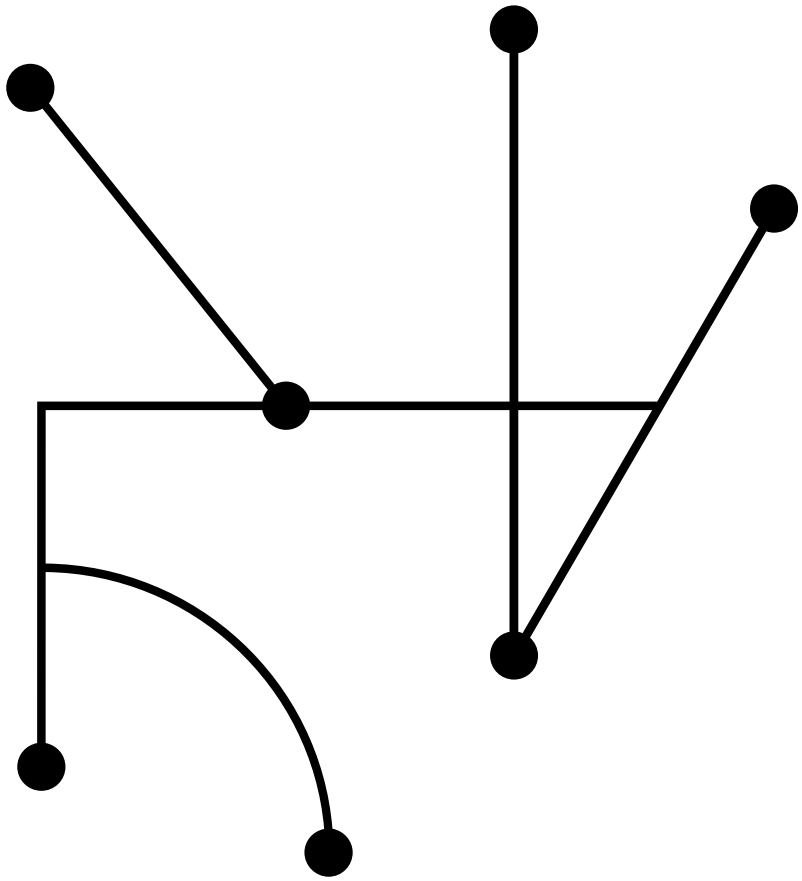
# *seven steps to*
# ICT INTEGRATION

*Margaret Robertson*
*Ivan Webb*
*Andrew Fluck*



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# About the authors



Margaret Robertson is associate professor and reader in education at La Trobe University. She is widely published in books and journals, with extensive international expertise in teaching and research project management. Her career-long interests in quality learning environments are linked with an enduring passion for geographical education and knowing more about visual and spatial literacies.

Ivan Webb is currently completing his PhD at the University of Tasmania, investigating the 'key success factors' associated with the successful and sustained use of ICT in teaching and learning in schools. He also works as a consultant to schools in relation to school improvement, capacity building, and supporting students with learning and behavioural needs. Previous experience includes thirty-seven years as teacher, principal and superintendent in the Tasmanian education system.

Dr Andrew Fluck is a lecturer in Information Technology at the Faculty of Education, University of Tasmania. He divides his time at work between teaching ICT skills to pre-service teachers and conducting research into the transformative effects of technology. He has been involved with several national projects related to ICT connectivity and has a particular interest in home and school links associated with ICTs.

*Dedicated to Jock's Folly*

# Preface



We hope that *Seven steps to ICT integration* will assist its readers to move smoothly towards specific initiatives of their choosing. We work from the premise that achieving a return from the substantial workplace investments in Information and Communications Technology (ICT) requires an understanding of situated professional learning. Our book describes learning based on firsthand local-lived experiences of participants observed through research studies. Interwoven with these observations are general principles of learning, understandings, possibilities and related examples.

## KNOWLEDGE, LEARNING AND ACTION

We take the view that knowledge, learning and action cannot be separated meaningfully. Support for learning and action with ICTs requires expert knowledge and related understanding. Each situation is unique and there are no ready-made answers that can be applied universally. That is, in a complex endeavour such as incorporating the use of ICT into teaching and learning there is neither a unique, nor a specific strategy for achieving a particular outcome. What is valid in one situation may be irrelevant in another. Moment-by-moment judgements are required in order to achieve progress. Extracts from literature and findings from research are not sufficient to remove the need for judgements. However, they can provide points of reference and insightful examples, heuristics or 'rules of thumb' that others have found useful, or just prompts that may assist the learning processes occurring in the everyday conversations of those individuals involved.

To the extent that this book is able to make a contribution, it will promote learning that enables its readers to construct and reconstruct their own understandings of:

- their lived experience in relation to the use of ICT
- the possibilities for its continuation
- the possibilities (and opportunities) for improvement and change
- the constraints currently limiting initiatives.

In relation to change and improvement, *Seven steps to ICT integration* has in mind Goldratt's (1999) three fundamental questions of the current lived experience:

- What to change?
- What to change to (in order to achieve an improved future lived experience)?
- How to cause the change?

We hope you enjoy our approach and that you will find some ideas to apply to your situation.

# Acknowledgments



The theoretical basis of this book has been developed as part of an Australian Research Council Linkage Grant titled: 'Online learning and authentic teaching skills'. Partners in the project were the Department of Education Tasmania, the Catholic Education Office Tasmania, and Telstra. Additional project information cited in this research has included schools located in Victoria. We acknowledge the contributions and support of the Victorian Department of Education and Training along with the Catholic Education Office Victoria.

The authors wish to acknowledge and thank all the people interviewed, and pay special tribute to the teachers and students in whose daily working environments we were so privileged to spend time.

