leader should be a role model for others to emulate, and should "walk the talk" when it comes to the use of technology. As such, they can only lead technology-enhanced learning when they have a clear understanding of the use and application of technology, and when they consistently and continually seek to innovate and upgrade their processes and skills to keep up with cutting-edge technological developments.

Yee (2000) proposed learning-focused envisioning as a contributing factor to successful technology leadership. This implies that techno-leaders should be able to formulate a clear vision of ICT integration, and to effectively communicate it

to staff, students and other relevant stakeholders. This is echoed by Knee (1995) who suggested the importance of an inspirational leader with a clear vision. He highlighted the need for what Yee (2000) would later call *adventurous learning,* implying a willingness to take risks and to be unafraid of challenging conventions. Both authors shared the same view that techno-leaders should show commitment and adherence to the goals that they set.

12.5.2 School Structuring

School structuring involves the organizational structure and processes, budget allocation and funding, equitable and ethical considerations, curriculum development and evaluation of the technology-enhanced programs (Anderson and Dexter2000; Yee 2000; Flanagan and Jacobsen 2003). An effective organizational structure could involve not only the one who helms the school, but rather a carefully selected team whose members are not only able to advise on technical matters, but more importantly to oversee the processes that would allow the seamless integration of new technologies in teaching and learning. In this way, the head of the school could effectively lead technology integration without having to be an expert in every technological novelty that comes along.

Budget allocation for technology enhancement could be aligned with considerations for equity and ethical processes. Thus, technology funding should provide for resources, training and support for *all* staff and students, irrespective of their differences in gender, culture, academic ability and socio-economic status (Yee 2000; Flanagan and Jacobsen 2003). School leaders are also leaders of resource management, and in this capacity, they are responsible for establishing priorities in expenditure that directly support the schools' technology projects in a fair and equitable manner.

As leaders of learning (Flanagan and Jacobsen 2003), heads of schools hold the responsibility of organizing and planning for the integration of technology into core curricula. It is also within their capacity to deploy staff for the planning or delivery of technology-enhanced lessons. When teachers are involved in developing the ICT-infused curriculum and hold the ownership of developing such lessons, they become less sceptical about the role of technology in teaching and learning and more confident in the use of techno-enhanced pedagogy. A school leader holds the additional responsibility of constantly monitoring the adherence to the school's ICT programs, in terms of setting expectations and standards, evaluating key performance outcomes and providing feedback to students and teachers.

12.5.3 Community Engagement

School leaders are tasked with engaging the community within the educational institution. Hughes and Zachariah (2001) suggested that techno-leaders should

encourage dialogue and interaction between the various stakeholders, thus providing opportunities for partnership building, whereby social and professional networks can be established to enable collaboration within as well as beyond the school.

In building partnerships within the school, Yee (2000) stressed the importance of attentiveness to the individual needs of subordinates. As such, techno-leaders must be prepared to lend a listening ear to both staff and students, as well as to understand the challenges and constraints that they encounter. Keengwe et al. (2009) recommended that prior to ICT adoption, institutions should conduct a thorough pre-assessment to determine the culture and technological status of their organization, thus enabling a closer match between the needs of the users and the ICT tools to be acquired and utilized.

The leadership should then use the outcomes of the pre-assessment to determine how best to engage both staff and students in embracing a shared vision, mission and goal underpinning the technological initiatives to be implemented. Keengwe et al. (2009) found that staff buy-in was poor when there was no proper framework or common directives from the administration to guide implementation at ground level. Furthermore, successful practice of ICT initiatives is dependent upon equity of access and the provision of adequate training and development for both staff and students (Yee 2000).

12.6 Conclusion

> As we look ahead into the next century, leaders will be those who empower others. (Bill Gates, n.d.)

The above quote seems particularly apt for the conclusion of this chapter, which aims to discuss how technology leadership can look into skills upgrading for the digital immigrants, while stretching the innovative and technological capabilities of the digital natives. Whereas, it is a common assumption that the staff would belong to the digital immigrants whereas students would be the techno-savvy Net Gen, an informed leadership should be mindful of the fact that there are always exceptions to the rule. As such, there will always be older staff showing the attributes of digital natives, while some students will be by nature, techno-averse. Good leadership should look into empowering others, not in terms of whether they are digital natives or immigrants but according to their differential technological capabilities.

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Part III
Curriculum Design and Pedagogy for Twenty-first and Net Gen Learners

Chapter 13
Designing Student Learning for a Networked World

Judine Ladbrook and Judy Parr

13.1 Overview

The nature of the knowledge, skills and competencies our young people will need in order to live, participate and work productively in this century is an issue being grappled with internationally. A significant consideration entering this equation is the proliferation of global communication systems, the affordances of Web 2.0 and the demands of the twenty-first-century workplace which, together, form a heady mix that is affecting not only the visions and demands of twenty-first-century learning but also the means and context of this learning. Learning and its environments have been viewed largely within the framework of formal schooling, both compulsory and tertiary. But learning is ubiquitous; building knowledge, skills and dispositions is an ongoing process not bounded by the constraints of place or time. Diverse formal and informal learning situations are seen to characterise the modern world. Theorising around learning and development recognised this some time ago with the advent of ecological models, most notably that of Bronfenbrenner (1979); these models articulate both the range of learning contexts and the significance of the connections between and among them. The underpinning notion is that there are primary social contexts (micro-systems) for learning and development, like the family, the school and even the peer group, and these are linked through meso-systems such as communication channels between school and parents. In such a model, the macro-system exerts a pervasive but indirect influence. The political system and the media are viewed as two such macro-system influences.

While retaining the basic notion of an ecological model with a number of linked contexts for learning, a reframing in the light of twenty-first-century technologies seems timely. In the framing of the learning environment suggested in this chapter, technology is seen as both a virtual context for development in and of itself and also the potentially powerful, hub-like meso-system with the ability to con-

J. Ladbrook (✉) · J. Parr
University of Auckland, Auckland, New Zealand
e-mail: j.ladbrook@auckland.ac.nz

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nect (or to blur the distinction between) all of the various contexts for learning and development (and their participants) within which the individual operates. Within such a framework, the creation of learning environments and associated artefacts has to utilise the affordances of technology, maximising them by matching them to how students learn best, as well as taking account of how constraints might be addressed. How we configure a learning environment— the opportunities to learn, the resources available, the nature of the support and interactions facilitated—will have powerful effects in terms of channelling (akin to Valsiner's (1997) zone of promoted development) learning and development for students.

Twenty-first-century technologies are all pervasive for many of our students not only in their personal and social lives but also increasingly in their learning lives. Students are seen to be leveraging technologies for learning according to findings from Project Tomorrow (2011). This report talks of mobile learning, online and blended learning and e-textbooks as trends each including 'the student vision of socially-based, untethered and digitally rich learning' addressing the three new Es of education—enable, engage and empower. The nature of the world young people live in and the pace of change are acknowledged to be radically different to that of previous generations. We are at risk of disengaging students if learning environments do not meet the challenge of a digitally savvy generation, who wish to learn and communicate in ways and time that may jar with the current conventions of schooling. Our attempts to date to address twenty-first-century technologies in order to capitalise on the evidence that information and communications technology (ICT)-rich environments influence human cognition and human culture, positively (Mehlenbacher 2010), by integrating technology into existing curricula and structures, have been less than successful. Despite increased access to technology for students (Johnson et al. 2005), there appears to have been little change to the teaching and learning practices in many classrooms (Cox et al. 2003a, b; Hayes 2007). Integration—the vision where technology is a seamless part of the educational environment, providing support for the type of learning experiences that engage students with experiences that are meaningful, relevant and intellectually stimulating (Bransford et al. 2003)—has not happened to any extent. Although technology use in schools has increased, it has remained limited in terms of students' school activities and experiences, both with respect to time and nature of use (Bakia et al. 2008).

There has not emerged, for technology-mediated learning, a comprehensive theoretical framework of relevant constructs and their relationships (Wan et al. 2007). Theoretical frameworks are needed to transform curriculum and instruction so that they not only reflect the role of ICT in the wider society (Gilbert 2007; McDougall and Jones 2006; Pearson and Somekh 2006) but also push the boundaries of what ICT can enable. While we may have viewed technology as a potential lever for school reform and reform of pedagogy, it has still been reform conceived of within largely traditional notions of education and schooling. We have not thought of technology as a way to revolutionise learning. But a networked world demands our attention and action. Some commentators would have us believe about the future of learning that, 'Just as the Berlin Wall fell in 1989, the wall of conventional

schooling is collapsing before our eyes' (Cookson 2009, p. 12) and that Star Trek's Captain Kirk may well look around him in 20 years' time and mutter, 'It's school Scottie, but not as we know it'.

13.2 What Knowledge, Skills and Dispositions Do We Want for Our Young People?

Key skills and competencies for successful lives in the twenty-first century have been a central consideration in the development of educational goals internationally over the past decade or so. There are common themes regarding both the goals of education and of curricula. For example, the United Nations Educational, Scientific and Cultural Organization (UNESCO) report of the International Commission on Education for the Twenty-first Century (Delors 1996b), recognising that learning is lifelong, describes four pillars on which it is based: learning to know, learning to do, learning to live together and learning to be. It further elaborates that 'As the development of the "information society" is increasing the opportunities for access to data and facts, education should enable everyone to gather information and to select, arrange, manage and use it' (Delors 1996a, p. 22). The Definition and Selection of Competencies (DeSeCo): Theoretical and Conceptual Foundations Project (Rychen and Salganik 2003) delineates three categories of competencies, namely, 'use tools interactively', 'interact in heterogeneous groups' and 'act autonomously'. Category one, 'use tools interactively', incorporates competencies of interactively using language, symbols and texts, knowledge and information, and technology. Within it, the aspect concerning processing and managing information is similar to the UNESCO report statements but includes critical evaluation of information and its sources. However, it is a further aspect in this category of using tools interactively that resonates when we consider learning in the networked world, that ICT 'has the potential to transform the way people work together …. To harness such potential, individuals will need to go beyond the basic technical skills needed to simply use the Internet, send e-mails and so on' (Rychen and Salganik 2003, p. 11).

Locally, national documents reveal similar themes. In Australia, the Melbourne Declaration on Educational Goals for Young Australians (Ministerial Council on Education, Employment, Training and Youth Affairs 2008) outlines two goals: that Australian schools promote equity and excellence and that all young Australians become successful learners, confident and creative individuals, and active and informed citizens. Part of being a successful learner is to 'have the essential skills in literacy and numeracy and are creative and productive users of technology, especially ICT, as a foundation for success in all learning areas' (Ministerial Council on Education, Employment, Training and Youth Affairs 2008, p. 8). The New Zealand 2007 Curriculum similarly includes in its vision for young people the statement that they will be confident, connected, actively involved and lifelong learners. Lifelong learners are described as 'critical and creative thinkers', 'active seekers, users

and creators of knowledge' and 'informed decision makers' (Ministry of Education 2007, p. 8). In addition, in the key competencies, one goal is for students to 'confidently use ICT … to access and provide information and to communicate with others' (Ministry of Education 2007, p. 12).

Education authorities recognise, in their rhetoric, the potential of technology to assist in numerous ways, including the making of connections that enable students to enter and explore new learning environments, supportive learning environments that offer resources that cater to individual, cultural and developmental differences and allow the overcoming of barriers of distance and time so that students can share learning by joining or creating communities of learners that extend well beyond the classroom (Ministry of Education 2007, p. 36).

Notably, however, the descriptions of the nature of learning in national policy and documents are still largely implicitly coupled to a model of schooling as we currently know it. But, these trends in educational thinking and policy, together with the demands of a global economy and communication system, of twenty-first-century workplace requirements for collaborative, digital and information skills, and the ways in which many of the current generation of students learn (particularly outside the school walls), mean that educationalists need to be proactive in redesigning learning environments that are maximally effective for their students in meeting the goals for twenty-first-century learning. Alongside this, however, are constraints that indicate that the road to a completely networked, anytime, anywhere learning environment will not happen overnight. And, arguably, neither it should. It may be that there is an evolutionary road that can be taken, which begins with a hybrid of formal and virtual schooling, to meet the conflicting demands and constraints that currently exist.

13.3 How Might We Frame These Redesigned Learning Environments? What Principles and Features Should We Attend to?

Perhaps, the most important principle that should inform our development of the learning environments we construct as we move towards a technology-infused environment and one where technology mediates between the different contexts in which our students learn, concerns establishing the connectedness of learning between contexts. These learning contexts need not be physical entities like a school or home, but may be more diffuse networked contexts, like an educational or community context. Theorists who take an ecological view perceive the failure of school-based learning as often a failure to create 'inter-contextuality' (Engle 2006), where students are able to 'see' the links between previous, current and future learning or the links between school learning and their goals. With respect to technology, some argue that there is a 'digital disconnect' (Levin and Arafeh 2002; Project Tomorrow 2011); a widening gap between what students use the Internet and technology for at home and what they use it for at school.

The design of learning, the tasks and problems that encapsulate what is to be learnt, all need to enable students to transfer learning readily from one context to another. Transferring existing learning is a preparation for future learning. So, activities should be designed to cue learners, assisting them to tune into the relevance of new information based on their prior knowledge (Schwartz and Martin 2004). For teachers, the issue is to design activities that bring relevant prior knowledge into the same 'frame' for the learner, and to consider the features of the activity that might afford or constrain this transfer for learners (Brown et al. 1989; Gee 1997; Greeno 1997). In technology-mediated learning environments, the work completed previously and stored in an electronic folio, for example, can be instantly accessible and searchable; the work begun elsewhere can be continued and added to; electronic searches can provide information that serves as a schema for new learning, and hyperlinks can take students to the required prior knowledge when necessary. Links that enable two-way information flow between the community of educational professionals and the home community through technology—emails, blogs, e- portfolios and social networking sites—can enable the relevance of out-of-school learning to become apparent and able to be utilised, built on and connected. Such interaction can promote partnerships that strengthen learning through greater coherence across sites.

It is also a matter of helping transfer by ensuring that students have sufficient depth of knowledge so that they are expert enough to use it flexibly. So, educators need to design learning environments that will teach students understanding at a deep level (Bereiter 1995), learning that goes beyond surface manipulation of knowledge resources to a level where the learner has sufficient depth of knowledge that he/she has control over that knowledge and the confidence to apply it flexibly. Breaking down the traditional walls between curriculum areas, especially in the secondary school, so that learning is integrated across disciplines and learning in one discipline supports learning in another, could lead to smarter and deeper learning for our students. Curriculum delivery that takes advantage of the affordances of new technologies could ease the restrictive nature of the current silo-like infrastructure that characterises our secondary schooling in particular. Multidisciplinary contributions to topics and themes for study via an electronic medium, (whether it is blogs, wikis or some other networking facility), would seem to be easier than trying to gather resources and people in real time within a timetabled and classroom-restricted environment. This cyber collaboration by teachers with students, to achieve a more holistic and integrated approach to learning, is a vision that seems possible.

Links more readily happen when learning contexts are not only framed as temporally connected but also when students are framed as contributing to a broader academic community (Engle 2006). Clearly, technology could contribute to connecting environments temporally and in terms of allowing a community of learners to interact and share and build knowledge. Connectedness can also be viewed from the standpoint of interacting with others. Situated perspectives of learning (Brown and Duguid 1991; Gee 1997; Greeno 1997) have identified the ways in which learning is inherently social; we learn in the course of participating in activity with more expert others. When young people want to know about, for example, installing computer software or downloading apps to a mobile phone, they think of learning

from what others have posted on the Web, reasoning that someone else will have encountered this problem and be sharing the solution. So they search online or post questions on a networking site to ask for help.

But connections, for instance within an online community, are not simply about transfer of knowledge but also about patterns of participation in the activity. Recognition of the inherently social nature of learning means that educators should structure tasks and activities to foster interaction and co-operation. This is not straightforward as the literature concerning how best to ensure the effectiveness of co-operative learning and group work illustrates (e.g. Webb and Palincsar 1996), and students will need guidance in how to participate productively in any collaborative activity. But communication technologies (phones, video links, instant messaging, software and sites that allow shared production of documents and so on) make the notion of a networked learning community highly feasible.

13.4 What Will Be Key Pedagogical Levers in Building Learning Environments?

Our knowledge of teaching, of effective pedagogy and of how students learn is still primarily based in traditional school settings, just as our knowledge of the processes of reading is primarily based on linear print text. We would argue that the key pedagogical levers in any environment will be pedagogical designs that support learning that is purposeful, relevant and stimulating; learning over which students exert control and where they have a sense of self-efficacy because they feel competent. Much has been recently written about how today's students are interacting with Web 2.0 technologies in their own time. By drawing on this intrinsic motivation and situational interest (such as interest in digital technologies), and the resultant feelings of autonomy and competence that researchers maintain accompanies such motivation (Ryan and Deci 2000), effective learning environments can be created.

In designing these learning environments, educators need to ensure students develop not just cognitive competence and knowledge but also that they develop positive self-beliefs. Social cognitive theory stresses the importance of beliefs that people have about their capabilities to learn or perform behaviours, in relation to outcomes (Bandura 1986, 1997). Self-beliefs are a major part of academic motivation (Pintrich and Schunk 1995). The beliefs students develop about themselves are forces in their success or failure at school, influencing choices, effort, persistence, thought patterns and emotional reactions (Pajares and Vialante 2008; Schunk and Meece 2006). Self-efficacy may account for around 25% of the variance in academic performance (Pajares 1996), so, it is an important consideration.

Contributing to self-efficacy is a feeling of being competent and in control of learning. When students have a choice about when to engage in, and what aspect of learning to work on and whom to interact with around the learning task, they feel in control. When they also feel that they are equipped with, or can access readily, appropriate knowledge, skills and strategies, this contributes to efficacy. Similarly,

being able to choose one or more formats for learning—visual, audio, print or combinations—means students can utilise what medium works best for them. Another factor is students having the necessary skills to regulate their lives effectively so that they have a much greater chance of reaching their potential (Bandura 1997; Gaskill and Woolfolk Hoy 2002; Pajares and Urdan 2006). Self-regulation has been identified as a key enabler of both academic and social–emotional competence (Graham and Harris 2005; Schmitz and Wiese 2006). Self-regulated learners can generate and implement strategic plans to attain the goals they set themselves. They also regularly monitor and evaluate their progress towards these goals, and they look for feedback to help them make strategic adjustments so as to optimise their chances (Zimmerman 2000).

Within the interactions between teachers and students and among peers, there are actions which help a student to become more self-regulatory; these actions centrally include sharing goals and criteria, and feedback (Black et al. 2006). Increasingly, to build a self-regulating system, the teacher or an expert needs to let students into the secret, sharing with the student the guild knowledge (Sadler 1989) that the teacher has, regarding what is to be learned. To support learning, the feedback teachers give needs to provide learners with information about where they are heading, how they are achieving, what the next step is and how to close the learning gap (Hattie and Timperley 2007). The feedback has to be provided in a manner that helps students to become aware of their own cognitive processes so that they are supported to gain mastery of them to become self-regulating learners. The teacher, according to Sadler (1989), plays a significant role in bringing about the transition from receiving and using feedback to being self-monitoring. Teachers also assist by providing opportunities for and through scaffolding the processes of peer and self-assessment, as part of the normative practices of the learning community. Appraising your own work and that of your peers is a way to develop evaluative and productive knowledge and expertise (Sadler 1989), further strengthening the self-regulating system. Of all of the interventions in education, feedback is the largest contributor to the student's achievement. Ordinarily, in a classroom, students receive very little individual attention in the course of a day. Electronic communication and digital technology could change this. Teachers could provide more contingent feedback; teachers and students could interact through electronic logs; peers could comment on posted work; and programmes could help analyse written work and provide stylistic feedback.