Finally, a tribute to Dr Werner Henneke and Dr Neville Grady for their contributions during the information phases of the book.

# Introduction



Welcome to *Seven steps to ICT integration*. Despite the title, this is not just another 'how to' book. The ideas and strategies presented are grounded in practical solutions to problems and issues identified in schools and higher education through several years of research. Our approach, as set out in the book, is pragmatic. We take complex ideas related to the integration of Information and Communication Technologies (ICTs) in educational settings and attempt to interpret them in ways that are practical and sustainable for improved educational outcomes. In so doing, we hope to reflect our enthusiasm for the educational opportunities that contemporary discoveries offer. As authors and researchers, our conviction is that if we are willing participants in learning more about how to learn, we have the chance of re-invigorating our roles as teachers *and* learners. The outcome can be limitless opportunities for contributing to world futures in socially just and inclusive ways.

Nowadays, we find technology and learning in a perpetual relationship. E-learning is the dominant pedagogical movement of our times (Rosenberg 2006). Any learning that involves the use of a computer or the Internet can be described as e-learning. It is difficult to imagine the world of now without computers. Children today have not experienced a world without a computer, handheld device or ATM machine, and very little in the daily lives of children and adults does not involve computing. Yet it is just one generation ago that computers were being introduced into the workplace. From these recent beginnings, knowledge access, sharing and development have been revolutionised. So, too, have communications systems. The transformations in the ways in which we go about our daily lives are fluid—in a way, there can be no 'getting it right' in what we do. Our best tactics need to encompass flexible pathways, ongoing professional learning and a continuing sense of wonderment in the achievements of humankind.

This introduction provides an overview of the educational context in which our approach has been developed, as well as a summary of its scope and contents. We present our ideas in three sections. Part A (chapters 1–4) provides a basis for understanding the

Seven Steps to ICT integration introduced in Part B, chapters 5–11. Part B draws on the theory, research and case studies elaborated in Part A, to help readers focus on their own situations and experiences in order to learn and construct responses that have the potential to lead towards improved use of ICT in teaching and learning practices in the current local situation. Part C (chapters 12 and 13) provides some examples of case studies that have successfully implemented the Seven Steps.

Hence, while individual readers, educators and related professionals will gain important insights from this book, it is also intended to be supportive of the work of groups responsible for governance, leadership and management within schools, the successful completion of development projects, as well as everyday teaching and learning.

## STRUCTURE OF THE BOOK

### Part A Theoretical overview

Chapters 1, 2, 3 and 4 present and develop our ideas with specific reference to related policy literature and research. The projected implications of state, national and international agendas for the purposes of teaching and learning are considered along with some challenging questions for reflection. Each chapter focuses on a different dimension, providing theory and research, and accounts of other people's practices and experiences. We also introduce some of the major underpinning theoretical constructs used to develop our approach. They relate to the following:

- Meaning making in real contexts
- The interrelationship of knowledge, learning and action
- The co-construction of organisation leadership and governance.

Together, the four chapters inform the more strategic approach for implementing change as set out in Seven Steps in Part B of the book.

#### Chapter 1: Getting to know the ICT landscape

Chapter 1 introduces the various aspects of ICT and its uses, including teaching and learning; curriculum models and schooling. This chapter considers the broader issues facing educational reformists, and reflects on changing lifestyles in the information society and our need to educate young people to be ready for ever-changing futures.

#### Chapter 2: Capacity building with ICTs

Chapter 2 focuses on the influential forces in the development of an active ICT learning environment. Four distinct forces are identified. First, the pragmatics of daily life in the classroom can lead to different responses in different contexts. Second, outside pressures from the diverse local, national and global influences impact on the daily working lives

of teachers and learners. Third, policy dictates directions for schools. Fourth, responses to any of the forces are likely to be ad hoc and fragmented if not backed up by professional learning that is situated in the context of the teachers and leaders.

### Chapter 3: Policies and curriculum frameworks

In Chapter 3 we provide an overview of international trends in ICT policy and curriculum developments. This overview is designed to offer the 'big picture' context of ICT educational developments. In turn, we hope this information will help to interpret the rippling-down effects that impact on our daily working lives. The reflection will assist in identifying current strengths and opportunities for further progress in technical, pedagogical, curriculum, community and cultural matters; systemic requirements; and reporting and assessment. The resources for this reflection include case studies of schools from various school systems and sociocultural contexts.

### Chapter 4: Policy to practice—how to 'do it'

Our view is that much of the current dilemma related to how to shift educational responses in schools to more fully embrace ICT is bound up with trust. The interactive nature of digital technologies highlights the renewed meaning of Marshall McLuhan's (1967) belief that 'the medium is the message'. The new technologies depend on the working relationships developed between learner and teacher across all levels of the system. They need new sets of rules and codes of behaviour that are contractually negotiated and flexible to ongoing change. This requires a power shift in the ways in which role identities are constructed. Negotiation rather than 'telling' is the key to successful and purposeful outcomes. But, trust is the starting point. How we govern and lead our learning communities assumes we are all aware of our mutual interdependence. The school is a living, organic institution—accepting this reality is a good starting point for meaningful dialogue.

## Part B The Seven Steps

Much of the research knowledge applied in this book is derived from a 2002–04 Linkage project funded by the Australian Research Council.[1] As members of the project team the authors completed extensive observations of fifty classrooms in twenty-eight Australian primary schools. In addition, personal interviews were conducted with teachers, technical support staff and school leaders. Groups of students in each class were interviewed in focus groups along with whole-class interviews to determine knowledge of and familiarity with digital technologies. Outcomes from these intensive interview and observation sessions were complemented by action learning projects in the areas of professional learning

1 For full details on some of our research projects see http://www.educ.utas.edu.au/users/ilwebb/Research/index.htm

and the use of online learning objects. From this large body of work, several key factors associated with the successful and sustained incorporation of ICT into teaching and learning activities in schools have emerged.

Chapters 5 to 11 focus on solutions achieved by the application of soundly based strategies. The recommendations draw on related research to elaborate each of the Seven Steps, and the processes involved are clearly laid out for readers to consider. In addition, case studies of schools that have already undertaken each step highlight the lessons to be learnt from their first-hand experience. With these notions in mind, and based on our recent research and the best available current literature, we propose a model of the Seven Steps towards the successful incorporation of the use of ICT into teaching and learning practices.

**Chapter 5 Step 1: Starting out with theoretical underpinnings**

- Theoretical underpinnings informing development, including Activity Theory
- Rationale for the use of ICT (relating to values and purposes)
- Philosophy
- Pedagogy
- Integrating learning, opportunities and action: a focus on practices
- Theory—success factors

**Chapter 6 Step 2: Agreeing outcomes**

- The current local reality—what is working, what is not and what else is expected/possible?
- Baseline measurements—understanding the current practices and resources
- Criteria for success—what is actually possible, desirable and feasible?

**Chapter 7 Step 3: Identifying constraints**

- Understanding constraints
- Identifying constraints and resources
- Managing the change process in the face of constraints with the resources available
- Focusing on solutions—small steps that can make a big difference

**Chapter 8 Step 4: Action learning**

- Knowledge-based improvement: focus and investigate
- Reflecting on experience and prior knowledge

**Chapter 9 Step 5: Professional learning for embedding ICT**

- The aim: improving learning and embedding ICT in the class program
- Collaboration and constructing professional knowledge

- Adapting the general to the specific
- Principles of professional learning
- The professional learning cycle

**Chapter 10 Step 6: Sharing outcomes and practices**

- Identifying achievements
- Celebrations and sharing
- Transferring and embedding practices
- Using ICT
- Professional learning
- Development
- Transformation

**Chapter 11 Step 7: Future projects and transformative potential**

- Informed conversations and transformation
- Applying the Seven Steps process
- Possible projects
- What is possible and under what conditions?
- What is desirable and why?
- What is feasible, how and when?

## Part C Case studies from research findings

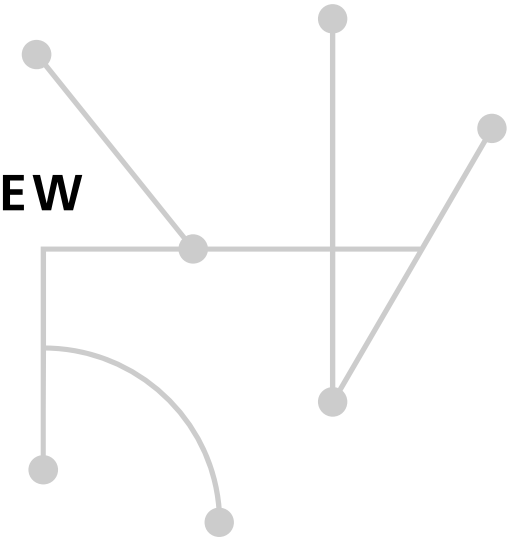
**Chapter 12: Case studies**

The Seven Steps have been developed and presented with schools in mind; the underpinning theory and approaches have the potential to be adapted to a wide range of situations. For most readers the outcomes will relate mainly, but not exclusively, to teaching and learning. We hope that other readers will creatively adapt the Seven Steps framework to address the provision, use and management of ICT in their own everyday context in order to achieve improvements in their practices and the practices of those with whom they work and learn.

**Chapter 13: Conclusions**

Central to successful integration of ICT are collaboration and action learning that focus on implementing new and improved practices in order to enhance the core activities.

# PART A
# THEORETICAL OVERVIEW



Any prior conceptions about the world can be considered original. For the individual perhaps this premise holds some validity. However, in the cold reality of contemporary thinking it is highly unlikely that 'I' alone have been responsible for a particular idea. In this section we honour this declaration with an overview of current literature as it relates to the integration of ICTs into teaching and learning, including policies and practices.

For theorists and pragmatists alike the issues related to research in the social sciences are less than clear. As Robson (2002) describes: 'one of the challenges inherent in carrying our investigations in the real world lies in seeking to say something sensible about a complex, relatively poorly controlled and generally "messy" situation'. (p. 4) The literature on the relationship(s) between ICTs and education reflects this view.

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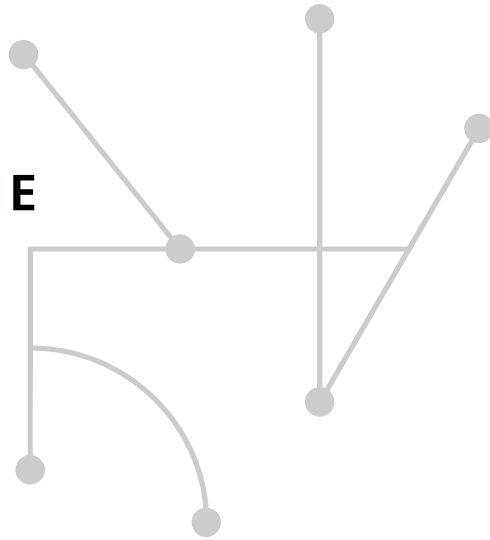
# CHAPTER 1
# GETTING TO KNOW THE ICT LANDSCAPE



*In an age of uncertainty one requires strategies that empower rather than constrain.*