13.5 Considerations and Constraints

There are several considerations when thinking about creating networked forms of learning that are technologically situated and mediated. The first concerns the function of schooling. It has been variously argued that schools exist for more than the function of delivery of an overt curriculum—they serve wider socialising functions. As Larry Cuban has said in his aptly titled book *Oversold and underused*, 'the next

generation of Americans will wonder about the wisdom of previous reformers seeking technocratic solutions that ignored the broader civic and social roles of schools in a democratic society' (Cuban 2001, p. 196).

The second issue concerns the evidence that technologically mediated environments are maximally effective for students. While conducting a meta-analysis of research on online learning for senior secondary school students, it was discovered that, 'few rigorous studies of the effectiveness of online learning for K-12 students have been published' (Means et al. 2010, p. xiv). The analysis, however, did reveal that, 'instruction combining online and face-to-face elements had a larger advantage relative to purely face-to-face instruction than did purely online instruction,' (p. xv) but the estimated effect sizes were for students older than those in traditional schooling (p. xviii). The authors concluded that there was no evidence that online learning was superior as a medium. Other research into online learning posits that it is 'less well suited to learning highly contextualised information; … large quantities of textual material … the development of certain practical skills; and areas that involve and depend on direct face-to-face human contact including emotional and affective learning' (Candy 2004, p. 5).

Research to date suggests the need for an approach to designing learning environments that offer choice in the extent to which networked or online learning might be available and utilised. It may be that there is also an option whereby there is a realigning of current conceptions of schooling with real-world-technology experiences. There is a research, for example, that supports that 'students want to bring their technology experiences as a part of a social network outside of school *into* school to increase academic engagement' (Spires et al. 2008, p. 512), which is what Millard (2003) would call a transformative pedagogy that 'would allow children's cultural interest to be merged with the school requirements into what is described as a literacy of fusion' (p. 3).

If, however, we agree that technologically mediated, networked environments are an effective way for our young people to engage with learning, then, there are several additional considerations. The first is access. In general, the term digital divide has been used in relation to the socioeconomic divide that restricts some students' access to online technologies. More recently, however, the term has come to mean a number of different things. For instance, although still connected with inequitable access, it has been used to describe an urban/rural divide based on access to fast and reliable broadband connections. Another way, it is used is to describe what is perceived as a tech-savvy divide between students and teachers. All of these divides would have implications for a networked 24/7/365 learning environment; the most significant of these for students being the access divide. In fact, there is now some evidence that schools and libraries currently play an important role in where students' go online, with Pew Internet and American Life Project (Lenhart et al. 2008) maintaining that 77% of the American teenagers access the Internet from school and 60% from a library. As we know that there is a digital divide and that access to the type of technology that they desire is an issue for many students, the educational entity to which they are affiliated would have to provide well-located technology pods (like some schools currently have) where students could drop in at any time.

There is also an accumulating body of evidence that perhaps the assumption that today's students are tech savvy has in fact done them a disservice (Bennett et al. 2008; Helsper and Eynon 2010). Teachers and parents, often feeling their own technical skills might be lacking, are easily impressed by students' familiarity with technology and the affordances of Web 2.0. Research is now emerging, however, that while students may be skilful with online networking possibilities and in uploading or downloading different media like music and film, they are much less knowledgeable when searching for and using curriculum-based information (Combes 2009a, b; Hipkins 2005; Ladbrook and Probert 2011). The American Library Association (1989) posits that to be information literate 'a person must be able to recognise when information is needed and have the ability to locate, evaluate and use the needed information effectively'. These skills are also applicable when operating in an online environment. The issue of students' information literacy skills is further compounded by what some see as a lack of critical literacy skills with texts that go beyond the information (Burn et al. 2010), and there is also a large number of students who struggle with functional literacy skills in school and are the focus of many current initiatives.

In a learning environment where students have a choice on what, when, where and with whom they work, an issue which often surfaces currently in secondary schools, becomes more salient in a networked community of learners, namely, are adolescents, let alone younger students, able to make good, informed decisions about their learning? The issue of 'maturity' and developmental readiness both cognitively and in a psychosocial sense is highly complex. Developmental psychologists (e.g. Steinberg et al. 2009) contend that, at a certain point, adolescents demonstrate adult levels of cognitive capacity but not necessarily emotional and social maturity at the same time. There is not a single line or time when adolescents can be deemed to be able to take responsibility for various actions and decisions. It varies depending on the nature of the context and the demands placed on the adolescent for adult-like functioning. In terms of school learning, the issue would seem to be the nature of the context and the extent to which taking responsibility for their learning is a cognitive versus a more social act. While there is agreement that by 15 or 16 adolescents have adult-like information processing capacities and ability to understand cognitively, in other areas with more social input they do not, even up until early adulthood.

The conclusion is that, while adolescents by 16 have adult-like cognitive capacities, they have far less capability in relation to more socially situated decisions and some decisions with respect to learning are inherently social acts. Those younger than 16 may be doubly disadvantaged (cognitively and psychosocially) with respect to making decisions about their learning.

13.6 Conclusion

We agree with the recently released *Horizon Report* (Johnson et al. 2011) that current key trends include that 'people expect to be able to work, learn, and study whenever they want' and that 'digital media literacy continues its rise in importance

as a key skill in every discipline and profession' (p. 3). However, we remain unconvinced that a fully online curriculum is the current way to approach the imperatives described in the first part of this chapter. Given the constraints we have described and the lack of evidence for success, we would be more in favour of a blended approach. Even then, we would urge work to be done to develop new pedagogical approaches that include new technologies, so as old wine is not simply being packaged into new bottles. We agree with Bennett, Maton and Kervin that there needs to be a 'considered and rigorous investigation that includes the perspectives of young people and their teachers, and genuinely seeks to understand the situation before proclaiming the need for widespread change' (Bennett et al. 2008, p. 784). Unlike Cookson (2009, p. 512), we do not see the walls of conventional schooling collapsing before our eyes, but we do see considerable gaps in the wall and in this real opportunities for change in the way learning is organised.

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Chapter 14
Using Assessment to enhance Twenty-First Century Learning

Alan Ovens, Dawn Garbett and Rena Heap

14.1 Introduction

This chapter examines the role assessment can play in motivating and guiding learning for the Net Generation. It has been recognised for some time that assessment is a problematic term that is often used to denote several things at once (Ramsden 2003). For example, assessment can refer to the process of grading and the process of enhancing learning; it can involve appreciating the issues students encounter and teaching them better; it can be about meeting standards and having explicit criteria of expectations and it can simultaneously generate information and influence future decisions (Carless 2007). Roos and Hamilton (2005) suggest that such differing purposes reflect deeper discussions about the nature of teaching and learning. They posit that those who lean more towards summative assessment draw from behaviourist learning theories that are focussed on measuring learning, while those who concentrate on formative assessment draw more from constructivist theories of learning and are more focussed on issues of feedback and development. In a similar way, Joughin (2009) proposes that assessment is typically framed in binary terms between a model built around measurement, where knowledge is objective and value free and assessment becomes a means to determine the extent of learning, and a model built around judgement, where knowledge is seen as provisional, subjective and context dependent, and assessment is construed in terms of evaluation, quality and judgement.

Assessment has also been closely aligned to efforts to improve school effectiveness. Within the concerted effort to reconfigure schools for modern times, Mutch (2012) suggests that there are three different movements in assessment that can be identified. The first relates to how assessment is used for accountability purposes to ensure schools are meeting stakeholder needs. The second concerns the role assessment plays in improving student learning, particularly as it relates to

A. Ovens (✉) · D. Garbett · R. Heap
University of Auckland, Auckland, New Zealand
e-mail: a.ovens@auckland.ac.nz

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the improvement of school processes to achieve societal goals. The third relates to embedding assessment as a sustainable educational practice in terms of enabling students to be lifelong, self-reflective, independent learners and critical thinkers. These discursive movements are captured in the distinction between assessment *of* learning, assessment *for* learning and assessment *as* learning, respectively. In her analysis of assessment in the New Zealand Curriculum, Mutch (2012) suggests that all these purposes operate simultaneously, although their relative importance varies in some policies and at some times rather than others.

Our concern with viewing assessment in this manner is that it can overlook how connected the modern learner has become and the implications this has for the types of learning that emerge. One of the key values of drawing on the concept of the Net Generation is its ability to shift attention to the connecting, connectable and connected nature of modern life and the possible implications this has for recognising the dynamic way an individual's aspirations, knowledge and identities emerge from the networks they are part of. Connections are relational, meaning that they enable a means of exchange (such as the flow of ideas, information or material goods) and such information can be used as feedback to influence a system's behaviour (Mützel 2009; Ovens and Godber 2012). Such a relational orientation focuses attention on the individual learner as part of social networks that extend beyond the school boundaries and afford access to different flows of information. When the form, nature and content of human connections are so numerous and dynamic, what may appear to be a linear and isolated process (i.e. individual students learning in the apparent confines of the classroom) can, on closer inspection, reveal itself to be far more complex (i.e. each student forming a highly personalised learning network across multiple sites).

For the purposes of this chapter, we suggest that assessment is best understood as a set of processes involving technological and social resources that enable those involved (both teachers and students) to engage purposively with evidence of learning in order to enhance the learning process (Daly et al. 2010). In this way, assessment becomes linked with fostering a learning culture aimed at supporting meaningful engagement with learning activities, inferring from this what learning is emerging, deciding what further resources and connections are needed and providing accountability to ensure learning takes place. Such a definition does not assume the purpose(s) of assessment, who assesses, when assessment occurs or how it is done (Joughin 2009). It does, however, view assessment as embedded within broader frameworks of learning, which are based on the roles of the participants (teachers, individual learners, peers) and a range of practical and discursive actions in which they participate. It provides a basis for considering these matters clearly and aids the discussion of the relationship between assessment and learning as well as how to skilfully utilise those 'teachable moments' that emerge in pedagogical encounters.

Table 14.1 The nature of a Net Generation learning culture (adapted from Brown 2005)

Net Gen trait	Learning principles	IT application
Group activity	Collaborative, cooperative, supportive	IM chat, virtual whiteboards, screen sharing
Goal and achievement orientation	Metacognition, formative assessment	Online formative quizzes, e-portfolios
Multitasking (connected)	Active	Wireless
Experimental, trial and error	Multiple learning paths	Applications for analysis and research
Heavy reliance on network access	Multiple learning resources	IT infrastructure that fully supports learning space functions
Pragmatic and inductive	Encourage discovery	Availability of analysis and presentation applications
Ethnically diverse	Engagement of preconceptions	Accessible online resources
Visual	Environmental factors, importance of culture and group aspects of learners	Image databases, media editing programs
Interactive	Compelling and challenging material	Variety of resources, no 'one size fits all'

14.2 The Net Generation and Assessment

The concept of the 'Net Generation' can be defined in a variety of different ways (as evidenced in other chapters of this book). Typical definitions point to the nature of the learner and suggest that such learners are somehow substantially different from earlier generations because they have grown up with digital media and are assumed to be universally savvy with information and communication technologies (Hargittai 2010). Our interest in this chapter is not so much on the debate of whether there is indeed a new generation of learners, but on considering whether this concept better describes the effects of social networks and connectivity on learners. A variety of characteristics have been observed in those described as the Net Generation and these include: familiarity with and regular use of computers; active social networks and highly connected via the World Wide Web; technologically savvy and confident in multimedia environments; a preference to be actively engaged in tasks; and regarding social interaction as important (Hargittai 2010). However, the empirical evidence suggests that these characteristics tend to be distributed unevenly across the cohort of young people. Based on this, our suggestion is that rather than being a homogeneous generation of learners who are technologically savvy, the concept of the Net Generation is more aptly described as an expression of a possible learning culture enabled by technology.

The nature of this culture and its relationship to changing ideas around learning and how this is enabled by information technology are illustrated in Table 14.1.

Framing the Net Generation learner in this way recognises that learning cultures are always dynamic, uncertain and that the connection between learner and teacher

Table 14.2 Characteristics of assessment activities (Elliot, 2008)

Characteristic	Description
Authentic	Involving real-world knowledge and skills
Personalised	Tailored to the knowledge, skills, and interests of each student
Negotiated	Agreed between the learner and the teacher
Engaging	Involving the personal interests of the students
Recognise existing skills	Willing to accredit the student's existing work
Deep	Assessing deep knowledge—not memorisation
Problem oriented	Original tasks requiring genuine problem-solving skills
Collaboratively produced	Produced in partnership with fellow students
Peer and self-assessed	Involving self-reflection and peer review
Tool supported	Encouraging the use of information and communication technology

is 'not linked by chains of causality, but (by) layers of meaning, recursive dynamics, non-linear effects and chance' (Osberg 2008, p. viii). Elliott (2008) suggests four ideas in particular are of particular relevance to understanding this contemporary culture. First, modern information systems provide an 'architecture of participation' that not only makes it easy to connect and access information but also improves as more people become involved. Related to this is the second idea of 'user-generated content' that refers to the ease of creating and sharing content through social networking sites. Third, the idea of 'openness' refers to the philosophy that this content is freely shared among users of the net. The fourth idea relates to the 'power of the crowd' and the way being connected can provide access to a diverse range of resources and expertise that constitutes forms of both individual and collective intelligence when needed. The irony is that formal education and schooling risks being disconnected from the social and digital spaces are enabled through technology and social networks.

Such ideas have implications for modernising assessment (Elliott 2008). They seek to bring a future-oriented approach to teaching and learning, not by upgrading to, or foregrounding, a concept of 'e-assessment' (through machine marking or other adaptations of modern technology) but by using the same tools and techniques that students use at home and teachers use in their workplace. Elliott (2008) suggests that the type of assessment activity best suited to the emerging educational and technological landscape assessment activities should exhibit some or all of the characteristics in Table 14.2, although the list is not an exhaustive one.

We have used the frameworks as outlined above to consider our assessment practices with Net Generation learners. This assessment does not discriminate between summative and formative assessments, nor does it focus on the ideas of assessment *of*, *for* and *as* learning. Yet, these various distinctions are implicit when we think about working with Net Generation learners. We view such ideas as fluid and dynamic, each coming to the fore if and when required. Unfortunately, we note that there is currently a paucity of examples in the literature of how such principles

become enacted in teaching contexts. For that reason, we focus the remainder of this chapter on four case studies in an effort to illustrate how we have enhanced our teaching by drawing on this framework. The case studies cover a range of courses of study, students and technological tools.

14.3 Case Study One: Negotiated Coursework and Grading Contracts

The first case study addresses the notion that in any typical course, the teacher makes nearly all of the decisions related to what is going to be taught and how it will be assessed. To interrupt this pattern, and encourage students to think more deeply about the value of what they were learning, a cohort ($n=40$) of third year students enrolled in the Bachelor of Physical Education (Secondary) Teacher Education Programme were invited to participate in planning and designing a course they would be doing in the following semester. As co-contributors to course design, a representative group of students were invited to negotiate what learning was important to their needs, where and how such learning should occur and how the outcomes should be assessed.

In the initial workshops, there was a lot of discussion around students' prior experiences of assessment. Concerns were expressed by the students about the ability of traditional forms of assessment to fairly assess their learning. There was also a concern that written assignments (e.g. essays and reports) tend to be the assessment norm and that they were keen to explore alternative ways of demonstrating their learning (e.g. PowerPoint presentations, models, dance or role-play performance). In the end, the workshop group agreed that portfolios seemed to be the logical way to explore many of the ideas discussed and allow individuals to focus their learning around their individual needs. While a number of ideas and approaches were included into the course design, it was agreed that the course use individualised negotiated grading contracts (Brubaker 2009, 2012).

Negotiated grading contracts allowed students to be involved in many of the key decisions that related to how their learning would evolve and be assessed. In negotiating a grading contract, students were being asked to engage in a meaningful way with assessment decisions they were never normally privy to in other courses. For example, students were asked to explain what they would do to earn a grade for the course, to what extent they would do it, how they would document and present their work, what criteria should be used to judge the quality of the work, and how such judgements would translate to a final grade. Guidelines were provided to assist students with each of these decisions along with active discussions during initial classes. Each contract was also negotiated with the course lecturer and eventually signed when both parties agreed that the contract provided a fair basis for engaging in the course. The process challenged students to think about the nature of the coursework they were undertaking and how it related to both the course goals and their individual aspirations.

Now in its third year, this case study demonstrates the advantage of providing opportunities for assessment to accommodate the characteristics discussed above (see Table 14.1). When learning opportunities are personally tailored, students are in a position to connect their learning with other aspects of their lives and personal aspirations that their lecturers are not normally aware of. For example, they may have identified that they need to deepen their understanding of a particular concept they are unsure about, or connect their work across several courses. When students are engaged in learning tasks that are meaningful, authentic and determined by them to be of real use, students often go far beyond what might ordinarily be expected. These students report that they are completing tasks for their own benefit rather than their exchange value for grades as such. Typical of their comments in the end of course evaluation were statement such as 'I don't care about the grade. I have learnt so much doing this assignment'.

14.4 Case Study Two: Engaging Students Through Online Tools

The second case study was with a cohort of students ($n = 160$) enrolled in the Graduate Diploma (Primary) Teaching Specialisation. In this case, we highlight synchronous and asynchronous learning in their science education course through the use of online learning tools such as PeerWise and Piazza. PeerWise (Denny et al. 2008) was used to engage students in a collaborative learning community in which they created, shared, evaluated, answered and discussed their growing repository of media rich multi-choice questions. Students were asked to upload a science animation or interactive, which could be used in a classroom with children, and to provide one multiple-choice question related to this artefact but directed to their peers as teachers. Students were also required to answer at least five of the questions uploaded by their peers—for a relatively small number of final marks.

Data collected through the PeerWise analytics and from the students' course evaluations shows this assessment task met many of the assessment criteria in Table 14.2. The task was authentic in that the students spent considerable time sourcing and selecting animations and interactive sites which would be appropriate and valuable resources for their own later use as teachers. By sharing their questions and sites with their peers, they developed a rich and growing repository of resources. The task was personalised in that each student approached it with their own knowledge, skills and interests. The task involved peer review of each other's postings, and self-reflection based on the feedback the students received from their peers. Because PeerWise is based on some of the familiar gamification aspects of the Net Generation with a leader board and badges for incentivising tasks, technology has made this an even more engaging activity. This was evidenced by participation rates in PeerWise which far exceeded our expectations. Over 86 % of students answered more than the five questions required for the maximum marks available

for this assessment task; 17 students answered more than 25 questions, with one student answering 104.

These students also used Piazza, synchronously during each session and asynchronously in their own time, throughout the semester. This is an online web application and computing platform combining personal communication, instant messaging, wiki, and social networking and is able to work in real time. Piazza became a back channel during sessions, where students were asked to upload posts commenting on different aspects of conceptual understanding in an ongoing manner throughout each session. This allowed the lecturers to more openly assess student understanding during the session, in real time—and to provide feedback to the class and adjust course content as appropriate. The students were encouraged to provide feedback on each other's comments, thereby significantly increasing the opportunity for feedback well beyond that which an individual lecturer could provide in any session.

Piazza met the socio-cognitive considerations of collaboration, learning how to learn and the improvement of ideas that is considered essential for knowledge building (van Aalst 2009). Piazza foregrounds the goal of collective knowledge advancement within a community (Scardamalia and Bereiter 2003) rather than competitive individual gains. The collaboration required more than the students sharing ideas. They had access to the ideas of other students and were able to consolidate these in order to improve their own understanding while at the same time building the knowledge of their peers (van Aalst 2006). Piazza allows for students to revisit the session, re-read the record and to upload new artefacts for their peers to consider.

Relating to Elliott's (2008) four ideas of Web 2.0 assessment, both these online tools provided an architecture for participation and relied upon user-generated content, openness and the power of the crowd.