Hargreaves 2003, p. xi

## WHOLE-SCHOOL APPROACHES

Our book advocates whole-school approaches to ICT integration. There is a high level of agreement that schools should incorporate the use of ICT into their practices (British Educational Communications and Technology Agency [Becta] 2006, 2004a & b; Organisation for Economic Co-operation and Development [OECD] 2001). There is also a high level of agreement that for the potential benefits of ICT to be realised, it is necessary for 'teachers to change their pedagogies'. However, there is little evidence-based support for the notion that individual teachers have the capacity to change their pedagogies unless they are well supported in their working environment. Teachers generally work in a school, act on behalf of the school, and are subject to the hopes, expectations and requirements of the school. Similarly, students are normally enrolled in a school and are not usually enrolled with a particular teacher. It is reasonable to expect that it takes a school to make provision for the use of ICT, to endorse matching practices and to support the efforts of teachers to implement the practices involved. It is for this reason that school governance is considered a key issue.

In brief, our problem-solving approach assumes the need for holistic thinking; that is, a willingness to explore the whole context and seek understanding of all perspectives. The age of mass education is gone and with that passing is the belief system that all is orderly and controlled (Hargreaves & Goodson 2006, Loveless & Ellis 2001). In Britain, Sanger (2001) describes this phase as the 'demise of UK schooling and the rise of the individual learner' (p. 9). We now need school-based strategies that are responsive to these ever-changing contexts and solutions that can be enacted swiftly. Learning communities, rather

than top-down bureaucracies, can achieve these goals (Senge 2005). Underpinned by trust and built on shared visions and collaborative planning, the learning community can act collectively and support individuals, both as learners and teachers (Hoy & Tarter 2004).

Along with many big-picture thinkers of our world of tomorrow, Hargreaves (2003) calls for a vision for the knowledge society that can embrace not only the 'transmission of knowledge, but also learning how to learn' (p. xi). Achieving such goals relies on good leadership and traditional practices may not help.

Reflecting this observation and expressing his frustration with contemporary schooling, Stephen Heppell (2001) maintains that the pursuit of learning outcomes is driving the curriculum in prescriptive ways. Rather than using the technologies in the ways in which students do in their after-school lives, users seem restricted to doing such tasks as online tests for mandatory reporting. In his view, young people are taking all the new devices in their stride, but schools are not meeting the challenges of what 'being wired' means. Nowadays, asynchronous communications supersede the synchronous communications of traditional practices. Young people are into meta-knowledge or 'how to do it' rather than knowledge as an end in itself. As he states:

> *We do not need to be a cyber-geek or a futurologist to see that when young people find themselves in the working world and discover that the things they valued, but within the curriculum [were] ignored, are of considerable economic, social and creative value, then they will ask serious questions about the schooling that they will accept in the future for their own children and—as it was with music—youth moving to parenthood will be an unstoppably powerful engine for change. (p. xviii)*

Heppell tosses the education profession quite a challenge but one that has endless possibilities for re-energising learning and learning partnerships between children and their adult teachers and mentors. Similarly sceptical of school curriculum is Larry Cuban, popular writer and speaker at conferences. His book titled *Oversold and underused: computers in the classroom* (2001) provides persuasive argument against school-based responses to the technology demands of our knowledge society. As popular voices in scholarly debate, many of Cuban's and Heppell's assertions seem based on observation and experience rather than recent research. However, we ignore their messages at our peril. Their popular voices can be advocates for the future and alert us to our responsibilities.

Fortunately, recent research information collected by agencies in ICT research such as Becta (2006) suggests the benefits of ICT for learning outcomes. All these opinions are drivers for our book. We face the challenges with endless optimism and a sense of exhilaration, but are mindful of how much work lies ahead in schools and the networks that support teachers and educational leaders, including parents and guardians and local community networks.

Sergiovanni (2005a) sees the virtues of leadership as the starting point. The 'virtues' for success are stated as 'hope, trust, piety and civility' (p. 112). 'Hope' relates to the need to provide realistic goals for the learning community—optimism is maintained and so is the necessary goodwill to reach the required standards. 'Hope' can be translated into a set of beliefs, or faith, for the future that can guide actions for schools. However, before any work on shared vision can commence there is need of 'trust'. Without trust there is little hope for sustained outcomes or lasting partnerships. Trust takes time to develop, but it is the essential ingredient for stemming concerns and feelings of inadequacy. The final virtues are described as 'piety' and 'civility'. Embodied in 'loyalty, respect and affection' (p. 117), piety and civility help set boundaries of what is acceptable behaviour. Camaraderie and a sense of concern for colleagues will 'embrace difference' and lead to cordial relationships of mutual obligation. In brief, successful leadership comes down to relationships. The people dimension is the heart and soul of what we do in civilian life, as it is in the educational environments where we learn about culture, society, our planet Earth and each other. ICTs are up there at the top in how we achieve these learning outcomes.

In the chapters that follow our strategies reflect this ideal. We recognise that successful integration of ICTs requires whole-school approaches (Webb et al. 2005, Robertson et al. 2006). Part of this challenge resides in the leadership or management approaches of the school or institution (Caldwell 2006). As a result, we argue that issues of governance are a first step in the building of a culture that can lead to capacity building for the schools of the future (Eisner 2005, Sergiovanni 2005b). The flow-on effect of such relationship building can in turn provide the foundation that will underpin most educational challenges.

Mutual trust and genuine regard come from camaraderie in the shared workplace, but it takes time to develop. A willingness to listen to all voices in each setting and to act on concerns are fundamental building blocks for the kind of future we believe we all aspire to in our individual and collective lives. From collective wisdom comes the sense of community that is crucial for sustainable educational change to occur.

## DAILY LIFE IN THE KNOWLEDGE SOCIETY

We are all well aware that new (and not so new) technologies along with their latest gadgets infuse daily life. The relentless speed of this roll-out of electronic and digital devices confronts all prior notions of inventions, including their accessibility and affordability for families. Along with Internet links at home or 'just around the corner', mobile devices of phones, handheld computers and global positioning systems (GPS) enable instant connectivity and feedback. The intrinsic rewards not only capture our imagination, they drive our social, business and institutional structures. In just one generation, letter writing by longhand on parchment and bookkeepers' handwritten ledgers have become part of our archaeological past. This generation and future generations may need to go to the attics of grandparents and visit museums to see examples of pen-and-ink writing on paper!

The historical argument is informative. Nowadays, we might conclude that handwriting has entered its 'dark ages'. Historically, the advent of the print media provided the impetus for mass education; however, this was a one-way street. Students were able to study and analyse the writings of great thinkers and communicate their ideas on paper, but their avenues for sharing were largely restricted to their immediate and local community. What was once for the privileged few is now a mainstream opportunity for everyone in the community who so chooses. Choice has become a right of passage in everyday life. The norms and values of our society have changed so that the traditional custodians of knowledge are but one of infinite knowledge sources. Are we ready for this reality? Consider the following.

One of the curious outcomes of the digital world is that along with opportunities for one-to-one communications, the public now has free and ready access to publish. With task-specific software packages ordinary folk can become semi-professional publishers. This new artistry in the form of digital publication raises questions related to self-expression and the methods we have available for the exploration of ideas. The rapidity of these changes in our daily lives can be viewed through several lenses, including: *innovation and language*, *threatening zones*, *life-changing times*, and *energising spaces*. To a lesser or greater extent, all provide some measure of the social impact of the changes. Some explanation follows.

## Innovation and language

With a fleeting regard for scribes and their skills, perhaps tinged with more than a little nostalgia for the generation who learnt to write with pen and ink, we accept letter writing has taken a step to the background. Short text messages with their unique mix of symbols and rapid interaction functionality are 'cool'. By contrast, the labours of arduous and expansive descriptive passages appear 'uncool' in popular culture. So, too, in the business world, brevity and politically correct language have lifted former 'niceties' and, increasingly, courteous acknowledgments into the 'out tray'. The litigious nature of our society with its eye to the simplest mistakes in human activity can be very unforgiving and harsh in its actions. On the one hand we can experience a sense of grief for lost pleasantries associated with living in a civilised society. On the other hand, especially among the younger generation, we seem to embrace the new forms of communication with some underlying taken-for-granted assumptions about how to act and how to react. Young people can be seen to express themselves through these mediums in ways that the previous generation might interpret as appearing confronting and more than a little aggressive.

For instance, the decline of letter-writing traditions associated with addressing a person by name and with a signed greeting provides an interesting illustration. This action could be viewed as simply a stylistic change that reflects the times and the tools at hand. Conversely, it could be observed as sound preparation for the adult world.

How so? Applying the traditional greeting 'protocols' to email does not appear to be warranted—you already know the owner of the message from the address in the message bar. The spill-over effect into mainstream society is a set of norms for how to behave in digital environments. The new norms provide standards that challenge traditional social behaviour. In our view, a pedagogical framework that does not recognise these more subtle changes in codes of behaviour runs the risk of being de-motivating for learners and doomed to failure.

Herein we find a dilemma. If you follow the pathways of young people's discourse, there is cause for optimism that their focused communications will equip them well for the culture of the adult world they will soon enter. So be it. But what about our heritage and customs associated with living in a polite and caring society? Are they still relevant? Seemingly, there are no definitive answers. Interestingly, at the time of writing, the urge to revive the teaching of history in Australian schools appears in part to be a call for us to take a lead and remind the here-and-now generation of their roots. The narratives that follow will be worthy of analysis.

## Threatening zones—learning is personalised

'There are no rules of space and place' (Massey 2005, p. 165). If that's not confronting enough for educators who thrive on law and order and routines and procedures, then consider the following.

Our children have the time and interest to figure out how to make the latest technological communication devices work. With the best of advice this is not such an easy ask for teachers. As well as keeping up with the latest media-driven 'must haves', their pressures to perform are governed by policies, curriculum statements and the continual demands for accountability reports (Eisner 2005). Regardless of the intrinsic motivation that the Internet and associated digital devices may hold for learners of any age, there is always the need for teachers to steer the learner into the 'right' knowledge zone, skills and competencies. Moral debates aside, quite rightly our society demands that our children 'be educated' to national standards, including a commitment to lifelong learning that partially reflects the national identity.

With so many pressures from the learners as well as the school, state and national educational change agendas, teachers are placed in positions where they have good cause to feel anxious. Preparation for our globalised world makes information technology literacy a national priority. In schools, ICTs are mandatory for inclusion in all curriculum content areas. The rhetoric is clear, but how to interpret the requisite skills and competencies in diverse learning contexts goes well beyond the training sessions usually associated with e-learning (see Chapter 3).

Being threatened from above and challenged from below leaves the teacher in the middle of the sandwich. Trying to please learners and administrators is not an easy task.

Learners like 'free' time and flexible spaces, and administrators look for ordered time—timetables and regularity. Nevertheless, the teacher is the one person who interprets the curriculum and who chooses equipment for the learning spaces, including when and how it will be used. This is a powerful position that deserves the highest professional learning support and guidance. Acceptance of the strength of this role is a starting point for bridge building to successful e-learning outcomes. Our book attempts to provide teachers with a set of ideas and principles that can assist this process of identity building in ways that are encouraging, supportive and enjoyable.