14.5 Case Study Three: Interactive Teaching

The third case study was with a cohort ($n=40$) of first year students enrolled in the Bachelor of Education (Early Childhood Education) Teaching Specialisation. This course was designed to develop students' understanding of science content and pedagogical content knowledge appropriate for young children in early childhood centres. We believed that a teacher's science content knowledge is an important determinant of their willingness to engage young children in science activities (Garbett, 2007). We utilised GoSoapBox and e-portfolios to maintain a focus on content knowledge while also encouraging students to curate a pedagogically appropriate and rich resource.

GoSoapBox was used to provide user-friendly short multiple-choice question tests, as formative assessment so that students could see at the beginning, during or at the end of a session how much they knew about a particular topic. Since the tests remained on-line and were supported by other resources, students could continue to develop their understanding after the sessions. We used a random selection of 20

out of the 160 amassed multiple-choice questions in the examination at the end of the course. The average score in the examination was 18.45 out of 20 (92.25 %) with 15/40 scoring 100 % and every student scoring more than 70 %. Even though this was only worth 10 marks in their final grade, we signalled that content knowledge was important if they were going to be confident and competent to facilitate learning about science in the early childhood centre. During the course, students were able to revisit the tests as often as they chose, thus aiding the teacher in relinquishing the role of sole engineer of the learning process and turning epistemic agency over to the students (Scardamalia 2002). In considering characteristics of Web 2.0 assessment (Elliott 2008), this task was personalised, recognised existing skills, was self-assessed and was tool supported.

Another assessment strategy was the students' creation of e-portfolios over the duration of the course to record their developing pedagogical content knowledge. Each fortnight, they were required to upload the following: an artefact (e.g. a photo or video clip) of themselves engaged in 'doing' science in the workshops; a brief description of their learning for at least two practical science activities; a half-page reflection or description focussed on something that had surprised, excited or puzzled them about teaching that topic to young children; and an original resource or a web-based resource for young children based on the topic. These were marked online, but privately, within five days. Additionally, a general statement which highlighted any common misconceptions, offered alternative explanations and suggested ways to improve the quality of the exchanges was published on the Learning Management System platform. In this way, students were made aware of their progress as a cohort as well as receiving personalised feedback. Of particular note, students commented positively on their control over what they uploaded and took advantage of being able to update work that they had previously submitted into their e-portfolio for grading, based on their new learning.

This epitomises the characteristics of assessment as being personalised and involving self-reflection. Utilising the 'power of the crowd' in order to create their e-portfolios gave students access to alternative learning networks beyond their class community, and the capacity to curate numerous sites and expertise accessible in the wider Web.

14.6 Case Study Four: Peer Marking Panels

The fourth case study was with a cohort ($n = 15$) of science students enrolled in the Graduate Diploma (Secondary) Teaching Specialisation. As part of their coursework, each student completed an individual research report that was submitted to a marking panel of their peers from the course. There were three panels established within the cohort, with each panel responsible for reviewing and marking a set of research reports from their peers. The panels were organised so no panel member's report was marked by their panel.

Peer marking panels provided multiple authentic learning opportunities. The process developed a lived understanding of the mechanics of assessment, including peer moderation and standards-based assessment. Having four or five peers comment on each student's work increased the amount of feedback that each student received. Peer marking panels extended who read and judged the quality of each student's work. Furthermore, it challenged members of each panel to think about issues related to fairness, standards, criteria and moderation. The course lecturer had the ultimate responsibility for moderating between the panels as well as being the arbiter of any discussion.

One benefit noted by a number of students as members of the marking panels was the value they got from reading the work of their peers. However, a drawback which they drew our attention to via focus group interviews conducted at the end of the course was that some students had been reluctant to have their peers read their work. Transferring this onus from the traditional authority (i.e. the teacher) had undermined their confidence in the social context to an extent that we had not been aware of.

One of the corollaries of the assessment task was that students created media-rich resources with an informative splash page to advertise the web-based resources they had amassed. Collaborating and making their end-point resources available to their peers would have been useful for all of the students. However, because their resources were graded and figured on their official transcripts, the overriding motivation was to maximise the exchange value of them for grades. The ramifications of this were that rather than openly sharing their work, a competitive job market led to most students guarding their final resources closely. This case draws attention to the gap between the theory and practice of implementing Web 2.0 assessment practices for the Net Generation learners.

14.7 Concluding Thoughts

Each of the case studies discussed above offers a different way of invoking assessment as an integral aspect of the learning culture of Net Generation learners. We outlined at the start that in this new culture, pedagogical encounters are characterised by learners engaging with and connecting to other key agentive elements in ways that combine to create a personalised learning network that extends outwards from each student (Ovens and Godber 2012). Such a view places the student at the centre of the learning nexus and positions the teacher as possibly being with, against and alongside other significant elements that also contribute to and shape the individual's learning. In this sense, it is difficult to define assessment in concrete ways since its form is fluid and emerges as forms of dialogue as students engage with learning activity.

Our focus in the case studies was to enhance learning by viewing assessment as part of the ongoing dialogue emerging from pedagogical encounters. This has required numerous changes in our roles as teachers, changes in the role of students,

changes in the nature of student–teacher interaction and changes in the relationship among the teacher, the student, and the course content. Assessment that is more student centred, reflective and proactive in enhancing students' achievements and their capacity to harness the potential of the net acknowledges that an essential part of working with the Net Generation of learners is having a greater sensitivity to how they make sense of learning activities and the need to adapt pedagogy accordingly. Assessment must be deeply embedded as part of the learning culture and how our students learn. It must be evoked in different ways that work for the Net Generation learners – and if teachers are to be leading learning in their classrooms, it behoves them to become Net Generation learners themselves.

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Chapter 15
Maximizing the Benefit of Technology for Language Learning

Alexander Seeshing Yeung, Zhu Chen and Bingyi Li

15.1 Introduction

Since the advent of the information age, ongoing technological developments have significantly changed our lives. In educational settings, the prevalence of technology is also expected to bring about a revolution in learning and teaching. Governments and policymakers have injected significant amounts of resources, and support to promote the use of technology in schools. The use of information and communications technology (ICT) in learning and teaching processes is believed to benefit learners and learning in various ways and in a whole range of curriculum areas. This belief still persists although it is also known that some teachers are reluctant to use modern technology for teaching purposes and for some, ICT usage tends to be superficial (Yeung et al. 2012b). In this chapter, we focus on the use of ICT in language learning. We first identify critical issues related to the use of ICT in language learning and teaching, and then attempt to suggest possible ways to maximise the benefit of ICT application for language learning.

15.2 Technology in Twenty-First-Century Education

Governments tend to integrate technology into education for economic, social, and developmental purposes (Hawkridge 1990). From economic and social perspectives, it is necessary to highlight technology-related skills as an end in education since technology has become increasingly important for people to function

A. S. Yeung (✉) · Z. Chen
Australian Catholic University, 25A Barker Rd, Locked Bag 2002,
Strathfield NSW 2135, Australia
e-mail: alexander.yeung@acu.edu.au

B. Li
University of Western Sydney, Parramatta, Australia

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in modern society as skilled members of the work force. From educational and developmental perspectives, technology has been widely introduced in educational settings worldwide as a means to boost students' learning outcomes and to promote educational innovations (Education Commission, Hong Kong 2000; Ivers 2003). In Australia, ICT capability has been listed as one of the seven general capabilities essential for living and working in the twenty-first century and thus needs to be covered in the National Curriculum as described by the Australian Curriculum, Assessment, and Reporting Authority (ACARA 2012c). To develop students' capability in ICT, ACARA has identified two approaches in the National Curriculum. The first approach emphasises a 'technologies' curriculum which covers two subjects, namely design and technologies and digital technologies. This emphasizes treating ICT as a discipline which is to be explicitly taught in formal education (ACARA 2012c). The second approach places an emphasis on 'using technology as a tool to search for, organize, evaluate and communicate information, and the possession of a fundamental understanding of the ethical/legal issues surrounding the access and use of information' (Partnership for 21st Century Skills 2007, p. 1). This approach is materialised through an infusion of ICT techniques and applications in all learning areas of the National Curriculum, by encouraging the use of ICT for tasks such as 'conducting research, creating multimedia information products, analysing data, designing solutions to problems, controlling processes and devices, and supporting computation while working independently and in collaboration with others' (ACARA 2012c).

The infusion of technology in the process of learning and teaching is believed to have more than just motivating effects on students' engagement to learn. It can also promote students' independence in learning, increase the connection of learning to life, provide what the teacher cannot provide, improve the quality of presentations in class, increase the amount of resources for learning, and enhance students' interaction with their peers and the teacher (Goodison 2002). In view of these potential benefits, the Australian government has invested substantially in the supply of technological equipment to schools, in support of the expected widespread utilisation of ICT by teachers and students. One of the recent programmes is the Digital Education Revolution (DER) in which Australian $2 billion were budgeted by the former Rudd Government to provide every ninth through twelfth grader with a computer (Harris 2011; Murphy 2011). For the schools, as planned in the state of New South Wales (NSW; NSW DEC 2011), for example, 4300 interactive whiteboards, at the cost of Australian $23 million, have been installed in 1000 NSW primary schools since 2012.

15.3 ICT in Language Learning

As one of the key learning areas in the school curriculum, the language curriculum is designed to embrace ICT capability development as one of its components:

> Students use ICT when they interpret and create print, visual and multimodal texts. They use communication technologies when they conduct research online, and collaborate and

> communicate with others electronically. In particular, they employ ICT to access, analyse, modify and create multimodal texts, including through digital publishing. (ACARA 2013, "Information and communication technology (ICT) capability", para. 2)

While ICT application is expected to bring about a range of benefits to the language learners, the English learning process involving ICT applications is also expected to promote ICT capability:

> As students interpret and create digital texts, they develop their capability in ICT including word processing, navigating and following research trails and selecting and evaluating information found online. (ACARA 2013, "Information and communication technology (ICT) capability", para. 2–3)

From the policymakers' point of view, it is also expected that language-teaching efficiency will benefit from the use of technology, just as would the teaching of other subjects in the school:

> Learning languages is enhanced through the use of target language multimodal resources, digital environments, and technologies that provide for both synchronous and asynchronous learning experiences. Accessing live target language environments and texts via digital media contributes to the development of information technology capabilities as well as linguistic and cultural knowledge. Accessing diverse real–time contexts extends the boundaries of the classroom. (ACARA 2012a, p. 14)

15.4 Benefit or Not

To date, the actual impact of technology on language learning has remained controversial. In spite of the government's commitment to promoting technology in schools, there seems to be no classroom-based evidence showing that increased utilisation of technology would improve language learning. There is no evidence that clearly shows that there were increased applications of ICT as a tool in language teaching due to the provision of large numbers of computers and interactive whiteboards to teachers and students (Goodwyn and Findlay 2003; Harris 2011). In general, in school settings, traditional modes of teaching and learning seem to be preferred by at least some teachers and students (Goodwyn and Findlay 2003; Harris 2011). Compared to other subjects such as mathematics and science, technological revolution in language subjects seems to have happened to a much smaller scale (Goodison 2002). Traditionally, language subjects are considered to be the least compatible with technology use probably due to the nature of the subject, often described as 'humanities-based, liberal and book-dominated culture' (Andrews 2000, p. 23). Even though there is an increasing use of online modes of delivery for language programs, some teachers and students still prefer face-to-face interactions to online delivery (Pena and Yeung 2010). Also, even though some teachers use the technology provided to them, they rarely do so effectively.

For some teachers, the use of technology in teaching is not even voluntary. Some of them do use technology just because they are required to do so to fulfil their obligations and to meet certain requirements (Yeung et al. 2012b). The potential of

technology application in boosting students' outcome has therefore not been sufficiently exploited by language teachers. From this perspective, we may speculate that it is the people, instead of the physical facilities, or resources, that allow the benefits of technology to actually materialize in language learning and teaching. This is substantiated by a range of studies which suggested that among other factors, pedagogical and psychological factors tend to have the most significant influences on the utilisation of technology in learning and teaching (Becker 2000; Hennessy et al. 2005; Rogers 2002; Veen 1993). These factors are elaborated below. While reviewing these factors, we will be able to explicate how technology can be used to its full potential for language-learning purposes and how barriers can be overcome to allow the effective use of technology to benefit language learning.

15.5 Issues with Learning Objectives

The literature has suggested a number of benefits of technology for learning. Attracting and retaining learners' attention to learn has been frequently mentioned as one of the major advantages of technology (Cogill 2003; Cooper 2003; Davison and Pratt 2003; Goodison 2002). However, the sensational nature of computer graphics has raised concern over students' overemphasis on the presentation of the layout features of the technology rather than focusing their attention on the intended learning objectives (Cogill 2003; Goodison 2002; Hennessy et al. 2005). When ICT becomes a compulsory requirement in all learning areas, language teachers, like teachers from other subjects, are likely to face the tension between the use of ICT to achieve learning goals and the demonstration of technology use per se. For students, a shift from language-learning objectives to attention given to superficial software features will become a distraction from curriculum goals. Furthermore, for some teachers, when language lessons are deliberately adapted to fit in with the development of ICT skills, the actual amount of time spent on language-learning activities may be decreased.

Potential Solution The inconsistency between technology use and learning objectives could have important implications. Firstly, despite the emphasis on technology use, it is important for teachers to ensure that the focus on language-learning objectives is maintained. For the application of technology to add value to the language classroom, we need to ensure that it is clearly oriented towards the goals of the language lesson. It could be a disaster if teachers apply software features in a superficial way and overemphasize presentation layout, as these will result in the language lesson becoming a demonstration of technological features instead (Goodwyn and Findlay 2003; Hennessy et al. 2005). Technology should be used only when it is appropriate and clearly advantageous over other resources. Primarily, teachers need to first ask themselves how the technology is going to be used and what it is for, to determine whether it is appropriate. As language learning is not one of the 'technologies' domain in the National Curriculum (ACARA 2012b), ICT should be treated as a 'tool' for effective language learning as suggested in Partnership for 21st Century Skills (2007).

Secondly, even though it is argued that technology can be used to support a variety of language activities, ranging from 'the most mechanical drill-and-kill exercises to fully communicative real-time conversations' (Blake 2013, p. 15), optimal use of technology requires a clear mapping of a relevant tool to each learning activity. In essence, it is not about how much is used, but how they are used (Mishra and Koehler 2006; Sipilä 2010). According to Hennessy et al. (2005), to best address learning objectives, what is required is the critical and selective use of the appropriate technology, which may involve two aspects as follows: (1) the choice of technology for the best effect and (2) the interface between non-technological teaching approach and technology use.

The first aspect is to use various tools for different activities or different pedagogies according to their relative advantages. It is problematic to ignore the diversity of technological tools with different features and consider technology as a homogeneous tool yielding similar effects. Different tools empower teachers in different ways. For example, the Internet increases teachers' access to authentic target language-teaching material. Online chatting helps teachers to encourage language learners to engage in interactions, to facilitate the negotiation of meaning and language production, and to create global learning networks (Blake 2013). Facebook has been highlighted by Blattner and Fiori (2009, p. 25) as an innovative tool for 'authentic language interaction and development of socio-pragmatic awareness (language use in specific contexts, relationship building, and language awareness through observation and/or experience)'. The authenticity offered by Facebook-based communication with speakers all over the world is deemed especially beneficial for intermediate and advanced learners to understand language variation (Blattner and Fiori 2009). Web pages are not only resources for enriching language but also provide material for applying the target language as the medium to learn content or acquire information from a content-based approach (Blake 2013; Richard 2005). Tele-collaboration, which is an online communication tool that helps bring together language learners from different countries (O'Dowd and Ritter 2006, p. 623), seems to be a useful tool for intercultural language instruction (Belz and Kinginger 2002; Blake 2013).

A variety of other ICT applications, such as chat boxes, bulletin boards, messaging, blogs, wikis, and email, are also known to be facilitative to communicative language learning. This is partly because they reduce physical and time constraints for learners to be involved in meaningful and authentic communication with their teachers and other learners (Abraham and Williams 2009; Hampel 2006). Recent improvements in interactive classroom technology (combining the use of interactive whiteboard, video conferencing facilities, computers with Internet connection, lesson creation software, data collaboration software, etc.) have even made it possible for teachers to deliver language lessons to a number of schools at the same time (NSW DEC 2010). With the help of interactive classroom facilities, students in different schools can engage with each other in various ways as well. The list of the technological tools for each teaching approach is inexhaustive, as the number of new technological tools will keep increasing, and the innovative functions and features of each tool will keep evolving. The relevance and appropriateness of each

technological tool to the taught content are subject to teachers' discretion and judgement. Hence, teachers' creative use of the various technologies is highly valued and should be encouraged, but to make this happen, teachers should undergo proper training on the use of these tools.

The second aspect is about compatibility between non-technological teaching approaches and technology use. Some authors have proposed that the value of some important language skills such as spelling and handwriting should not be undermined despite the significant place of ICT in the curriculum (e.g. Goodwyn and Findlay 2003; Hennessy et al. 2005). Some researchers suggest conducting manual processes first and then using technology to enhance and extend these essential processes. In this way, the use of technology will add value to learning without compromising language-learning objectives (Hennessy et al. 2005). An example is to have students practise the language via traditional classroom activities first, and then the teacher can make use of blogs, videoconferencing, podcasts, and forums to expand communicative opportunities for students to apply their newly learned language skills when connecting to the world outside the language classroom.

15.6 Issues with Language Assessment

Nowadays, a wide range of technological tools such as recording equipment, statistical programs, databases, and programs capable of language recognition is used in language tests (Chapelle 2008). Three major contributions of technology to language assessment have been identified by Chapelle (2008). The first contribution is that computer-adaptive testing tools are nowadays capable of evaluating examinees' answers immediately and generating subsequent items accordingly. The second contribution is the use of multimedia in listening tests to contextualize aural language with images to monitor progress and guide improvement. The third contribution is that natural language-processing technologies have made it possible for learners' linguistic responses produced in speaking and writing tests to be scored by the computer. However, despite these major advances, some difficulties have also been observed. Apart from the substantial financial investment required to install new equipment for assessment, there is concern that the use of technology in language assessment may complicate what we intend to test. For instance, in computer-based writing tests, it is not only writing skills but also typing skills that contribute to the assessment scores. According to Chapelle (2008), what a computer-assisted reading test measures is not reading strategies in a traditional sense, but 'the ability to read with strategic use of online help' (p. 130). Furthermore, natural language-processing technologies assess learners' spoken and written language with particular focus on the linguistic aspect of answers (Chapelle 2008). This is in stark contrast to the intended outcome based on the communicative approach of language learning which emphasizes fluency over accuracy and claims that linguistic competence is one element, not the whole, of communicative competence. Moreover, in computer-based speaking tests, the interpersonal aspect—an essential feature of communica-

tion in authentic context—is missing. For these reasons, technology-based language assessment is sometimes considered as incompatible with communicative competence development.

Owing to these difficulties, technology-supported language assessment is unlikely to totally replace traditional forms of language assessment. Consequently, it is of no surprise then that some teachers feel strongly about the tension between the requirements of using technology in the language classroom and the adherence to traditional forms of assessment which, in contrast, give significant value to printed materials instead (Goodwyn and Findlay 2003). As many teachers use pedagogy conforming to the examinations for their subject content, too much emphasis on integrating technology as a component of the language curriculum will remain problematic as long as the use of technology in language assessment is not a general practice. An obvious example is that if word processing software is used in a writing test, the spelling check function can automatically amend incorrect spellings, making it impossible to detect students' spelling competence.