## Life-changing times—the intergenerational turn

Grandparents are having the time of their lives with new technologies—perhaps a wild claim, but more a reflection of the 'grey power' revolution leading the way to renewed relationships between the generations. Adult education classes and school-age children teaching the elderly in their retirement villages and nursing homes are helping to build better intergenerational understanding. For school teachers, the grey power asset is only just being discovered. Our hunch is that within a decade there will be a substantial rise in the presence of retirees in schools offering voluntary service as a support group for teachers and their communities of learners. More than previous generations, many retirees are mobile, energetic and financially self-supporting. Better educated than their parents, they also have the time to spare (if they so choose) to learn about new technologies for themselves. Alternatively, life experience usually has taught our older citizens an array of shrewd techniques to use in finding how to gain new knowledge from the young 'techno-head' on the block. Adults and teachers with teenage children or grandchildren are in the lucky zone of inbuilt 'help-desks'.

We can smile at this observation or reflect on the social capital that can flow between the partners. The young find themselves in a helping relationship with their older family members. This can be motivating and affirming of self-confidence. At the same time, the willingness of the older person to listen to the young person is an inspired way to 'pilot' the journey forward into the future. Like safe flying, the need for team work and sharing knowledge is an imperative. So too, is a willingness for all parties to accept the 'givens' of the technologies—that is, the basic working knowledge for the communication tools to work (see Chapter 7).

## Energising spaces—exercising judgement

There is a quiet renaissance taking place in homes, neighbourhood spaces and local communities. With all the digital tools available, people can connect with the global community every day and from the comfort of home. There is no need to go to the movies or concerts in cold and uncomfortable spaces—these can be part of the home theatre and entertainment centre all at the flick of a switch. More than that, we can use the Internet

to publish our latest piece of inspired writing through podcasts, zines, weblogs, chat, bulletin board, etc. If that is not enough, we can also talk to 'connected' family and friends anywhere in the world through the Net's voice-recognition functions.

All that there is on offer for private individuals in mainstream society at reasonably affordable prices is gobsmacking! So many opportunities … if used wisely and responsibly. Locating those boundaries is one of the greatest problems to solve. Like learning to drive a car, we can learn how to use new technologies if we have the time. But experienced drivers will say that *how* you drive relies on judgement. In addition to life's experience and trial-and-error guidance, we must be willing to learn from experienced others. This example can also be used to illustrate the ebbs and flows in our need to know more—the basics need practice in repetitive movements and actions. A familiar metaphor such as learning to drive a car can help in demystifying the process and understanding the complexities of ever-changing sets of interacting variables such as those that pervade all learning environments.

Our view is that knowledge, learning and action cannot be meaningfully separated. That is, in a complex endeavour such as incorporating the use of ICTs into teaching and learning there is neither a unique nor a specific strategy or method for achieving a particular outcome. What is valid in one situation may be irrelevant in another. Moment-by-moment judgements are required in order to achieve progress. To the extent that this book is able to make a contribution, it will promote learning that enables its readers to construct and reconstruct their own understandings of:

- their lived experience in relation to the use of ICT
- the possibilities and opportunities for improvement and change
- the constraints currently limiting initiatives.

In learning to use new technologies in educational environments we see professional learning for practical outcomes as the number one priority. To achieve this outcome there needs to be an ability to interpret the actions required to make the working environment function at local levels—or real places in real contexts. School governance has a key role to play in 'getting things operational' as a first step towards achieving the desired developments. At face value, governance is often associated with plans, budgets, policies and accountability but, although important, these are not ends in themselves. Ultimately they are to support and guide the life and work of the school, all of which is expressed and experienced as activities of various kinds. These issues are more fully explored in Chapter 4.

The series of steps proposed in Part B of this book derives from these principles. There is wisdom in knowing your own place first, next gaining the requisite knowledge for understanding the new technologies, then planning the ICT implementation—but do it all in cooperation with peers and students.

In brief, we can conclude that we live in ever-changing times—sometimes turbulent, but fast and 'alive'. Far from panicking about how to cope as individuals, we see

a remarkable opportunity to help shape the future for the next generation, provided we work with our community to develop the knowledge, understanding and flexible structures for change. The inevitable time lag between curriculum reform at policy levels (Olssen et al. 2004) and school-based policy responses complicates matters. In schools, the need to 'keep up' has become part of the survival ritual. In relation to change and improvement, *Seven steps to ICT integration* has in mind Goldratt's (1999) 'Theory of Constraints'. Taking a holistic approach to organisation change, Goldratt's perspective defines the benefits in this way:

> *The Theory of Constraints is based on the convergence of cause and effect logic to a core problem; the alignment of all local actions to support the 'global' or 'holistic' system solution to this problem and the implementation of a solution—through the only long-term competitive advantage an organisation has*—its people*. Through educating, assisting and developing the understanding of how to focus on critical constraints, exponential improvement is quickly gained.*[1]

Three fundamental questions of the lived experience are posed:

- What to change?
- What to change to in order to achieve an improved future lived experience?
- How to cause the change?

## Summary

This chapter introduces the context for our book. Issues explored include the current realities of living and growing up in a connected digital world. The intergenerational challenges are considered along with some advice on how best to engage young learners in the decision-making processes that govern their learning environments. The challenge for all practitioners is to imagine a world twenty years from today. Seeing the world of the future raises the urgency for educational responses now to prepare the next workplace generation.

***Questions to consider***

1 What interests children today?
2 How do they spend their leisure time?
3 When do children appear most motivated?

1 See http://www.goldratt.co.uk/

# CHAPTER 2
# CAPACITY BUILDING WITH ICTs

Print-based media, film and television do not 'talk back'. Digital technologies do. Therefore, the learning dynamic is different!