Potential Solution A possible solution to this is the use of a combination of technology-supported assessment and traditional assessment. These two types of assessments may be applied to different aspects of language tests based on their focuses and advantages. For summative assessment purposes, it will be useful to capitalize on the advanced functions of computer technology to assess the accurate use of language forms, but it is also important to assess communicative aspects of language using human assessors. For diagnostic and formative assessment purposes, computer-adaptive testing would have a significant role as it is fast and accurate, and perhaps more cost-effective. For example, in listening and reading tests, upon a successful response, the computer can generate the next test item appropriately aligned to the student's level of proficiency. By programming the test items in an appropriate sequence of difficulty, it is possible to very accurately identify each student's level of proficiency in the specific skill domains. In essence, the use of technology for assessment purposes should be approached with caution. For example, natural language-processing technologies may be useful for writing tests assessing the linguistic aspect of the learners' written language. Nevertheless, the scores for this linguistic aspect should only be treated as part of the final score because the other important aspects of the written language such as consistency, coherence, fluency, logic, and the content of the written piece can only be justly scored by an examiner. Most speaking skills are likely to be more accurately scored by a human examiner, who can provide more appropriate judgements on the communicative effectiveness of the examinee.

15.6.1 Issues with Pedagogy

Despite the increasing drive towards technology in learning and teaching, there are weaknesses in the language teachers' current pedagogical practices, which may become barriers against optimizing the benefits of technology for language learning.

While the choice of technology must be compatible with the pedagogy employed, pedagogy itself may need to be adjusted to accommodate the chosen technology. Some features of technology are attractive and may trigger students' attention, but conversely, they may distract them from valuable learning goals. This challenges teachers' pedagogical skills in minimizing the distraction, while maximizing the achievement of learning goals when using technology. In essence, the use of technology and pedagogy should complement each other (Blake 2013; Harris 2011). An additional complication in technology-supported learning and teaching is the increasing demand for achieving two interacting goals. That is, while learning the target language, students are also expected to build capabilities in using technology to complete various tasks in the language classroom. This adds an extra burden to the language teacher because, while it is not easy to achieve both language- and technology-related goals simultaneously, there may also be trade-offs whereby gains in one area may lead to negative consequences in the other.

For instance, whereas increased accessibility to information and resources via the Internet leads to a widened knowledge base, it also increases possibilities of plagiarism which can be a difficult issue to tackle. Even though teachers can use specifically designed software to detect plagiarism, it is not easy to monitor the way information is obtained, manipulated, and presented. Information from publicly accessible sources may be inaccurate, untrue, or misleading, and false information about language features could sometimes cause harm by reinforcing incorrect language habits. Hence, when setting tasks to students involving information from various sources, teachers need to specify not only elements such as the audience, the purpose, and word limit on downloaded text, but most importantly, emphasize the requirement for critical processing of the obtained information (Hennessy et al. 2005). It is essentially critical thinking and critical selection of relevant information from a wide range of sources that make information become useful knowledge. This emphasis on the learners' monitoring of available language material and selection of useful information clearly requires a shift from traditionally teacher-centred approaches to more learner-centred ones. It is therefore not surprising that with the increased use of technology, more student-centred activities and more collaborative learning are observed nowadays (Blake 2013; Goodison 2002; Sipilä 2010).

The increasing use of technology may also result in a new type of teacher–student relationship. Instead of the traditional relationship of teachers conveying knowledge to their students, teachers today may view ICT-savvy students as a valuable resource and may actually learn the latest technologies and applications from them. In this sense, the school setting is gradually becoming a broader learning community (Goodison 2002). Together with a shift to more student-centred learning, the increasing openness of information sources and the decreasing structure of teacher-directed instruction inevitably demand more flexibility in teachers' pedagogy. In practice, the use of technology has led to new directions in learning, which may include student-initiated activities and peer collaborations. Overall, these suggest a new pedagogical evolution in language learning. In general, Hennessy et al. (2005, p. 173–174) have provided a list of characteristics of effective pedagogy for ICT-supported teaching including:

- Affecting working processes and improving production
- Supporting processes of checking, trialling, and refinement
- Enhancing the variety and appeal of classroom activities
- Fostering pupil independence and peer support
- Overcoming pupil difficulties and building assurance
- Broadening referencing and increasing currency of activity
- Focusing on overarching issues and accentuating important features

The expected pedagogical evolution within the context of technology use is also reflected in Mishra and Koehler's (2006) extension of Shulman's concept of *pedagogical content knowledge* (PCK) to *technological pedagogical content knowledge* (TPCK). Shulman (1986) argued that having knowledge of the subject matter (content) and knowledge of general pedagogies (pedagogy) are insufficient for effective teaching. Teachers nowadays need to develop PCK which represents the intersection of content and pedagogy and deals with 'the ways of representing and formulating the subject that make it comprehensible to others' (Shulman 1986, p. 9). Basically, this distinctive body of knowledge enables teachers to transform content for teaching in effective ways. In response to the increasing use of technology in teaching, Mishra and Koehler (2006) have proposed the notion of TPCK which embraces technology as an important aspect of teacher knowledge in terms of how the subject matter is made accessible to learners. The extension of PCK to TPCK implies changes in the knowledge framework of teachers. In the sense of TPCK, neither knowledge of technology alone nor previous PCK, can maximize students' learning outcome in technology-supported language teaching. TPCK represents the intersection of technology, content, and pedagogy, which should no longer be considered as isolated from each other (Mishra and Koehler 2006).

Potential Solution Teacher education must be adapted to match the pedagogical evolution. Teachers' decisions and actions are also to some extent influenced by usual practice and the culture within their subject-specific community (Goodwyn and Findlay 2003; Kirschner et al. 2008). There are communities of practice 'where a process of social learning occurs between people with a common interest in a subject…' (Kirschner et al. 2008, p. 442). Hence, to language teachers, for the benefit of technology to materialize in language learning, it is important for the use of technology to be internalized as a subject-specific norm shared by language teachers. This internalization does not arise automatically from the increase of technology infrastructure in schools or compulsory requirements from authorities. The internalization will occur only when the relevance and benefits of technology application to the specific subject is visible to the subject-specific community. This may be realized through subject-specific professional development in which teachers are exposed to substantial examples of pedagogically meaningful technological application in language teaching (Goodwyn and Findlay 2003; Harris 2011). For any benefit to be sustainable, it is also necessary to promote professional dialogue about pedagogical use of technology within the community of practice so that language teachers can learn from each other. This is crucial because there is evidence that teachers' decision-making processes are shaped more by their actual experiences

and practical knowledge than theoretical knowledge acquired in teacher education programs (Kirschner et al. 2008; Sipilä 2010). It is therefore not surprising that more experienced teachers resist adopting technology in their classroom because they are used to non-technological approaches and have continually experienced success in achieving notable student outcomes without any technology (Hennessy et al. 2005). Therefore, effective teacher education should provide enough opportunities for teachers to play with various technological tools in subject-specific situations as well as to reflect on their congruence with practices in the subject delivery. In this way, teachers can accumulate hands-on experiences and practical knowledge in the pedagogical use of technology and build up a sense of ownership, which contributes to their further application in the classroom.

Even for those teachers who are competent personal users of technology, subject-specific professional development is also valuable. The extensive use of technology in personal lives does not necessarily indicate teachers' proficiency in the use of technology to teach a language effectively (Harris 2011; Hennessy et al. 2005). Pedagogical use of technology demands not only a general understanding about technology but also, more essentially, knowledge about how different technologies can deliver various language outcomes. Teachers need to be explicitly trained to adapt technology for language-teaching purposes and rectify any incompatibility between technology and the language content through effective pedagogy. Here, TPCK (Mishra and Koehler 2006) may be a useful framework to guide subject-specific professional development. According to this framework, it is the interplay of technology, content, and pedagogy that should be the pursuit of teacher training. In a language-teaching context, issues to consider may include: how technology (e.g. tele-collaboration, Facebook) can be used to enhance the effectiveness of pedagogy (e.g. intercultural language teaching, communicative language teaching) in delivering the content (e.g. intercultural communicative competence, communicative competence). Professional development programmes may start with considerations of how technology can be used to carry out popular learning activities more quickly, reliably, broadly, productively, interactively, and efficiently (Hennessy et al. 2005). Teachers will then also consider how these activities can be adapted further to facilitate more effective use of the technology to bring the best effects.

15.6.2 Issues with Teachers' Self-Concept

An important factor that has often been neglected is the self. With rapid updating of technological tools available to us, it is widely agreed that continuing self-initiated learning is essential for effective pedagogical use of technology (Blake 2013; Goodison 2002). Nevertheless, we cannot assume that teachers automatically have such commitment to self-initiated learning. According to Goodison (2002), there is a difference between commitment and compliance. Teachers who are committed to using technology for teaching not only attend training and implement programmes required by authorities but also become actively engaged in pedagogical use of

technology. Teachers' self-concept seems to be essential for such engagement. A lack of self-confidence or sense of competence is often found to be one of the major barriers leading to teachers' reluctance to use technology in their teaching (Cooper 2003; O'Mahony 2003; Sipilä 2010; Yeung et al. 2012a). Teachers' self-concept may be influenced by several factors. First, research has revealed that substantial personal use of technology in daily life has a positive relationship with teachers' attitudes towards the use of technology in education (Sipilä 2010; Wozney et al. 2006). It is possible that the personal use of technology, although not specifically for teaching purposes, improves teachers' self-confidence and self-efficacy related to technology, which contribute to their positive attitudes towards utilizing technology in their classrooms. Second, self-concept is developed from what teachers believe to be effective, based on their own teaching experiences. For those teachers who have developed a significant level of self-confidence through successful delivery of high-quality teaching using technology, the successful experience further reinforces the teachers' sense of competence. This is known as reciprocal effects such that self-concept and performance mutually reinforce each other (Craven and Yeung 2008). Shifting from non-technological approaches to substantial technology use poses a serious threat to teachers' self-efficacy, especially when they have negative experiences such as technology breakdown during teaching in class. Hence, non-technology users tend to choose conservative methods and stick to non-technological approaches, to be on the safe side. Third, gender stereotype may be another factor. There was some evidence showing that female teachers tend to have less positive self-concept in technology use for teaching purposes than male teachers (Colley 2003; Meelissen and Drent 2008; Shapka and Ferrari 2003). This gender inequality tends to imply that low self-concept in technology use maybe more common in language disciplines than in other curriculum areas such as science and mathematics since language teachers are mostly female. Nevertheless, there is also contrasting evidence showing that female teachers hold more favourable attitudes towards technology use (Anyan et al. 2000), whereas Sipilä (2010) found slightly more positive attitudes towards technology in male teachers than in female teachers, but the difference was not statistically significant. Hence, the lack of consistent evidence suggests that gender stereotype may be a myth.

Potential Solution Considering the factors outlined above, psychological factors should be addressed in professional training to enhance language teachers' self-concept in technology use. While negative experience can destroy teachers' self-concept in the use of technology for education, positive experiences with technology use can build up their self-concept in this respect. Therefore, providing positive experiences with pedagogical use of technology becomes an integral part of training programs. Subject-specific training mentioned earlier would also be helpful. By highlighting the relevance and pedagogical benefits of technology to language subject with rich examples, professional development and professional dialogue would foster language teachers' belief in the value of technology for teaching languages. By providing positive feedback and encouraging self-appreciation upon success, teachers' self-concept in TPCK would be reinforced. Once technology application

becomes the norm of language teachers' practice, teachers' positive self-concept would continue to drive further application. By offering opportunities for teachers to play with and explore the functions of technology, more positive experiences can be generated when teachers become increasingly sophisticated in using various technological tools. They may also develop the flexibility to deal with different situations and find innovative ways to increase effectiveness and cost-effectiveness. In sum, language teachers' positive attitudes towards technology and their self-concept in successful pedagogical use are crucial to their continual application of technology in language teaching. The first step to enhance their self-concept is probably to encourage and facilitate their personal use of technology in daily life.

15.7 Conclusion and Recommendation

To prepare young generations for the increasingly technology-sophisticated world, governments worldwide have invested substantially in the use of technology in schools. Whether such an investment represents value for money is controversial. Some research has found that despite increasing availability of technology in schools and despite compulsory requirements from authorities, technology has not been utilized to its full potential in language classrooms. To maximize the benefits of technology for language teaching, teachers' effective use of technology for teaching purposes is essential. Among other factors, learning objectives, language assessment, pedagogy, and teachers' self-concept seem to be the most salient factors which influence teachers' actual use of technology. After reviewing these factors, the following suggestions are made to promote effective applications of technology in language learning and teaching:

1. Technology use should be clearly oriented towards language-learning objectives
2. Technology should be used critically and selectively. This involves:
   - Using different technological tools for different activities and pedagogies
   - Using a mix of both technological and non-technological approaches to complement each other
3. Technology use should be given a place in language assessment while some traditional language assessment approaches should be maintained as well
4. Subject-specific professional training in technology application is needed to:
   - Promote technology application as a norm in the language discipline
   - Make the relevance and benefits of technology application visible to the language subject community
   - Facilitate technology-related professional dialogue within the language subject community
   - Provide opportunities for language teachers to try out technologies in subject-specific situations
   - Develop skills in pedagogical use of technology and TPCK
   - Build up language teachers' self-concept in pedagogical use of technology

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Chapter 16
The Implementation of e-Networks to Support Inquiry Learning in Science

P. John Williams, Kathrin Otrel-Cass, Elaine Khoo, Bronwen Cowie, Kathy Saunders and Suskia Van Der Merwe

16.1 Introduction

Research into science classroom teaching has reflected a renewed interest in pedagogies that embrace the idea of students conducting their own inquiries. Inquiry learning where students explore ill-defined problems, investigate ideas that are not yet known to them (Feldman et al. 2000) and where they have opportunities to communicate with more knowledgeable others is said to support student authority, agency and identity in science (Duschl et al. 2007; Lee et al. 2010; Roth et al. 2008). Inquiry learning in science is about students developing competencies where they draw on science knowledge and use scientific processing skills (Abd-El-Khalick et al. 2004). Inquiry is often described as a cycle of investigation which includes

P. J. Williams (✉)
Technology, Environment, Maths and Science Education Research Centre,
University of Waikato, Hamilton, New Zealand
e-mail: jwilliam@waikato.ac.nz

K. Otrel-Cass
Aalborg University, Denmark
e-mail: cass@learning.aau.dk

E. Khoo
University of Waikato, Hamilton, New Zealand
e-mail: ekhoo@waikato.ac.nz

B. Cowie
University of Waikato, Hamilton, New Zealand
e-mail: bcowie@waikato.ac.nz

K. Saunders
University of Waikato, Hamilton, New Zealand
e-mail: kathy@waikato.ac.nz

S. Van Der Merwe
University of Waikato, Hamilton, New Zealand
e-mail: suskia.douw@vodafone.co.nz

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asking questions, exploring possible solutions, coming up with and considering new findings and experiences and considering what the meaning and implications of new-found knowledge are, to then asking new questions (Bruce and Bishop 2002).

While such inquiry approaches are said to support students developing ownership over their learning, this is likely to require a change in the power relationships between teachers and students (Hipkins 2006 citing Bryce and Withers 2003). Such pedagogies have also been described as transforming the way in which students look for information or collect and analyse data in a manner that moves beyond a focus on knowledge acquisition to one that enables learners to acquire skills for global competence. Gilbert (2012) argues that this "means having people with a new and different orientation to knowledge, people who know enough to do things with knowledge, and who can work with others to do things with it" (p. 8). She argues that if we think it is important to engage young people in science, foster attitudes and dispositions needed for future science thinking and encourage young people to consider becoming future innovators and scientists, then doing what we do now is not enough. Skills such as thinking to critically access and evaluate information that changes constantly, problem solving and actively collaborating and communicating with others are recognised as supporting future oriented learning and teaching in science (Bolstad & Gilbert 2012; Bolstad & Buntting 2013).

Access to information in different formats and modes seems an important aspect to developing such competencies. Not surprisingly, science education researchers have taken an interest in how digital technologies change the way that people communicate and learn and also transform ways in which we design for learning. Inquiry learning in science for the twenty-first century is likely to require and benefit from increasing use of electronically networked (e-networked) ICTs in the collation, analysis and representation of data, in order to better engage students (Roth et al. 2008). ICT can play a key part in supporting an inquiry approach to teaching and learning science by enabling students to develop and expand their skills of observation and research into questions of interest to them, and by assisting students to collaborate to create knowledge, use it to answer their questions and then communicate their findings in multimodal ways.

Teachers' use of e-networked ICTs has been promoted as a way to motivate students and facilitate the development of collaborative and independent inquiry skills. Appropriate and meaningful integration of e-networked tools into a class's learning activities has been found to support richer and deeper forms of interaction, dialogue and sharing of ideas among students and between teachers and students (McLoughlin & Lee 2007). Studies have demonstrated the merits of using networked ICTs to collect and collate, analyse and make sense of, as well as communicate and represent information (Roth et al. 2008), and highlighted that they offer opportunities that can stimulate critical student thinking (Feldman et al. 2000).

In this chapter, we define *e-networked ICT* in science classrooms as communication technology tools that are Internet and/or mobile based and allow users to network and collaborate on their science inquiry projects. Such collaboration may occur within a class or across classes or even across schools or geographical locations. Users, therefore can gather, access, share or disseminate and communi-

cate information with other known or unknown users (Feldman et al. 2000). Many schools now provide networked environments, for example through Internet-based Learning Management Systems (LMS), such as *Moodle* which they use to deliver e-learning programmes, through class websites that provide for blogs, or e-mail whereby teachers and students are able to share information and communicate in a virtual space.

16.2 NILSS Research Project

In this chapter, we discuss findings from our own study that explored the ways in which teachers and their students made use of networked ICTs in science and how this shaped pedagogy and engaged students. The 'Networked Inquiry Learning in Secondary Science' classroom study (NILSS) was a 2-year project where a team of researchers worked and collaborated with six New Zealand high school teachers and their students. The team set out to investigate what e-networked science inquiry teaching and learning practices might look like. We explored what it means to include ICTs in a discreet and overt way, and the consequences of these approaches. Our position towards exploring and describing the ways in which knowledge was constructed was shaped and framed by a sociocultural view of learning, including that knowledge construction is transformation in use and learning is an integral part of activity. Our understanding was also informed by the idea that tools, including physical artefacts and cognitive conceptual tools, mediate knowledge construction (Wertsch 1998); human activity is shaped by tools and artefacts and the modes of using them. In seeking to understand the nature of networked inquiry we took into account that activity is also shaped by the nature of tasks and the social rules in play where these can constrain or enable outcomes (Engeström 1991). We approached the study with the view that transformations in education require rethinking, reshaping and restructuring the roles of those involved, because learning is also about the formation of identity.

The NILSS project developed case studies with six year-nine and year-ten teachers in three New Zealand high schools. Teacher participants brought with them varying levels of understanding and experience with science inquiry, from very experienced to not having tried inquiry as a teaching and learning approach before. Teaching knowledge and experience with e-networked tools was equally diverse but all were keen to find out more about what inquiry in science can look like when it is supported by e-networked tools. Teachers and researchers initially spent time together developing a shared understanding of inquiry, and how this could be enacted. The researchers observed the inquiry projects in the classrooms and then, together with the teachers, reviewed and analysed the data that had been collected. Data produced and collected by teachers and researchers included:

- Teacher planning documents;
- Field notes and video recordings from classroom observations;
- Transcripts from the classroom dialogue;

- Student work produced during and as a result of their inquiries, during homework activities and as part of assessment activities;
- Online records from networked activities (e.g. blogs); and
- Reflections and insights from both teachers and students collected during formal and informal interviews.

This data allowed for rich descriptions of how the process of using e-networked ICT to support inquiry in science evolves and can be stimulated. The data was analysed to search for common themes (Merriam 2002). The first level of data analysis included initial reflections by and with teachers, students and researchers after the classroom observations. These were shared with researchers online using Google Groups. These notes informed the selection of sequences of video from the classroom observations for the second level of analysis. These video analyses became a central information source in the meaning-making process at a microlevel (Erickson 2007), informing the third level of analysis which integrated text (transcripts and reports) and audio (interviews) data. The use of the Nvivo software package enabled integrated video, audio and text analysis.

The findings from the project which are discussed in this chapter highlight three main themes revolving around the teacher's role, student expectations for learning and the school's responsibilities for preparing students for learning in the twenty-first century. These are elaborated in the following discussion and exemplified through key participant quotes.

16.3 Pedagogies for Motivating, Leading and Designing Inquiry Learning

Inquiry rarely happens in a linear way. This means that teachers have to think flexibly about inquiry processes and what is needed to facilitate student outcomes and to do this they need robust pedagogical content knowledge (Crawford 2000). They also need to consider how students might communicate what they have learned and to identify possibilities for students to share insights along the way into how they have generated and validated knowledge. They need to carefully balance providing students with scaffolds and models to support their investigations with nurturing independent thinking (Goldman et al. 2007).

Collaboration, co-construction and confirmation of ideas are appropriate and valued in science inquiry and can support this balance but these activities tend to contrast with the ways of working found in conventional classrooms. Accordingly, we found it important for teachers to understand that there are degrees and levels of inquiry, from structured inquiry in which the question and procedure are provided by the teacher and students generate explanations based on evidence they have collected, through to guided inquiry where the question is provided by the teacher but students design the procedures. The highest level along this continuum is that of open inquiry where the questions are student formulated, as are the procedures for

seeking answers. In our experience the position of the inquiry approach taken by a teacher along this continuum is determined by the teacher's understanding of the nature of the student group and their own confidence and experience with inquiry and the prospective science topic. In our study, as noted above, some of the teachers had gaps in their understanding of inquiry and needed support to increase their level of pedagogical content knowledge (PCK) about authentic inquiry.

The teachers used a range of digital technologies to support student inquiry processes to do with accessing information, collaboration and co-constructing and sharing their science ideas. Mobile devices, as well as providing access for online information searches, were instrumental in the collection and analysis of data in ways that 'mirror' authentic scientific inquiry. Mobile devices such as smart phones and iPads assisted in developing critical observation skills by allowing students to record an inquiry and identify patterns in the data, share observations, ask, review and then ask further questions. Students commented:

> It helps a lot if you are watching a [cell phone] video, you take it in more…and you remember it better.
> You can actually see what we were learning and doing.

And from a teacher:

> By initially allowing the use of phones in class I effectively gave them the understanding that it is Ok to use their phones to help their learning, this had a twofold effect in that classroom misuse of the phones was no longer an issue.

E-networked tools not only provided students with increased opportunities to interact with teachers, peers and experts, but also with students from other schools. In this project, Moodle discussion forums and Wallwisher (now called Padlet) software allowed for the exploration and sharing of ideas by providing new spaces for learning that allowed students more time to think and plan, with an opportunity to revisit and reflect on emerging ideas at any time and from anywhere. These spaces enabled clarifications, summarising knowledge and identification of 'next steps' for student learning. For example, one of the teachers used Moodle discussions to continue and expand on what was discussed in class about acids and bases. The teacher avoided providing answers but rather 'listened in' to prompt and ask deepening questions when needed. Moreover, this activity also gave the teacher an opportunity to pick up on points that required further clarification back in class. The use of such discussion forums relies on a supportive culture for learning within the classroom community for students to have the confidence they can safely share their thoughts. They also need to learn how to think and discuss critically within a group.

> You can chat and research about the question in your group and also it is in a safe environment. I didn't know some of the students in my group and I wouldn't feel comfortable about going round to their place, but it was good to chat to them on-line.
> Mr J helps us as individuals using Moodle. He doesn't tell us the answer, he just makes you think about it. He gives you pointers to the next stages of your thinking, it's personal, related to you.

Skype and e-mail were other forms of e-networked ICTs used in the project. Students collaborated with scientists and asked questions and discussed their devel-

oping science ideas with them. Sometimes these tools allowed for connection and communication, other times they afforded opportunities for deeper two-way knowledge exchanges. They supported students' in constructing science knowledge in areas such as water quality, the nature of light and how 3D images are created. The connections and collaborations made when working with scientists and each other to undertake authentic scientific inquiry, promoted realistic perceptions of scientists and the work that they do and in doing so, further developed the students' understandings of the nature of science. Some students reported:

> We learnt things we wanted to be taught.
> You get to talk to a scientist…to really understand

Within the project, a range of tools was used by students to create presentations to communicate their findings. These included student generated videos (within groups) reporting on their inquiry investigations, Glogster which allowed students to create virtual posters including audio, video, text, hyperlinks and images, and share their creations; and Google Docs PowerPoint, which enabled them to share, create, collaborate, edit and publish PowerPoint presentations online as well as to access from anywhere at any time. Students indicated that:

> We repeated filming the videos several times, reviewed them until we were happy with the content. The reviewing helped because you could see what had been improved.
> It's [Glogster] good as you can pop in videos and stuff, do all sorts of pictures, music, animated effects.

For teachers, the challenge in supporting students' learning for the twenty-first century is about innovation, making a pedagogical shift and reshaping their roles in ways that can enhance students' learning capacities. This also involves rethinking how e-networked ICTs can be used to create a future focused education for their learners where creation and use of knowledge is used to solve authentic problems by connecting, collaborating and communicating their findings to others beyond the boundaries of the classroom in terms of space and time.

16.4 The Nature of the Learners and Inquiry

Increasing access to e-networked technologies is shaping new ways of communicating, constructing and representing knowledge. The ubiquitous availability of access to massive amounts of information and the ability to communicate unhindered through a range of media has resulted in the current generation of students presuming and expecting immediate and relatively unhindered access to information and communication for their personal and academic needs (Kvavik 2005). Consequently, customisation of e-networked environments becomes common where students adapt technologies to their learning needs. If they are lacking information, students typically take the initiative to draw from a range of informal approaches to meet their learning needs (Sefton-Green et al. 2009). The role of the teacher as the sole dispenser of knowledge is increasingly being challenged as students learn to draw

from multiple networked resources, their peers and experts in the local or wider community.

The current generation of students, therefore have expectations regarding their teachers' use of e-networked technologies in their planned learning experiences. The challenge is thus posed for educators to adopt pedagogical strategies that build on students' diversity in learning strategies (Sefton-Green 2004) and to draw from them (i.e., informal learning strategies) in designing more meaningful and relevant formal learning environments (Chen & Bryer 2012)**.**

Our study reported in this chapter has highlighted several themes related to the nature of learners in the current generation. They include the fact that e-networked tools allow students more interesting and new ways of learning, exercise agency in their learning, use multimodal resources in their learning, and opportunities for collaborative work beyond the class. These are exemplified through the following representative quotes:

Value of Technology Supported Teaching and Learning One of the case study teachers explained the value of incorporating e-networked tools in his practice to engage his students' learning:

> …technology can make it more efficient, can make it faster, it can make it more interesting for them [students], I think there's an interest factor for the kids, because they see technology as a tool that is fun to use. So not only is it just good because it's efficient and simple, it's also good because it motivates the kids, you know—they want to be able to use their iPods, they want to be able to use the laptops, they enjoy doing that, so why not? It seems logical, if that's what they want to do then get them doing it but get them doing it in such a way that they're learning as well.

Student Agency Students in our study also initiated the use of their own mobile devices (e.g., smartphones, iPads) when they needed quick access to the Internet to answer questions that emerged during an investigation. Such devices supported their agency in pursuing particular learning goals. One student explained this:

> …it is really useful because I could just go on my email straight away or go on the Internet and I just scanned through Google and saw some different websites I could go on. It was quite good having that because even if we didn't have the laptop we still had something [the mobile device].
> Since we had things like Google like if we were curious about something we could kind of just do a quick research and then we could just learn through that. And expand on it.

Multimodal Resourcing Students extended their mobile phones to use the visual recording facilities to record practical group investigations. This process was particularly valuable in helping students understand otherwise hard-to-comprehend science content. The act of recording meant students adopted an active stance during the activity and were provided with multimodal opportunities to expand their critical observational skills and to talk about science. Students typically shared the mobile phone recordings with their peers and sometimes, with family members afterwards which meant their learning could be enriched through expanding conversations within and beyond the classroom. Students noted that:

> It helps a lot if you are watching a [mobile phone] video, you take it in more… and you remember it better.
> We record what we see and send it to the teacher. To record the process for when we do evaluation, to give other people an idea of what it's like to do this. It's like taking notes in class just a different form. It's better to take it in a picture, as you can't explain what its like in words always, it's easier to explain what it's like using videos.

The teachers in our study verified students' use of mobile phone recordings as a new and additional form of evidence of students learning. They explained:

> A couple of them have already videoed stuff going on throughout the year and thrown them up on Youtube. They are quite tech savvy. I have a couple of flip cameras for back up. Kids definitely looked at it [kitchen chemistry] from a scientist point of view rather than as a food tech unit…
> … a few will probably go onto Facebook tonight and post it [their mobile phone recording] on Facebook. For them they think it's a cool buzz. They take it home and they show their mums and dads, 'This is what we've actually done in school'.

Peer Collaboration Beyond the Class Teachers and students in our study reported the value of using networked tools in enabling them to continue collaborating and interacting outside of class hours. One teacher commented on his student use of Google presentations in allowing for collaborative group work:

> I think the use of networking, particularly yeah, like you said the Google Presentations, even with the emails, you know, some people got replies out of class and were able to continue, so it's nice to see, particularly from a teacher's point of view, that the learning is continuing at home and that they're taking this stuff home and sharing it and continuing with it.
> With things like the website and Google Docs we were able to collaborate on things and like [our group presentation] without being at school. So we could share each other's knowledge.
> Well, you could see what the other person was doing. And I guess you could do it like it was like we could all work on it at home, not that we did but we could of, like you could all go to do it together, all add stuff without being together, which is like if you did on like a Word document and anything you'd have to be all together to do it on the same computer as you did last time.

The above themes and representative quotes reflect how the skills and lifestyles of students impact on their classroom learning activities and the roles of their teachers, who are no longer necessarily the source of all knowledge. In order to better support the current generation of learners, teachers can align their pedagogy with the available networked technologies to offer students more ownership and responsibility for their own learning, encourage them to draw from a wider access of knowledge sources and collaboratively communicate to construct and represent new ways of understanding and knowledge.

16.4.1 The Role of the Teacher

The teachers in the project found that there were a variety of adjustments they had to make to their roles in the classroom in order to facilitate an e-network sup-

ported inquiry learning approach. The most significant adjustments were related to accepting this changing role, shifting their pedagogical approach, improving their knowledge of learning technologies and reconciling school curriculum and assessment demands. Each of these adjustments will be discussed briefly.

Changing Role As teachers entered into inquiry teaching using an e-networks approach, their roles changed. Teachers expressed apprehension about abandoning familiar teaching methods and trialing new pedagogies, and reported *"... finding it hard to let go"*. This was reinforced by researchers initial observations of classroom teaching, noting that most teachers were more comfortable with their content-driven didactic approach. Teachers reflected on how they had developed in their new role:

> …when I first started I don't think I realised quite how big a step a teacher needs to take back in order to allow inquiry to happen. I think it's really easy as a teacher to dictate what's going to happen in a classroom and I think the biggest thing I kind of learnt is that in order for real inquiry to happen a teacher needs to be, not removed from the situation but needs to play almost a secondary sort of a role.

As time progressed, teachers realized that by *developing and setting the framework and approximate path that [an] inquiry should follow*, the transition to a student-centred classroom became effective.

Pedagogical Approach Teachers found that their approaches to planning and pedagogy needed changing in order to facilitate the inquiry processes. Planning for e-networked science inquiry proved to be largely different from a structured teacher-led format that may have been the norm. They found that planning was multi-dimensional, and while goals could be established, planning for the unexpected was necessary:

> …because you're not sure what direction it's going to go…planning for what you expect but also trying to anticipate some of those unexpected…directions that the students might take.

Providing for a variety of group dynamics and student abilities within a class became an influential factor in planning and implementing inquiry learning. It was found that while more able students embraced inquiry, the less able students required more support to scaffold their understanding as they engaged in a learning task. Some teachers found that *it's actually very busy teaching in a low-level enquiry lesson* because of the need to guide students' information seeking and task development. One teacher reflected:

> because of the nature of inquiry…kids talking to other kids all the time and they learn from each other and there's…that collaborative process and they come and ask you as the teacher to help them with certain things, and you soon see the kids who are just flying ahead and the kids who are behind, and it's obviously those kids who are behind that need to be helped with the skills and stuff like that and I think that's the easiest way to kind of facilitate that difference is just to get alongside them and actually help them with the problems that they've come up.

Technological Knowledge Teachers that were ICT-shy gradually attempted using new technologies and then subsequently, and with increasing confidence, embraced more technologies. For example in the first year, some of the teachers used Wall-

wisher to answer initial questions in a brainstorming session, and then in the second year, teachers enabled students to use the technology in more advanced ways, for example to communicate ideas with another class at a different school.

> I really feel that I know we're only two years down the track but for me personally I feel like I'm just starting to get the idea of what using networking means in terms of teaching… but being part of the project has made me do things that I probably wouldn't have done … in terms of using online technology and…putting in things like getting them [to] video… some of that stuff I probably would have said was in the too-hard basket.

In many instances, the teacher was not the expert in the technology, and the students were able to demonstrate their skills.

> …what I find great is…when you turn around to the kids and say I have no idea about this [technology], that empowers them a lot…because it's IT they're a lot more willing to share with you and teachers feel a lot happier saying I don't know about this, [then asks the student to] stand up and tell the class.

School Demands teachers found they had to deal with the tensions which developed between an inquiry approach and obligations to curriculum content and assessments. The time required for inquiry learning was longer than anticipated by some teachers:

> We didn't get through as much as we thought we would—when the kids were doing the enquiry time sort of elongates—what you think will take a lesson or two takes three or four and then you have to accommodate that somewhere else in terms of what else is a requirement to do and what you can afford to sort of leave out while they're exploring. So there is certainly a time issue with it.
> For me, what inquiry is all about is getting the kids to work together on something that they're interested in but still meeting your obligations in terms of curriculum content.

16.4.2 School Responsibility

School management and policies supportive of inquiry practices are necessary in order to establish a school culture which promotes inquiry. These policies encompass the hardware, software and technological infrastructure, as well as curriculum and assessment policies.

Infrastructure Issues Effective e-networking for inquiry can only occur if the infrastructure is working. Slow, malfunctioning or unavailable service and technologies were a source of frustration for both students and teachers. There were a number of instances where teachers and students used their own equipment such as iPhones, iPads, and digital cameras to circumvent infrastructure challenges and facilitate their inquiries. When the infrastructure was supportive, teachers found that sometimes productive unanticipated explorations and outcomes occurred:

> For the higher-level class where access to electronic media was pretty much the norm, access to online resources from home was easy for this cohort. Their knowledge of online applications was high, hence, the development by one group of their own web site. They

> also worked as a class through their own Facebook page that they had set up to discuss school things.

Supportive School Policies in Empowering Student e-Networked Tool Use School policies that shape more flexible learning environments to allow accessing and sourcing of hard and software can empower and engage students, including their sense of ownership and responsibility for their own learning. Through this, students' learning experiences are broadened beyond the confines of the classroom as they share their learning with their families and communities. One teacher commented on the value of having more considered/intentional school policies and systems in place for creating the opportunities for the use of e-networking in her school:

> So from a school wide perspective the decision was made earlier this year that our Internet access wasn't really going too far too fast and so the ICT committee has been endeavouring to make sure there's one person in each faculty who has learnt how to use the system and set it up and then we had some PD…so it is growing within the school in terms of a way to provide students with some networking…. We've certainly used ICT more as part of this project and we've endeavoured to look at ways to network

Our findings in this project indicate that teacher inquiry practices can be hindered by a lack of technological access or technical failure. More robust networking platforms (stable access to the Internet) are required to overcome this challenge. School policies that affirm productive ICT and networked tool use, for example, free access to the Internet, facilitate teachers and students taking up and incorporating these tools in their teaching and learning.

Flexible Curriculum and Assessment Practices Our findings also allude to tensions between current school curriculum and assessment practices that impact on inquiry approaches. On occasions, significant challenges arose from these tensions between the practical realities of class time and curriculum pressures, and the need for flexibility in curricula that accommodate student pursuit of their own inquiries. The following teacher comment exemplifies this:

> Inquiry takes some time to do, it's not something that can be done in a lesson, it's something that needs to be built. Also the students need to learn the skills of inquiry, it's not something that's innate…. That creates an issue with assessment, our tests are knowledge-based, they don't acknowledge the fact my students had spent two extra weeks doing inquiry.

Both teachers and students were concerned about their achievement in the compulsory testing that was done in the school for their year level, and felt that, even though they recognized the benefits of an inquiry approach, it was not preparing them for the traditional testing process. This was despite the recognition that the inquiry approach has synergies with the general curriculum:

> In the New Zealand curriculum…the key competencies…match up with inquiry beautifully because you've got participating and contributing, thinking, working together, all of those types of things and that's, for me, what inquiry is all about.

From a school systems perspective, school management can better support teachers and students in networked inquiry practices by investing in robust networking

platforms, adopting policies that encourage productive networked inquiry tool use and establishing flexible curriculum and assessment structures.

16.4.3 Conclusion

A key finding from our project was that it is not difficult to motivate learners by providing them with the opportunity to pursue learning in areas of their own interest within the framework of a science topic—in this case, accomplished through an inquiry approach in science, supported by e-networked technologies. Students have an affinity for communication technologies, and their use in class to find out and share information comes naturally to them. While initially some students found it difficult to develop a productive direction when in control of their own learning, scaffolded support enabled them to progress. So granting students control over the particular content and the means of their learning this is a strong motivation factor.

However, without a sound understanding of the nature of inquiry and how this related to the curriculum, teachers were initially tentative in exploring ICT based inquiry learning with their classes. It took time for them to become familiar with this approach, something that was achieved through discussions with colleagues and the opportunity to read and reflect as part of the research process.

The final element of success came through sympathetic school leadership. School hardware, software, curriculum and assessment structures were all conducive to teachers engaging their students with open-ended inquiry learning supported by e-networked technologies.

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Chapter 17
Promoting Students' Ability to Problem-Find

John Yeo

17.1 Introduction

In the context of twenty-first-century education, doing academically well in school may no longer guarantee a good career. Equipping students with the ability to identify new problems is regarded as a valuable skill (Chi et al. 1982; Parnes et al. 1977; Shore et al. 2009). Needless to say, we also need to equip our students with an inquiring mind and ability to solve problems. This chapter focuses on a related, but rarely investigated issue—how do we teach students to identify a unique problem in the first place? I argue that there is a critical need to develop creative minds predisposed to generating problems that may draw new insights and make uncharted connections.

Professor Gell-Mann, a Nobel laureate in physics, claimed that one of the most valued assets for the twenty-first century is a synthesizing mind (Gardner 2010). A synthesizing mind is one that is able to "survey a wide range of resources, decide what is important and worth paying attention to, and then put this information together in ways that makes sense to oneself and, ultimately, to other persons as well" (p. 13). This lends to a perspective of what problem finding may look like. An important proponent for research into problem finding, Getzels (1982) argue that the true mark of a genius lies in how he or she "discovers, creates, or 'finds' problems that needed formulation and solution" (p. 170).