## HOW TO 'CONSTRUCT' THE ARCHITECTURE FOR EDUCATIONAL SUCCESS

Just as knowledge is constructed in conversation, so too are the practices by which a school operates. A logical conclusion is that the development of the school, its ICT practices and the school itself are also constructed in similar conversations. On this basis, school development can be viewed as a 'process of construction', and the resulting development or changes as 'a construction'. Leading this process may be likened to the role of the 'architect' that encompasses the following:

- Consultation with a range of stakeholders, especially the 'owners' and those who have to undertake the 'construction', to identify needs and possibilities
- Evaluation of the situation in an 'on-site inspection' to identify the actual possibilities and constraints
- Provision of plans that:
  - consider the needs and possibilities
  - match the construction to the site—physically, historically, culturally and financially
  - guide the activities of those undertaking the development

- Monitoring and advising on the development activities as they are being undertaken
- Contribution to the achievement of desirable outcomes 'within budget'.

The use of this metaphor is consistent with the notion that generic answers cannot be provided and that those responsible must engage in a collaborative process of discovery and problem solving in order to achieve sustainable development of the school and its practices. A shared construct of ICT is central to the effectiveness for a whole-school approach. Agreements regarding the use of ICT are often compromised by differences in the construct of ICT held by those who are 'in agreement'. Consider the following.

Having two to five computers connected to the Internet may not be uncommon in many classrooms nowadays, but what this means varies considerably from school to school and class to class. In one class, each computer is understood as a single-user device to be mastered; in a neighbouring class the computers are understood as a set of shared tools enabling access to a wide range of resources and services; further along the corridor the computers are understood as the means for communication, collaboration and creation. Elsewhere in the same school, games are not permitted and it is 'politically incorrect' for anyone to talk about 'playing the computer'. Across the playground in another classroom the computer is seen as a reward or game (motivation), or as a fill-in when other work is completed and the teacher allows students to 'play Encyclopaedia Britannica'. ICT is in use in each of these classrooms observed in recent research, yet the prevailing construct of ICT varies greatly from class to class and teacher to teacher.

Students are not inactive in this regard: students whose ICT at home is state-of-the-art are frequently reluctant to use older, less capable classroom ICT. Similarly, the contrast between students' use of ICT at school and at home often reflects different constructs associated with the different contexts. For example, a Year 4 student was the leading 'game player' in a class in which twelve of the fourteen boys were online game enthusiasts. However, this same boy was very reluctant to use the classroom computers. It appeared that his constructs of ICT and class work were in conflict: for this student, real class work was done on paper, and computers were for play outside of class time. So constructs are also related to other constructs: the boy's unwillingness to use ICT also appears to be related to his constructs of work, class, learning and play. Even choice has an impact, as one student said: 'When we choose, it's fun; when the teacher chooses, it's work.'

In this chapter we outline the different perspectives from the context of who contributes to the ICT educational scene. Most of the observations in this chapter relate to our own school- and classroom-based research.

## Scene 1: Learning, reflection and action in the classroom

The pressure to use ICTs in the classrooms is none too subtle. It comes from students, peers, and the 'system' through curriculum and policy demands. Each pressure group has

a motive, but for the teacher the question is likely to be: What can ICT do in my classroom? Generally teachers look for answers that are couched in terms of learning outcomes for students. Our book works from this premise of enhancing learning outcomes through uses of ICTs that marry with sound pedagogy and recognise that what is true in one school is not always true in all schools. The responses need to be flexible, as the following practicalities illustrate.

Primary school teachers, for example, are often able to stay in the same classroom with the same group of students for most of their teaching week. However, secondary school teachers often move from classroom to classroom and meet many different groups of students throughout a week. These then are very different teaching and learning contexts.

It might be helpful to visit a few such classrooms to see what sorts of success can be found in respect of ICT integration.

For our first example, we meet David, who is a Mathematics teacher in a Western Australian high school. David has been teaching at the school for several years and has taken it upon himself to specialise in the education of the more gifted students in the school. To this end, he has gained permission to equip a specialist Maths classroom, and by a variety of means has accumulated sufficient computers to put a string of eight units along the back wall of his chosen classroom. Naturally, because these computers have come into the room through his personal agency, they are not all of the same make or model and therefore present a varied pattern of screens and keyboards. The rest of the classroom looks as though technology has passed it by, with desks arranged in pairs and wooden chairs behind each one, all facing the front of the room where there is a whiteboard and the teacher's table. When asked how he integrates computers into his teaching, David replied:

> *... at the beginning of the term I planned each of my units of work. For each of the units, I research the Internet for truly interactive mathematical sites that the students can use to deepen their understanding of the concepts involved. For each unit I only find two or three such sites. Then, over the course of the week, each student can usually spend one of the lessons working at the back of the room practising with these interactive modules and gaining another teacher's perspective on the concepts that I want them to learn.*

This combination seems to work very well. David's insistence on the interactive nature of the experiences his students will have on the Internet is very interesting. He is not content to allow students to access a single web page and hopefully read the content and understand it. His insistence is that they should be dynamically engaged in a learning process in which their understandings are challenged and enriched. Through his own efforts, David has created a learning context that suits his style of teaching and one in which the ratio

of working computers to students is fixed. Because he has sequestered a dedicated space within the school boundaries, he is able to control student access to the computers in such a way as to avoid disruption to the normal learning program. Rather than basing student use of ICT on a single application with multiple uses, he has sourced a small number of clearly identified Internet resources to supplement his standard face-to-face teaching. The arrangement appears to suit him, and his students.