Problems today are less obvious and more complex. A report on the "Applications of Complex Science for Public Policy" (2009) highlighted that the common feature of most scientific challenges today is *complexity*. The report explained that "the problems involve large numbers of diverse interacting parts that produce behaviors that cannot be obviously derived from knowledge of their constituents" (p. 19). While this may not be rocket science, Einstein and Infeld (1938) had already put forward the value of problem finding in extending knowledge of the scientific

J. Yeo (✉)
National Institute of Education, Singapore
e-mail: yeojohn75@gmail.com

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world. They proposed that "the formulation of a problem is often more essential than its solution, which may be merely a matter of mathematical or experimental skill" (p. 95). They further argued that real advance in science begins with the ability to raise new questions, to seek new possibilities, and to regard old problems from new angles. These views are still, if not more relevant in the twenty-first century, when information technology has enabled problems to be simultaneously presented and tackled from multiple angles. With their "hypertext" views of the world around them and their innate ability to multitask (Oblinger and Oblinger 2005), Net Gen learners are perhaps inherently prepared to tackle the complexities of problems in the new century, but they nevertheless recognize the need for guidance in their learning (Kvavik 2005).

Many people perceive a problem as a negative challenge. Puccio et al. (2011) define a problem as a "predicament or an opportunity, a gap between what you have and what you want" (p. 155). Jay and Perkins (1997) describe problem finding as "behaviors, attitudes, thought processes that are directed toward the envisionment, posing, formulation, and creation of problems" (p. 259). With a constructive view of problem suggested by Getzels (1975), problem finding can be considered as an act of "envisioning and creating new, deeper questions and fresh avenues for inquiry that must be posed and formulated in fruitful and often radical ways if they are to be moved toward solution" (Getzels 1975 in Jay and Perkins 1997, p. 260). Nevertheless, despite the affordances of problem finding, there has been little investigation done in this area, as compared to the rich literature around problem solving (Siu 2001; Ramirez 2002; LaBanca 2008; Perkins 2009). Hence, with the complexities of the global and technological changes today, we need to develop students who are skilled at problem finding, and thus able to discover gaps or new untapped opportunities. Students need to be taught the strategies and ways of investigating problems that they can identify and that are meaningful to them.

17.2 Problem Finding in the Twenty-First-Century Context

To be truly ready for the twenty-first century, students today should no longer rely on others to tell them what problems to solve. Economic rhetoric aside, the deepening of our students' thinking skills with the problem-finding dispositions to apply their thinking positively can help them analyze situations and challenges in order to propose better solutions, as opposed to only relying on the authorities to provide solutions to problems. Underlying Singapore Ministry of Education's vision for "Thinking School, Learning Nation" (MOE 1997), teachers are aware that they are required to shift their instruction from mere delivery of content to engagement with ideas, to switch the focus of the curriculum from knowledge to developing competencies and understanding (as defined by the ability to use knowledge and skills in novel situations). Pedagogically speaking, teachers need to change the process of learning from one that over-relies on memory to one that views learning as a conse-

consequence of thinking. However, the reality is that, in many classrooms, these developments have yet to happen. According to Dillon (1990), students gain mastery of how to solve the given problems, but they remain novices at posing problems or asking questions. According to the report "Technological Outlook for Singaporean K-12 Education 2012–2017" (Johnson et al. 2012), Singapore schools are gaining interest in the constructivist forms of learning such as problem based learning and inquiry based learning. However, is also reported that such forms of learning "have not gained enough traction and are not yet widespread" (p. 8). For students to be really engaged with discovery-based learning, they are required to actively seek out problems that allow them to take control of how they engage with a subject before they are able to relate the course materials with their own lives.

In 2010, MOE rolled out the Curriculum 2015 framework explicating the emerging twenty-first-century competencies (21CC) for Singapore students. The 21CC are specified within the three broad domains of civic literacy, global awareness, and cross-cultural skills, critical and inventive thinking as well as information and communications skills. These competencies aim to help schools "strike a better balance between students' learning of content knowledge and their acquisition of the necessary competencies and values to thrive in the future" (MOE 2010). During the MOE Work Plan Seminar 2011 (Ministry of Education 2011), Education Minister Heng spoke about the importance of creativity and innovation in this world of uncertainty and complexity. In his speech, he indicated an increase in demand for jobs that require higher levels of cognitive ability, particularly with regard to non-routine analytical and interactive tasks. These broad goals reinforce the clarion call by Mumford et al. (2000) to prepare students to contend with problems that are characterized by complexity, novelty, and ambiguity as such problems cannot be solved by routine solutions.

The science curriculum framework was launched together with the revision of science syllabuses to heighten the teaching of scientific inquiry skills. The conduct of inquiry needs to engage both teachers and students where teachers serve as leaders of inquiry with students becoming the inquirers. Yet, considering the essence of scientific inquiry and comparing it with the standards and benchmarks of the above 21CC, one would wonder how teachers would be able to propose ways to teach for problem finding as an alternative curricular practice based on redesigning pedagogy. Peering deeper into the domain of critical and inventive thinking (CIT), there is much room for teachers to design and connect a science curriculum to the teaching of problem-finding skills with the learning outcomes of CIT. The standards of CIT state that students should be able to generate novel ideas, exercise sound reasoning and reflective thinking to make good decisions, as well as manage complexities and ambiguities (MOE 2010). More intricately, the definitions and descriptions of problem finding are aligned with the benchmarks of the above standards listed for CIT. Descriptors of the CIT benchmarks include the following: students need to demonstrate the ability to extract implications, construct relationships between elements of problem, suspend judgment, show willingness to take risks and accept mistakes, tolerate ambiguity, and consider and accept alternative perspectives. Though these skills and dispositions are prerequisites for a science inquiry class, they may either

be intentionally or unintentionally left out in the enacted curriculum. If so, teachers in their enactment, nullify the curriculum by what they left out as well as what they have neglected to teach. Based on Eisner's notion of the null curriculum (1994), "what students cannot consider, what they don't process they are unable to use, have consequences for the kinds of lives they lead" (p. 103) and thus, students may not see the relevance or the explicit value of these skills.

17.3 Theoretical Perspectives

Many researchers acknowledge that problem finding is a critical component of the creative thinking process and can be regarded as an "influential view of creativity" (Kozbelt et al. 2010, p. 34). Most also hold the view that traditional problem solving is "inadequate to explain how creators come to realize that a problem exists in the first place and how they are motivated to proactively bring their subjective experience to understand the problem" (Kozebelt et al. 2010, p. 35). Runco and Dow (1999) suggested that problem finding is not a unidimensional concept but one that involves a set of highly interactive, complex skills. These skills include problem identification (i.e., the ability to conceive or envisage problems or questions and forming possibilities in a situation), problem definition, periodically assessing the quality of the problem formulation and its solution options and problem reformulation from time to time (Runco 1994).

Pertaining specifically to problem finding, Chand and Runco (1992) uncovered the interactions between explicit instructions and realistic problem-finding tasks. They concluded that "a significant interaction revealed that the explicit instructions influenced the responses to the presented problems and to the discovered problem divergent thinking tasks, but not to the problem generation tasks" (p. 247). This is arguably true as most research in problem finding investigate the nature of the problem-finding tasks as situated within a continuum between the well-structured and the ill-structured, since optimal solutions are not found and students need to make their own judgment about their problems (Meacham and Emont 1989). It was also found that the explicit instruction interplays with the level of declarative knowledge which "can facilitate creative thought by supplying requisite information" (p. 248). This step precedes the problem-finding process. Furthermore, declarative knowledge is experiential as the information may occur as environmental cues familiar to the learner. Such environmental cues can facilitate or inhibit the creative problem-finding process since they influence the level of "functional fixedness" (p. 248), which directly affects how one remains open or stuck with their perspective and may struggle then to find new alternatives.

Lee and Cho (2007) found that the two operational concepts of knowledge (using scientific knowledge as the declarative knowledge and science process skills as the procedural knowledge contribution to students' problem-finding ability) varied depending on the degree of structure of the problem situation. Dealing with ill-structured or open-ended tasks, Jonassen (2011) proposed that students need to make

decisions which are "influenced not only by cognitive activity but also by affective dispositions" (p. 144). Particularly for such tasks, he wrote that "in reality, designers are usually unable to articulate what an optimal solution is" (p. 145). Consideration for the affective skills of problem finding and problem solving is important as it directly impacts students' motivation to work on the task. How might students sustain their motivation throughout the creative process without being confined by their own *functional fixedness* which may "lock thinking so that an individual cannot see alternatives" (Runco and Chand 1995 p. 247)? Teaching for problem finding presumes the need to allow students to hypothesize problems in different ways and remain open to deal with new knowledge while avoiding premature conclusions.

Mumford et al. (1993) studied how people generate original problems by "turn(ing) inward as they use representations provided by past experience to find new ways of understanding the problem situation" (p. 383). By placing the learner then in an experience to discover and identify a heuristic problem that is open minded with "no set method to follow or obvious solutions available," the educational implication would be that the learner needs to use creative thinking to deal with the "predicament (that) is a difficult, complicated, or perplexing situation for which a new approach must be devised" (Puccio et al. 2011, p. 36). By allowing students to explore problems creatively, students become more proficient in generating better problems with richer knowledge construction as they learn to communicate, represent and reflect their understanding, believes, and perspectives.

Curriculum designers and teachers need to recognise that time for students to acquire these problem-finding skills cannot be compromised by simply teaching the process and tools in a once-off manner. Students need to be given the authentic experience to transfer the learning and apply the skills in different context. From the research on training in causal analysis to enhance creative problem solving, Hester et al. (2012) found that "performance in producing high-quality, originality, and elegant solutions on the posttest depended, and depended strongly, on pretest performance" (p. 130). Students need to experience the engagement of the subject thoroughly through the problem-finding phase before originality of solutions can emerge. Hester et al. (2012) suggested that one's creative potential is dependent on the long term, systematic development of individuals.

17.4 Factors Affecting Problem-Finding Skills

Lee and Cho (2007) identified factors that affected students' problem-finding performance. The results indicated that the degree of structure of problem situation influenced variables affecting problem finding. More specifically, data from 115 students were analyzed based on their participation in either an ill-structured task or moderately structured task. The researchers examined the correlation between the independent variables and problem finding in both the ill- and moderately structured problem situations. Students working on the ill-structured task were required to generate a problem on the basis of a naturalistic situation. Students in the mod-

erately structured task were required to pose questions from data or information given. Procedurally, they scored the means and standard deviations within the tasks and conducted a *t* test to identify the homogeneousness of groups and the difference between the problem-finding performances in two tasks. The relation between problem finding and the variables above were studied by fitting several multiple-regression models to provide a single index of the predictive power of all the predictor variables combined as the coefficient of multiple correlation.

Their findings based on the multiple-regression models of predictors of problem finding identified the significant predictors of problem finding in the two problem situations. For an ill-structured problem situation, students with a high score of scientific knowledge and personality traits and with a low score of divergent thinking were more likely to be better problem finders. In contrast, students with a high score of divergent thinking and intrinsic motivation were more likely to be better problem finders in the moderately structured problem situation.

Consequently, this study helps to frame and scope the design of the problem-finding task and offers a perspective of how students' divergent thinking affects their ability to problem find in terms of selecting the range of data that will be provided to students. To find out what will motivate the students to complete the science-related tasks, teachers need to encourage students to identify and define the problem in the given task. Students need to understand why they need to work on the various loosely connected data (i.e., narrative, graph, tables, case study) and more importantly, why should they value this problem-finding process.

Hooever and Feldhusen (1990) carried out an exploratory study on 86 highly intelligent ninth-grade students, to examine gifted students' scientific problem-finding ability. Specifically, the study compared selected cognitive and noncognitive variables' relationships with the students' ability to formulate hypotheses about realistic, ill-defined situations. Three hypotheses were tested in this study, namely, whether boys' and girls' abilities to formulate hypotheses differed, whether significant relationships existed between hypothesis formulation ability and cognitive and noncognitive factors, and to determine if there was a relationship between the quality and the quantity of students' responses.

No significant differences were found between boys and girls in terms of intelligence, attitudes, or hypothesis-formulation ability. However, there were significant differences for the following: girls scored higher than boys on tests of clerical speed, whereas, boys scored significantly higher than girls on tests of mechanical reasoning. A positive relationship was also found between the quality and the quantity of subjects' responses to administered questionnaires assessing students' knowledge and attitude toward science content learning (Hoover and Feldhusen 1990).Though the above study generated interesting findings, there are concerns regarding whether the outcomes are generalizable, since the age of the participants may impose a limitation on their understanding of real-world issues and of the possibilities within the domain of the natural sciences.

17.5 Strategies for Student-Generated Problem Posing

Chin and Chia (2004) described how questions generated by a class of Year 9 mixed ability Biology students individually and subsequently in small groups shaped their learning during project work. The researchers sought to "investigate students' inspirations for their self-identified problems and the types of questions asked, as well as to postulate a model of how students' questions guide them in knowledge construction" (p. 710). They found that students were able to pose questions that helped to fill information gaps, relate different concepts, explore beyond the scope of the problem and evaluate decision making in groups. Furthermore, the groups raised questions that were more focused and specific to the chosen topics while individual questions were broader, unfocused and related to a wide range of unconnected topics. This led them to propose a question-driven problem-based learning model (Q-PBL) that highlights the pivotal role of student-generated questions in directing the inquiry process towards reducing knowledge gaps and connecting isolated pieces of prior knowledge into a meaningful whole.

While many of the studies in problem finding focus on students' ability to pose questions, this operationalization of problem finding may be limiting. Based on the study by Chin and Chia (2004), the evidence on students' problem-finding ability may suggest that some of the inspiration may not be easily translated into questions which may require a more specific skillset of defining problems. While their Q-PBL may harness questions to drive students' learning, the formative function of the ill-structured tasks that will be designed to evaluate students' problem-finding skill can be broadened to leave room for students to write brief statements and/or questions that they have synthesized from their prior knowledge as well as the range of data provided.

Nardone and Lee (2011) suggested that problem-posing ability could be systematically developed using "problem-based learning, guided discovery, and student reflection" and that these "provided particularly valuable ideas to help us ground the learning experiences we created" (p. 14). One hundred and five university students participated in their pilot instructional program comprising a series of activities that included teacher-led instruction on thinking and asking deeper questions, and students' posing and improving their own questions while wrestling with the issues at hand. Qualitative evidence from the pilot testing and getting students to *grapple* with their own questions throughout the semester long of reflective writing assignments suggested a deepening of students' thinking as evidenced by the revision from close-ended to open-ended questions that called for more elaborated responses. While this study may be viewed as a possible contribution of problem finding to positive learning outcome, it was difficult to determine whether the enactment of this instructional program resulted in significant differences in students' critical inquiry skills and mindset. This helps to inform future research whereby, following problem generation, students could be asked to rank and explain their decision making in terms of how they identified the problem based on the range of data presented.

17.6 Solving Problems through Scientific Inquiry

Roth and Bowen (1993) conducted an interpretive study on science problem solving. With an open-inquiry setting, Grade 8 ($n=65$) students worked on ecology problems either framed by the teacher or the students themselves. Students' investigations were guided by research questions they have framed (student-framed problem condition) at the onset of inquiry activities while their teachers generated problems based on students' setting or problematic issues raised during field work (teacher-framed problem condition). Those teacher-generated problems were used to assess student thinking and learning during the study. A key assertion by Roth and Bowen (1993) pertaining to teacher-framed problems is that students relied on past experiences and understanding to interpret and negotiate the meaning of their teachers' problems. As a result, student-derived meanings might differ from the teacher's intended meaning, such that unexpected solutions are proposed to the problems. In terms of student performances, they were able to generate new questions and construct increasingly complex problems involving multiple related variables as the study progressed. However, this study's design and findings are somewhat weak in contributing toward deeper understanding on how student problem framing might help learning. While descriptive evidence on advantages of student problem framing and solving were discussed, little comparison was made between learning outcomes arising from the use of teacher- and student-framed problems. The results suggest that in future research, the pre-post task need to capture how much of the declarative knowledge is used in analyzing students' response particularly in the various categories that will surface from students' artifact.

Epistemologically, from the above studies, explicit attention can be drawn toward understanding how problem finding can be enacted in science lessons. In essence, the above researches suggest how problem finding may be integrated into existing pedagogical practices that capitalize on the affordances of problems to enable and enhance learning. However, three concerns arising from the above studies call for further cogitation. From the exhaustive literature search, the review revealed a paucity of qualitative research on problem finding in K12 schools. Second, apart from the guided inquiry study by Roth and Bowen (1993) as well as Nardone and Lee (2011), there is a dearth of research carried out to examine how teachers teach for problem finding as well as their own learning trajectory in this aspect of curriculum deliberation. Third, the above studies on problem-finding activities in the classroom provide little understanding on the influence of extraneous factors. While this concern is somewhat addressed in some studies that employed experimental or quasi-experimental design, future research could investigate in greater depth the mitigating factors that influence problem finding in the learning of science.

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Chapter 18
The Playful Curriculum: Making Sense of Purposeful Play in the Twenty-First-Century Preschool Classroom

Susan LeAnne Sim

18.1 Preschool Education in Singapore

For the past three decades, the significance of the early years in a child's development has taken a global prime seat in the social and educational landscapes. This is because many have begun to recognise the great influence and substantial contributions those quality early years have in moulding individuals to be more confident and self-motivated learners, with social and economic benefits in the longer term (Katz 2000; Elliot 2006). 'A good beginning to life is well recognised as the foundation for future development, health and well-being, not only in the early years but throughout life' (Hayes 2006, p. iii). It is hard to imagine that the preschoolers of today will be the future movers and shakers of tomorrow; hence, there is the need to consider how preschool curricula can be designed to better prepare our children for a twenty-first-century landscape that is constantly changing.

In tandem with the surge of interest in preschool education, driven by the increasing body of knowledge and research studies that posit its inestimable value to our social tapestry and economic entomology, Singapore's preschool landscape experienced a new awakening towards the turn of the new century, a timely move to better cater for the needs of the youngest batches of the Net Generation (Net Gen). Preschool education in Singapore is not compulsory. In fact, also otherwise known as 'Cinderella', preschool education has long been the only education sector in Singapore that was and still is a 100% private system (MOE 2000, 2010). 'Cinderella' does not have a centralized curriculum and does not come under the ambit of the government, unlike her 'stepsisters'—those in the formal education system, namely the primary, secondary and post-secondary education. As a result, there exists a huge disparity in the operation and facility standards, as well as the quality of teaching and learning amongst the preschool centres in Singapore that, in the recent years, piqued many complaints from parents, educators and stakeholders

S. L. Sim (✉)
National Institute of Education, Nanyang Technological University, Singapore
e-mail: mrssusanteo@yahoo.com.sg

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alike. Many have argued in favour of nationalizing the preschool curriculum, while others sought government interventions and reform measures to raise standards and to narrow the quality gap in its teaching and learning (MOE 2000, 2010).

Like Cinderella's cries of despair summoning help from her fairy godmother, the cries and complaints from parents, educators and stakeholders prompted greater involvement of the Ministry of Education (MOE) in preschool education. Hitherto, the flick of the 'fairy godmother's magic wand' summoned the following immediate measures aimed at raising standards and narrowing the quality gap within the preschool sector. Firstly, as part of the measures to improve teacher quality, there are more funds and training grants provided by the local government to encourage teacher professional development, as well as more teaching scholarships offered by MOE to the preschool teachers to promote lifelong learning (MOE 2010, 2012). In addition, preschool teachers who used to be recruited from the bottom one third of an academic cohort are now recruited from the middle one third of the academic cohort (MOE 2010, 2012).

At present, there is still no common centralised preschool curriculum. The policy rationale is to avoid having the preschool curriculum too prescriptive, giving rise to uniformity in teaching and learning within the sector. Instead, the MOE saw merit in having a variety of programmes and curricula offered by different preschool centres with different philosophies and schools of thoughts (MOE 2000). As each preschool strives to meet the needs of its unique pupil profile, the variety of programme offerings cater to more children with differing needs and provide parents with more choice. Hence, the preschool landscape in Singapore comprises a mosaic of preschool programmes with different teaching approaches and models, such as the Reggio-Emilia approach, the HighScope Model as well as the Montessori method. Parents can be spoilt for choice when it comes to deciding which of these programmes better suit the needs of their child. The variety of preschool programmes also encourages creative innovation in programmes and varied instructional activities within preschool education (MOE 2000).

Vis-à-vis the diverse teaching approaches, the government, however, advocates and encourages all preschool industry players to provide a curriculum that is age-appropriate, holistic, child-centred and encompasses active learning through purposeful play (MOE, 2000, 2003, 2008, 2010, 2012). In the light of developing competencies for the twenty-first century at the preschool level, play becomes valued as a vehicle for early learning, offering many opportunities to develop children socially, emotionally, physically and cognitively (Arthur et al. 2007) . Play research has also shown that the coupling of play with learning allows children sufficient time to establish positive attitudes, build confidence and develop social and language skills, all of which are essential in twenty-first-century living (Docket 1999; Fleer 2009; Glover 1999; MOE 2008; Tan-Niam 2000; Vygotsky 1966)

In an attempt to provide better quality control in teaching and learning amidst the diverse programmes, the MOE developed the Kindergarten Curriculum Framework (KCF) in 2003 to give broad strokes on the learning goals of preschool education, so as to standardize and delineate the learning outcomes desired of preschool education (MOE 2003). This was followed by the design and

provision of a Kindergarten Curriculum Guide as a supplement that serves as a teacher reference or teacher resource book for planning and implementing quality classroom activities and instructions in 2008. The guide comprises a collection of lesson plans and suggested activities to aid teachers in creating quality interactions with children, as well as checklists to monitor and assess children's learning, so that the latter can acquire a set of key knowledge, skills and dispositions in the early years (MOE 2008). More recently, MOE launched the refreshed Kindergarten Curriculum Framework (refreshed KCF; 2012) in January 2013 to refine the learning goals in the previous curriculum framework, so as to make them more explicit to further enable a smoother learning transition from preschool to formal education at Primary One (MOE 2012). This refreshed KCF reiterates the preschool core central beliefs that 'children are curious, active and competent learners' and updates the scope and relevance of the six guiding principles undergirding quality teaching and learning in the preschool classrooms (MOE 2012). In addition, the refreshed KCF (2012) also considers the importance of developing the twenty-first-century competencies (twenty-firstCC) and skills at the preschool level, specifically the need for our preschoolers to be able to 'think critically, assess options and make sound decisions…have a desire to learn, explore and be prepared to think out of the box' (p. 11). To this end, the refreshed KCF also provides more details on the importance of preschool teachers being facilitators in engaging the children in purposeful play. In other words, it is encouraged that teachers use play as a medium for learning in preschool classrooms.

Despite play as a medium for learning being a dominant discourse in preschool education (Fleer 2011 ;Edwards and Hammer 2015; Samuelsson and Carlsson 2008; Emslie and Mesle 2009) and play being advocated as the ideal activity for the development of young children and the central pedagogy employed by most countries in early childhood learning, how play is defined and interpreted, how teachers make sense of it and the forms it takes in its implementation in the preschool classrooms can actually be rather problematic and messy. In Singapore, the milieu is one which sees not only a prevailing function of preschool as a head start to prepare for formal education (Sharpe 1993) but also 'strong support from parents for an academic-type curriculum with emphasis on written work, homework and tests' (Lim 2006). As a result, notwithstanding most local preschool curricula being essentially thematic or activity-based (Lim 2006), the teaching and learning style is still very much didactic and teacher-centred. This is made worse, in a culture that makes a clear distinction between play and work, by which of the latter learning in school tends to be more associated with (Johnson et al. 1999). This is because the primary function of education is generally to promote learning, and this is seen as distinct from play (Samuelsson and Carlsson 2008), with work being serious stuff and play considered trivial (Isenberg and Jalongo 2001). Coupled with this conflicting distinction between play and learning, the situation is further exacerbated with many preschool teachers having a misinterpretation of 'learning through play' as a preschool pedagogy (Cheng 2012). Hence, there is a strong case for further exploration on how play is framed by the local preschool teachers in order to promote positive children's learning in their classrooms.

18.2 Learning Through Play

'Play time is not a waste of time. In fact, play brings very important values in developing the self-confidence and social skills of our children, in stimulating their curiosity to explore the world around them and in nurturing their creativity', said Singapore Education Minister Heng Swee Kiat in a recent newspaper on February 23 (Poh 2014). Exploring how play is interpreted and enacted in the preschool classrooms is timely at this juncture, not only because the refreshed KCF underscores the importance of developing children holistically but also because confidence, communication skills and creativity are essential twenty-firstCC that we ought to develop in our Net Gen.

In the Singapore context, the refreshed KCF encourages the use of purposeful play as pedagogy to engage children in learning. As described in the refreshed KCF, purposeful play involves the teacher intentionally planning and organising the environment to enhance children's learning experiences (MOE 2012). Children, on the other hand, have 'the flexibility to explore and initiate play within what the teacher has provided' (MOE 2012, p. 35). In this document, purposeful play entails the following features and characteristics in the local context (2012, p. 35):

- It is enjoyable to children.
- It requires active involvement of children in exploring, developing and applying knowledge and skills.
- It involves learning objectives that have been carefully thought through by the teacher while taking into consideration children's interests and abilities.
- It requires facilitation by teachers and this involves observing children at play to discover what they have learnt and then shaping their activities to reinforce or extend their learning towards intended objectives.

Based on the description, the notion of purposeful play in Singapore is, therefore, contrary to 'spontaneous free play' whereby the 'type and duration of the play in which they (the children) engage in, is entirely determined by them and activities can be taken up and stopped at will' (Sheridan 1999, p. 4); spontaneous play is also intrinsically initiated by children and is non-literal, involving some form of make-believe (Hughes 2010). Instead, the local definition of play envelopes the concept of intentional teaching and knowledge building to foster learning in the children. In other words, the teacher is the one with the full autonomy, control and power for play. It is the teacher who plans the scope of play and leverages on using play as an organised activity and as providing a stimulating environment for learning. Children's play in Singapore preschool classrooms is thus primarily confined to playing only with allocated play materials and takes place within the boundary of intended and planned activities. Free choice is limited and when given, usually refers to giving children their own flexibility to explore and to initiate play within the boundary of the rules and instructions set by the teacher (MOE 2012). Simply put, purposeful play in the local context requires the need for active involvement on the part of the teachers in an activity that all children like to do best, to play, in order to deliver the objective of education: to learn.

Despite all that was said, while many preschool teachers may recognise the importance of play in learning, the crux of the problem lies in the struggle with how the whole works of learning through play looks like; how they, as teachers, should go about doing it—how to scaffold and support children's learning through play and how to connect the learning objectives and content they have planned to teach to those play activities. In fact, because play can take so many forms in its classroom implementations and yet is nebulous in nature, teachers often find it difficult to master this play pedagogy or fail to fully take it on board to its fullest benefit and intention in their daily classrooms.

The situation is analogous to 'Gollum' in J. R. R. Tolkien's famous story, 'Lord of the Rings' (2012), who was corrupted and fixated by the ring, 'my precious'. There exist some teachers amongst our preschool classrooms who have difficulty letting go of traditional modes of didactic teaching and rote learning to embrace more inquiry-based approaches to learning such as through play (Ebbeck and Chan 2011). This is because we often teach as we were taught. Many see the long history of achievements and proven track records in the rote-learning method that we were taught in and have yet to see success indicators contributed by play in children's academic performances. These teachers are thus resistant to change. There may be, however, also those like the 'White Wizard, Gandalf', who have 'freed their mind' (Tolkien 2012) and are not bound by one's own rationality (Simon 1983); they are those who believe that there is 'magic' that lies in the skilful art of conjuring a mix and balance between playfulness and seriousness in their classroom delivery, and who know how to be playful yet opportunistic to new learning that can emerge in their lessons.

Therefore, this chapter is based on a study that aims at adding to the piece of the picture on how our local teachers conceptualize play and situate play in the teaching and learning within their preschool classrooms. Its epistemological benefits encompass several 'uniquely Singaporean' pictures of purposeful play in preschool classrooms and address the concerns on whether the teachers are on the right track with its enactment in their lesson delivery. The findings will dovetail how purposeful play is understood by the local teachers and the process of using it as a medium for learning for our Net Gen in Singapore.

18.3 Play and its Various Forms

Play holds different meanings to different people. More importantly, to a child, play is what he does for fun. As play is nebulous in nature, a definition of play is difficult to pin down, although most people would have similar ideas about play (Else 2009 ;Emslie and Mesle 2009; Macintyre 2001). To the majority, play is an activity that is enjoyable, one which is freely chosen, intrinsically motivated and led by oneself (Rubin et al. 1983).

The business of play is viewed more importantly for children, for their sense of well-being, health and their social interactions with others (Else 2009). Ask most children what their best time of the day is and you will normally hear 'time to play'

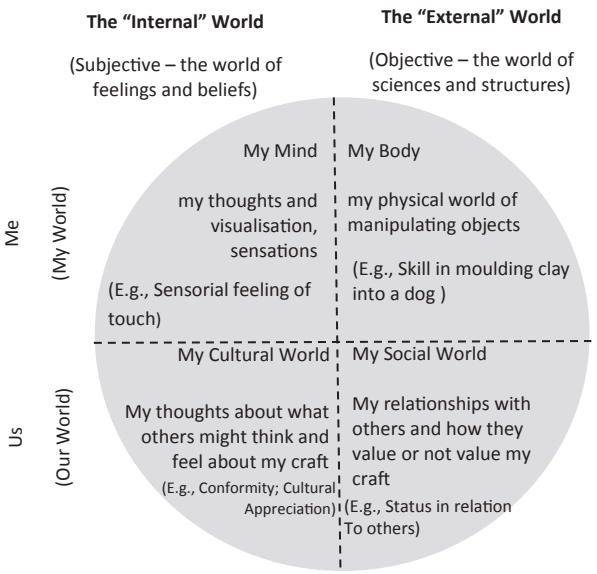

Fig 18.1 The integral play framework

or 'time to go to the playground'. Play to most children holds the elements of fun, joy, laughter, freedom and surprise. More often than not, play is an activity that children 'like', if not, 'love'. Play is often what one chooses to do for the pleasure of it, without anyone telling one what to do (Else 2009). Play for children is often filled with surprise, imagination and experimentation. Play is a process with no preconceived destination or agenda, with children moving back and forth between reality and imagination, shifting and developing the focus of play as the play goes on (Else 2009 ; Macintyre 2001).

One particular model that encapsulates the various differing perspectives on play and its value in a child's life is the Integral Play Framework (see Fig. 18.1), created by the philosopher, Ken Wilber (2000). This framework represents how play brings together the tangible world of objects shared with others in the child's real world, and the intangible world of feelings and beliefs within himself/herself, balancing the experiences from these two worlds. It is a neat representation showing the value of how, through play, we shape and are shaped by the lived experiences of our body, mind, heart and environment within these two interrelated worlds.

As children play, either alone or with others, they experience the world that is both physical and emotional at the same time. Take, for instance, the experience of a child playing and exploring with clay materials. He is using his hands to knead the clay dough to mould it in his external world, perhaps into his favourite toy, a pet dog. There is the sensorial experience (feeling of touch) interacting with the body movement and object, as he kneads. Coupled with the imagination and visualisation of how the dog is going to be like, the child slowly moulds the clay dough into the shape of a life-like dog. There is the embodiment of the child's body and mind with that of his surrounding environment in this play activity; both the emotional

and physical domains are interrelated and embedded in the child's own world (my world). These actions may in turn result in internal satisfaction and delight for the child, who, frequently also expects others around to comment, or praise the clay work.

At this juncture, the child may also choose to be a little creative in how his dog may look like, giving the clay dog either a ribbon on his head or a long leash on his collar. Much of this creativity is influenced by the child's cultural experiences and social norms. He chooses to make a collar and leash for the clay dog, as 'it is a boy dog', he said. The idea of a ribbon is perceived as more feminine culturally and the child is aware that it may be against the social and cultural norm for a male dog (which has now become a cultural artefact) to have a ribbon on the head. Positive feedback from people he is close to about his cultural artefact will bring him even more satisfaction about his clay work. The child holds up his clay work, beaming with pride. Similarly, an unconscious critical remark from others, like that from the teacher, may affect the child's sense of satisfaction and upset the child's internal world. As a result, the child may be disappointed with his craftwork, punching and flattening the clay and eventually giving up moulding altogether.

This framework depicts how interrelated and embedded each action of the child is in relation to his mind, body and the surrounding environment. Each action in the play activity has implications for and impacts on the other (Else 2009). Therefore, to truly support children at play, we should be open to what they want to play with, and provide a wide range of stimulating opportunities for play.

In the preschool settings, children can take part in various types of play that promote learning. Each play type displays different characteristics and emulate different behaviours from the children depending on the resources used and manipulated, as well as the amount of structures provided by the adults (Else 2009). The following list is not exhaustive of the different play types available but comprises play types that are more relevant and commonly found in the context of preschool centres in Singapore.

Firstly, there is the most common type of play—communication play whereby children use words and gestures to have fun; like in mimes, acting, singing and nursery rhyming. Secondly, there is the creative play which normally takes place when a child plays with blocks, paint mixing or working with craft materials to transform such materials to anything fun. Next is the exploratory play whereby a child engages with an object or area by handling, mouthing or throwing to assess its properties or make discovery on its use. Fantasy play is another common play in which a child lives his imagination in reality. For example, a child can assume the role of being a pilot who flies his aeroplane around the world. Children also often get engaged in imaginative play where they can pretend to be a pet dog and go around barking and playing 'fetch'. Locomotor play is observed when a child plays hide and seek, catching or tree climbing. Lastly, children often role-play in socio-dramatic play whereby they take up roles like the mother or father in the family and engage in tasks normally assumed by these roles in the society, like ironing or sweeping or working in the office. Through these different types of play, children are stimulated, supported and enabled to learn.

18.4 The Use of Play in Preschool Education

Children are generally curious about the world around them and are naturally playful. As such, play provides that ample opportunity for them to make discoveries, through exploring and observing and essentially, to learn. To children, play keeps them entertained and is often stimulating and rewarding (Sheridan 1999). Many research studies also show that playing helps children in their development (Sheridan 1999; Emslie and Mesle 2009; Herron and Sutton-Smith 1971; Rubin et al. 1983). 'There is a consensus on play as a profoundly important activity in the process of human development' (McCaslin 2006, p. 42).

In addition to being a critical part of the children's learning and development process, play in preschools is increasingly more highly valued nowadays largely because children in today's society have even fewer opportunities to engage in quality play experiences at their homes (Bodrova and Leong 2004). There are simply too many distractions, like the television programmes or video and computer games present at home that strive to seek more of the children's time and attention as our society becomes more technologically advanced (Levin 1998, 2008). There is also too little space to avail children of active fun play at home due to space constraints caused by expanding construction in cities. Moreover, children often play in a home environment where an adult facilitator or role model is absent. As such, play is identified as a central tenet for preschool pedagogy and is accorded an extremely important status within the early childhood teaching and learning arena. To an extent, play and learning becomes an intertwined activity in the classrooms, with preschool teachers becoming children's play mentors and who are then encouraged to promote and support play through intentional planning and teaching to foster children's learning. In Singapore, the MOE coined this intertwined activity as 'purposeful play' (MOE 2012). As described previously, this purposeful play should be enjoyable to children, require the children to be actively involved in exploring, developing and applying knowledge and skills, as well as require the facilitation of the teachers to scaffold and promote learning, so as to meet the learning objectives that are planned within the curriculum (MOE 2012)

This said, purposeful play challenges the notion of the child-centred, self-directed free choice play in which children 'provide their own motivation to play and act without prompting or intervention by an adult' (Sheridan 1999, p. 4). Instead, purposeful play embraces the Piagetian cognitive theory of development through play and adopts the Vygotskian approach that young children can master the necessary prerequisites of academic learning and language acquisition through social engagement in imaginative play, while at the same time comprising an additional emphasis on the active role of the teacher engaging the child in the learning process. In purposeful play, there is a need for adult scaffolding of the play activity using pedagogical strategies such as modelling and demonstrating, open questioning, explaining, problem solving and observing with the children to co-construct the learning and knowledge (MOE 2012; Edwards and Cutter-Mackenzie 2011). Having said this, teachers must therefore be skilled and well trained in observing children,

in understanding their development, interests and abilities as well as have sufficient knowledge about purposeful play and its mechanism in order to support children's learning through play (Tepperman 2007; Burton and Edwards 2006).

Some authors are in the view that the new technologies provide an appropriate platform to scaffold purposeful play and preschool learning, since most young children actively interact with digital media from a tender age. A recent article in the local Straits Times on July 28, 2012, mentioned how the use of new technologies has even permeated to the homes and schools of our preschoolers and already helped in their language acquisition at such a tender young age. Six-year-old Lim Qi learns and picks up most of her English vocabulary from her teachers in school as well as from interactive games played on an iPad.

> The recent word she learnt in school is "oxymoron" and to demonstrate her understanding of the word, she said, "Cold sun and dark light are oxymorons".

Encouraged by their parents, who support the introduction of computer literacy in the curriculum, these Net Gen preschoolers are not only confident with the use of new technologies but they readily engage in exploring and tinkering with the latest available tool (Aubrey and Dahl 2008; Downes 1999).

18.5 Play and Learning

Children are active learners and hence they learn by doing (Egertson 2004). In other words, children learn best when they are physically, socially, emotionally and cognitively engaged and involved in the experience. Teaching and learning in the classrooms should hence centre around the underpinnings that children are 'curious, active and competent learners' (MOE 2010, p. 41; 2012) by providing opportunities for them to learn by doing, rather than acquiring. To do this, it is important that preschool classrooms should provide children with opportunities to ask their own questions about the things that interest them, to make observations and measurements, blend logic and imagination as well as explore with tools and resources in order to seek answers to their questions. Since play is mostly inquiry-based, it allows children to actively explore, make sense and construct meaning, and eventually learn for themselves. In fact, 'an emphasis on play does not detract from academic learning but actually enables children to learn…the very foundational skills that will prepare them for the academic challenges that lie ahead' (Bodrova and Leong 2004, p. 10).

In other words, learning is embedded in play. Through play, children pick up positive social skills and learn acceptable social behaviour firsthand (Klein et al. 2004). They learn how to reject graciously by saying 'No' or 'Sorry' and accept gratefully, using words like 'Thank You' and 'Please' to communicate wants, needs and desires. They can achieve more in their language acquisition and cognitive skills when there is the provision of scaffolding from more-abled peers and adults during play (Vygotsky 1966).This is because such interactions with more capable peers and adults tend to engage the children's minds critically and constructively

with everyone's ideas (Vygotsky 1978), enabling them to develop critical thinking, conceptual understanding and metacognition (Paul 1993), as well as to use appropriate language to communicate their reasoning. In this same manner, the child's thinking develops and learning becomes optimised.

In their course of interaction with peers in play, children also develop empathy and consideration for others, which are social competencies necessary for the twenty-first century. When at play, children are exposed to and made aware of the needs, perspectives and ways of thinking of others, which then provided them with opportunities to put themselves in others' shoes and respond to the needs of others, to compromise, share, give in or cooperate.

Play also enables children to develop emotional competence. At play, children learn to express their emotions and communicate their feelings in the common gestures or languages. As a result, children learn to manage and control their emotions as they regulate their behaviour by cooperating, sharing, negotiating and practicing patience and tolerance for one another (Dorrell 2000). Active play also gives children the opportunity to coordinate and control their bodies. This can be seen when children play at the water table; the eye and hand coordination and the muscle control to grasp, pour and place the containers get developed and refined (Dorrell 2000). Very often, children move a lot and exercise several parts of their bodies when playing. Because play is enjoyable and fun, children are intrinsically motivated and willing to practise their skills repeatedly. This is necessary for acquisition and leads to the mastery of skills and dexterity (Catron and Allen 2008). In addition, play also helps children to develop body and space awareness and the control of balance, as they work on not bumping into friends or tripping over the play materials.

Most importantly, play is the most promising and engaging strategy to develop children's cognition (Bergen 2002). It is during these preschool years that children develop and understand basic skills and concepts in language, literacy, numeracy, science, cultural and social studies. It is important, therefore, that learning is made meaningful, engaging and enjoyable at the same time during this period, so that children can build strong fundamentals in both content knowledge and skills during their early years (MOE 2008). As such, teachers often leverage on play to provide children with fun and engaging experiences to learn basic concepts in the content areas, as well as to practise cognitive skills such as reasoning, logic, problem solving and memorisation.

18.6 The Enactment of Play

Learning through play in the classroom will not look the same as playing in the playground. Play is not a 'laissez-faire' approach to preschool teaching; in other words, play in preschool teaching and learning does not mean 'anything goes'. On the contrary, both the children and the teacher are equally important and have a great impact on the learning process; both contribute to what is going on in the daily classroom life and learning (Samuelsson and Carlsson 2008). It is important, therefore, that the preschool classroom is joyful and gives children a sense of belonging.

The paradox remains that while play has been acknowledged as an effective pedagogical tool for early education and the belief in learning through play has remained strong, the implementation of play is still not prevalently reflected in actual preschool classroom practices. The enactment of play, more often than not, either has to give way to conventional preschool teaching in which passive learning and drilling as 'practice makes perfect' dominate as a more effective approach for academic preparation or is superficial and brief, being frequently interrupted by other activities. The gatekeepers to a playful preschool curriculum, and in turn playful learning in preschool classrooms in this case, are thus the preschool teachers. In order to probe more deeply and further understand the underlying issues affecting implementation and enactment of play in preschool classrooms, it is therefore essential to examine the curriculum commonplace of preschool teachers more closely (Connelly and Clandinin 1988; Schwab 1973), as well as the five intersecting domains in Ball and Cohen's (1966) theory that interplay and affect teachers' classroom practices. The five intersecting domains are (a) the teachers' understanding and beliefs about children, their experiences and prior knowledge; (b) the teachers' knowledge, understanding and interpretation of the subject matter and instructional materials; (c) their pedagogical knowledge; (d) the milieu of the classroom; and lastly, (e) the culture of the school, community and the educational system.

Foregrounded in the refreshed KCF with the core beliefs that 'children are curious, active and competent learners', preschool teachers are encouraged to tap on the learners' natural curiosity and structure play embedded in active learning that allows children to manipulate with real objects, explore, reflect, interact, make decisions and communicate with other children and adults to construct knowledge and ideas about the learning experiences (MOE 2008). Because children are active learners, teachers, as facilitators, are also reminded to allow for messiness, especially during play, as well as mistake making and to bear in mind that the environment is safe for the learners during learning through play.

As a professional, preschool teachers are described as having 'the necessary knowledge, skills and dispositions to be architects of high quality learning environments' (MOE 2008, p. 49). This professional is encouraged to engage in reflective practice so that he/she can acquire a broader repertoire of his/her knowledge and skills, develop a deeper understanding of the subject content as well as explore a wider range of teaching strategies that leverage on play to provide exciting learning experiences for the children. At the same time, the teacher must be skilful in knowing when he/she should intrude and when to let be during the children's learning through play. It is also necessary that he/she times knowledge, that is, to be aware when the children's ideas and understanding begin to flag or when there is a teachable moment to heighten children's learning during play. This is because when teachers intervene without an understanding of the subtle nuances in the children's play, the play can be spoiled, and the crux and essence of learning will be gone with the play.

In addition, the teacher must not only construct a classroom environment and schedule that promotes play experiences for children's learning but also enhance the learning potential within the play contexts to create opportunities for children to make better sense of the world around them (Klein et al. 2004). It is important for

the teacher to consider three things in supporting play for learning: (1) the types of materials to provide, (2) the questions to pose prior to, during and after children's play and (3) other additional explorations to offer next in order to provoke deeper inquiry into learning (Hamlin and Wisneski 2012). It matters, too, that large blocks of time (30–60 min) are provided for play to be of high quality. This is because short sessions of play do not provide children with ample time to engage in planning, negotiating or cooperating with one another; worse, it may even cause children to abandon works that may have already commenced, resulting in a discontinuity in their thoughts, creative expressions or model constructions (Fox 2006). As a result, play becomes very superficial and less constructive.

Effective enactment of play also requires teachers to actively involve themselves in the play experience, to facilitate play. By joining the children at play, teachers can model new or desired behaviours, introduce children to new or subscribed language to communicate and facilitate the natural playfulness to extend the play experiences to new or unfamiliar contexts (Jones 2004). When teachers join children at play, the rapport and bonding that is established further supports children emotionally and socially and aid in their social and emotional learning and development.

Notwithstanding the initiative to promote learning through play, its enactment is also often a bittersweet experience in the local context. This is because on the one hand, the holistic development of the child is encouraged through the engagement of their learning through play, discovery and active collaboration; on the other hand, there is the children's parents who regard skills in literacy, language and in numeracy as more important than skills in play, experimentation and creative expressions. In other words, parents are more supportive of the instructivist approach and the teaching of traditional academic subjects as a curriculum, than a constructivist, play-based approach in learning. These high expectations from parents on their children's achievement can inevitably place considerable pressure on teachers and on the manner in which they deliver learning in their classrooms (Berthelsen et al. 2011). Programmes with play and little direct instruction from teachers can make parents nervous and anxious. Thus, teachers have to strike a good mix between freely chosen activities that include play as well as adult-initiated ones directed at literacy, language and numeracy knowledge and skills in their classrooms.

18.7 Teachers' Perceptions of Play

There is no doubt that many have understood and recognised the importance of play in the early years education. The crux of the problem lies in the struggle with how the whole works of play looks like and to contextualise it to the local milieus that are bounded with cultural values, traditions and belief systems. It is no wonder, then, that there are different camps when it comes to the perception of play; some with a very clear understanding and interpretation of play in education, and others with a fuzzy or misunderstood definition (Cheng 2012).

In a meritocratic society like Singapore, academic achievements and successes are highly rated aims. This meritocratic milieu for high academic achievements, more often than not, steers teaching and learning, as early as from preschool education, off-tangent and places pressures on the preschool curriculum to be more academically oriented instead (Wong and Lim 2002). As a result, the common societal perception of good quality preschool education is measured by how well the curriculum prepares the young child for entry into Primary One. Parents often have very high aspirations and expectations for their children's achievements right from preschool. This is such that the latter can have a smoother transition into the primary school and achieve high academic standing in the next educational milestone, where high-stakes examinations and placements into good classes, programmes and secondary schools await. The situation is further exacerbated with the mindsets that being academically successful secures a better future in terms of job prospects and wealth production. As such, the paving for this success begins as early as in preschool with greater emphasis on skills in literacy, language and numeracy.

This reality imposes great constraint on what and how teachers teach in their classrooms, because the high expectations from parents on their children's achievement inevitably place 'considerable pressure on teachers and on the manner in which they deliver their programmes' (Berthelsen et al. 2011). Much as the teachers would like to try the constructivist approach to teaching and learning using play, meeting societal and parental expectations may demand that they revert and yield to the traditional functionalist approach involving the teaching academic skills using paper and pencil. To an extent, play often becomes a motivational tool and is perceived as a reward after work instead (Cheng 2012); and the free choice of play activities comes with the condition on how well the children have done their written or academic work—the better one does his/her learning, the more choices he/she gets to with regards to the play activities to be done after work. Play, in this case, is used as a motivation to work academically. The harder you work in your writing, the longer or better you get to play. Of course, such extrinsic motivation certainly produces the positive learning behaviours that are also desired, and there are many teachers who perpetuate this type of perception; however, it is definitely not the kind of play that is strongly advocated.

Purposeful play is both children-directed and teacher-directed. Teachers are encouraged to provide opportunities for multiple experiences so that children can be actively engaged and involved in play that helps them construct knowledge and discover new knowledge about themselves and the world around them. However, providing ample opportunities for children to learn from observations, exploration, play and hands-on experiences would require a certain amount of tolerance for and acceptance of messes and mistakes to take place. The process of play and active learning carries some degree of trial and error that can be a messy affair. Moreover, in a constructivist context where children are encouraged to try something new so that new knowledge can be discovered, teachers need to bear in mind that children should not be criticized or reprimanded for the mistakes made in the process. Instead, they should be encouraged to try again after encountering failure, and be praised for their effort in this attempt. (MOE 2008).

The actual preschool setting, however, may not be so ideal. In addition, the educational institutions in our society advocate good behaviour and proper discipline in class, and do not condone noise and overactivity during lessons. Most of the time, there are rules and regulations made and the code of conduct is established so that there is order within the learning campus. In our local milieu, a classroom bustling with noise and lots of children movements can be looked upon as chaotic and with much distaste. Such an environment is often viewed as one in which the teacher lacks classroom management, and worse, one where learning cannot take place. Teachers also fear that play in learning will result in their loss of 'control and power' in the classrooms, especially when too much 'power' is accorded to the children, in terms of the free choice in play (Cheng 2012). Teachers can feel inadequate and 'helpless' in such play-based learning environments. This is often the result of a misconception in the meaning of play.

Purposeful play, in actuality, positions power as a productive process, operating in and through the manoeuvre of power between children and teachers in the classroom (Foucault 1978). Children's power in play is held in their 'self-motivation, relaxed engagement and control over their play'; on the other hand, teachers are required to take control of the children's learning processes by shaping the process through managing the learning outcomes and using play as a teaching tool, linking the learning outcomes to children's engagement in learning (Thomas et al. 2011).

18.8 Limitations of the Literature

The studies examined thus far have situated the importance of play in supporting preschool children's learning. While much of these studies revolved around the Piagetian and Vygotskian theories of development on the possibilities of learning through play, there has been an additional emphasis on the active role of the teacher to intentionally engage and scaffold the children's learning process in the recent years. The role of the preschool teachers in play and intentional teaching during play has been much discussed in the literature on how to promote children's learning.

In Singapore, this 'natural context of play' being supported by the facilitation and deliberate interaction of a caring, knowledgeable other is known as 'purposeful play'. How well the local preschool teachers enact this purposeful play in their preschool classrooms depend largely on the interplay of Ball and Cohen's (1966) theory on the five intersecting domains on the curriculum enactment of play in the classroom. Yet, this said, how the five domains all dovetail into the picture of purposeful play in the classroom, how this enactment eventually looks and works out in the reality, remains problematic and vague. There is a paucity of local research that examines how teachers actually conceptualize purposeful play and situate it in the teaching and learning experiences in their classrooms.

With this dearth of information in the local context, the focus of future studies should aim to describe and understand the perceptions of preschool teachers on

purposeful play as well as their use of play as a medium for learning. By using a collective case study approach on some of the local preschools, future research could provide a descriptive portrait on purposeful play and its role in children's learning in the local preschool contexts.

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Part IV
Epilogue

Chapter 19
Epilogue

Caroline Koh

We began this book with an exploration of what characterize twenty-first century learners and why, in order to engage them, there is a need to revisit and review the way we motivate them, lead their learning, and design their curriculum. This chapter pulls together the views of the various authors with the aim of formulating feasible approaches that could scaffold learning in both real and virtual classrooms. What transpires from the chapters is the intricate link between motivation, leadership, and curriculum. Indeed, knowledge of what motivates the Net Generation (Net Gen) is required before educational leaders and policy makers can chart a feasible course of action paving the way for curriculum experts to design appropriate curricula that are relevant and engaging for the twenty-first-century learner.

In Part 1, the general consensus among authors is that although studies have revealed the wide range of educational opportunities offered by digital innovations, there is still plenty of room for improvement in terms of our understanding of what motivates the twenty-first-century learner and how technology and virtual environments can be refined to enable deep and meaningful learning. In terms of understanding the factors that influence the twenty-first-century learner motivation, Dilani Gedera and her co-authors found that motivation to learn online is promoted when there is provision for easy access to well-organized hyperlinked resources, as well as the creation of space and opportunities for synchronous learning and interaction with peers and facilitators. These findings are supported by the research conducted by Ashwini Dutt and Trudi Aspen on the use of WebQuest strategy to scaffold the use of various Web 2.0 tools.

However, in his chapter, Quint Oga-Balwin cautions against the view that technology is the panacea against all educational woes. He argues that though digital environments may provide more choices to learners, the benefits from these innovations can only be reaped if they offer the necessary structure and direction for meaningful learning. He suggests that efforts should be geared toward building learner competencies and self-control, as well as improving the understanding of

C. Koh (✉)
National Institute of Education, Nanyang Technological University, Singapore
e-mail: caroline.koh@nie.edu.sg

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how learners can foster meaningful rather than surface relationships, in a virtual environment.

Cathy Gunn echoes these views when she proposed, in her chapter, that learner engagement and motivation in online learning are enhanced by attracting and focusing learner attention, establishing the relevance of activities to learning goals, confidence building, and the provision of feedback on performance. Collie Conoley and her co-authors reiterate the importance of these points when they advocate, in their chapter, the need for interactive learning environments that allow experiential, engaged learning, interactivity, collaboration, immediacy, and connectivity. They further assert that computer-generated tasks could provide the balance of challenge and skill, clarity of goals, and feedback immediacy to create the flow experience characterized by deep engagement in learning leading to performance achievement. This in turn fosters learners' well-being and positive emotions, which are the necessary ingredients for success. Conoley thus brings to our attention the role of internal factors in influencing learner motivation.

Kah Loong Chue, in his study on the relationship between personality traits, learner motivation, and academic achievement, further corroborates this view. His findings revealed that traits such as conscientiousness, extraversion, and neuroticism were consistent predictors of academic motivation, while academic achievement correlated strongly with agreeableness, conscientiousness, openness. One general conclusion that can be drawn from this section is that deep learning can be promoted by the use of virtual learning environments, particularly when the latter enable self-efficacy, interconnectedness, and autonomy to be leveraged. Although we have gained better understanding and knowledge of what motivates and engages the twenty-first-century learner, the implementation of what experts recommend can only be carried out with the support of educational and technology leaders and those at the forefront of policy and decision making.

In Part 2, the authors provide analyses of the approaches that could be adopted for the effective implementation of technology-infused programs for twenty-first-century learners, notwithstanding the challenges encountered in the process. Irene Ng perceives the introduction of technology as creating opportunities for school leaders, staff, students, and parents to share and develop a common vision and purpose. Of utmost importance is the principal's role, with input from the staff, in the planning and preparation of technology-infused programs, as well as creating a positive learning climate in the context of twenty-first-century teaching and learning. This author also recognizes the need for leaders to build staff capacity and competencies in both information and communications technology (ICT) and non-ICT domains, in addition to the provision of adequate support for the realization of these projects, thus reaffirming what other authors have advocated in Part 1.

In her chapter on twenty-first-century teachers' professional development, Maria Sit concurs on school leaders' influence on teachers' motivation and active participation in skills upgrading, especially in the need to keep abreast with new technologies and ensuing pedagogical changes. This author supports the view that school leaders should build a culture that supports professional learning, and take concrete

steps to engage individual teachers in their own growth, rather than resting on their assumptions of teachers' needs.

In my contribution to this segment, I elaborate on the issues raised by Irene Ng and Maria Sit by reviewing the extant literature on the topic, which further advocates the need for training and development to be extended to the digital natives, to even out the discrepancies in technology competencies. There is a need for leaders to formulate and communicate clear visions on ICT integration, followed by restructuring of institutional organizational processes, funding and resource allocation, ethical concerns, curriculum development, and program evaluation. Finally, Bee Leng Chua highlights in her chapter how these considerations can be translated into practice in the implementation of a problem-based learning approach in an initial teacher education program, thus establishing the link between leadership policies and curriculum making at ground level.

In the third and final segment of this book, the authors share their diverse views on the influence of new technologies and pedagogies in shaping the curriculum for twenty-first-century learners. To begin, Judine Ladbrook and Judith Parr, in Chap. 13, are of the view that schools serve wider socializing functions and that technologies, if integrated effectively into the curriculum, can assist in this respect by providing a virtual system capable of connecting all the various learning and developmental contexts in which the learner operates. They suggest that new pedagogies should be developed alongside new technologies to assist Net Gen learners, who despite being tech-savvy, are less adept at sourcing for and using curriculum-based information.

Ladbrook and Parr's views on the integration of pedagogy and technology are echoed in the following chapter by Alan Ovens and his colleagues. The latter further reiterate the need to engage twenty-first-century learners purposively, a view supported in earlier chapters by authors such as Quint Oga-Baldwin, Cathy Gunn, Collie Conoley, and colleagues. Ovens and his co-authors propose that student engagement could be achieved by establishing a closer link between learning and assessment. This can be attained by using new technologies to make assessment more student-centered, reflective, and proactive.

In the next chapter, Alexander Yeung and his colleagues agree with Ovens et al. on the potential of the new technologies in transforming learning and assessment, but they highlight the challenges encountered, specifically in the area of language learning and assessment. They outline the possible problems that may surface, such as the limitations of technology in capturing specific nuances of the subject being assessed, failure to align the tasks with the learning objectives, and the need to build teacher competency in dealing with new technologies and the ensuing new pedagogies, an issue raised by some of the authors in Part 2. Yeung and his colleagues recommend a flexible, blended approach, with the use of different technological tools for different activities, and the incorporation of some elements of technology use where appropriate, while retaining traditional assessment approaches that technology is currently unable to replace.

A need for flexibility in the adoption of technology in learning is also advocated by John Williams and his colleagues, writing on the use of e-networks in science

learning. The teachers involved in this study faced similar problems as the language teachers mentioned in the previous chapter, namely with regards to the need for changes in their role and their pedagogical approaches and the need to upgrade their knowledge of learning technologies and to reconcile the demands of the new curricula and assessment modes. However, in this instance, the path to successful implementation of new technologies was facilitated by what the author called "sympathetic school leadership," which in this study provided the necessary support that was recommended by many of the authors in earlier chapters, namely in terms of infrastructure, resources, and staff development.

One recurrent suggestion for effective infusion of new technologies in learning is a greater alignment of pedagogy with new technologies. This entails not only the review of current pedagogical methods, but also the introduction of novel approaches to teaching and learning that are of greater relevance to the needs of the twenty-first-century learners. The final chapters of this book focus on two such directions in curriculum making. John Yeo, in Chap. 17, highlights the need to focus on developing students' ability to problem-find, so that they are equipped with the strategies and skills to identify and investigate issues that are meaningful to them in the midst of the complexities presented to them in the virtual, hypertext environment they are exposed to. This is an issue raised earlier by Ladbrook and Parr, who recognize the gap between students' mastery of new technologies and their ability to make effective use of them.

In the final chapter, Susan Sim gives a lighthearted discussion on the benefits of purposeful play in scaffolding and supporting learning in twenty-first-century preschool classrooms. If William Wordsworth is right when he wrote that "the Child is father of the Man", what takes place in the preschool classrooms is likely to be a reflection of what will take place in post-school arenas. Since young children gain exposure to digital media from a tender age, new technologies can potentially provide an appropriate platform to scaffold purposeful play and preschool learning, thus setting the stage for learning through the journey of life.

Index

C. Koh (ed.), *Motivation, Leadership and Curriculum design,*
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