Our second example comes from observations of Glenys who teaches in a primary school and who has a background as a statewide expert in the use of ICT. As a primary school teacher, Glenys has a dedicated classroom space, which she uses with the same students most of the teaching week. Since she is the only teacher to use this space, she has felt at liberty to arrange furniture and other items to suit her needs and those of her students. Her own desk, therefore, is virtually indistinguishable from those of her students, except for its slight height and more general coverage of paperwork. Among the papers is a laptop computer and, noticeably along the wall beside it, all the tables also have computers on them. A printer sits in the far corner. As we look around the room we notice that these computers have been carefully situated, shaded from the ample windows at either end of this classroom space. Further on, in an open cupboard doorway we can see shelving carrying up to a dozen more laptop computers. Glenys plans to work so that there are opportunities to use ICT as part of every new learning topic. She also allows students to use computers whenever they feel this is the most appropriate tool for the activity to be undertaken. She tells us that there is a wireless network within the school, and that students are allowed to bring their own computers from home and connect them to access the information resources of the school via the network.

To many observers, Glenys's classroom is ideal. It has space and flexibility, achieves a useful linkage between home and school, but does not dominate the classroom with an excessive amount of technology that may inhibit interpersonal relationships. The classroom is unusual in that it sports so many laptop computers, which are often considered expensive and fragile in a primary context. She evidently has the support of parents and the school to be able to work in such a way, although the area is not particularly affluent.

For the final example we visit Mr Willis's classroom. At the beginning of the day, ten-year-old students arrive in dribs and drabs. They put their bags into boxes, take off their coats and hang them on hooks and saunter into the classroom, generally towards their designated desk. Some stay at the desk, take out an exercise book and start working on a series of standard mathematics exercises. Others skip this spot and move straight to one side of the room where an annex contains eight computers closely nestled on a higher table. Sitting on stools, they look into the computers and quite confidently start using 'Maths-attack', a drill and practice program.

Mr Willis talks about the way in which the students use computers in his classroom. He is quite clear that drill and practice programs are not the best way to use the

technology. However, it serves the purpose of allowing students to become familiar with and confident in the use of the computers in the classroom. Other applications such as the use of PowerPoint that bring together high-class images with ideas for sharing with a large group, are perhaps more powerful.

Here is another teacher who, through his own effort, has accumulated a critical mass of ICT in a classroom and which is not shared with others. From these examples, we can perhaps see the concept of 'ownership' is a crucial one for successful integration of ICT into pedagogical practice. In this sense, the owner is the teacher who has created a particular kind of learning space within the school. This kind of dedicated access to technology overcomes some of the difficulties associated with shared computer laboratories where a student may use a different computer on every visit.

## Scene 2: The global context

The messages in the teachers' responses suggest a high degree of enthusiasm for using innovative teaching and learning approaches in the classroom. The strategies they used are a reminder of the need to work together for co-shared understandings. However, the reality is that these inspirational efforts by teachers as learners with their students are often frustrated by the many stakeholder agendas that drive the day-to-day environments of schooling.

The range of stakeholders and other influential parties is large. Overall, there is widespread agreement that ICT is a curriculum imperative, with few dissenting voices. Expectations and agreements are not simply local; many occur at the national and international levels. The United Nations, OECD and the World Bank are just some of the international organisations advocating for extensive use of ICT in schools. At the national level, systemic initiatives such as curriculum reform and the transition to knowledge economies are paralleled by societal change as ICT becomes the dominant everyday technology in the workplace, homes and many social situations.

Competence with ICT as a requirement for full participation in society is a major theme relating to education and economics. This is closely related to a second theme regarding the impact of ICT: recently introduced ICTs merge and integrate to provide tools that (as they are adopted) reshape mainstream behaviour, perceptions and assumptions; for example, Google Earth. At the same time, the use of ICT (behaviour) is shaped by the purpose, perceptions and assumptions of the users, that is, the construct of 'ICT' adopted—often unconsciously—by users. Such constructs are far from stable as they shape, and are shaped by, emerging technologies.

Decisions about the use of ICT in teaching and learning must be made in the context of rapidly changing purposes and possibilities. Agreeing that competence with ICT is a requirement for full participation in contemporary society is a simple matter. What such a proposition might mean for the real-time practices of everyday teaching and learning

in actual classrooms, schools and communities is far from simple. Gathering resources, making arrangements, promoting engagement and achieving ongoing commitment are even more challenging in the light of rapid social and technological change. The school's development 'architect' has a demanding task.

Not surprisingly, our research shows that constructs associated with ICT and teaching and learning vary enormously from school to school (Robertson et al. 2004). In one school, ICT was deemed to be an electronic device (a computer) that one should know how to operate. In another school, it was a means of rapidly acquiring information from the Internet and producing a document as evidence of learning. In yet another, it was a set of tools and working arrangements for capturing and sharing the lived experiences of people in the school, using collaborative interactive processes to enhance thinking, communicating and relating in order to promote learning and build community within and around the school.

Thus, there is a need for a dynamic local workable—or working—construct of ICT as a starting point for ongoing collaborative development. A certain level of coherence is required for productive conversation about conceptual issues such as: what it is (devices, arrangements, potentials …); what it does (or more accurately, what can be done with it); how that links to learning and the everyday lives of its users; and its potential to assist in enabling the achievement of an improved future.

Such coherence extends beyond conceptual constructs. Understandings and actions are not isolated to individuals, especially in large complex organisations such as schools and their communities. The constructs of ICT, teaching, learning, school, student, teacher, and so on are related in operational frameworks that establish what is acceptable, expected and feasible. These, in turn, shape actions, their meanings and significance, and the value of what is achieved by the actions; each shapes, and is shaped, by the others.

The implications of introducing ICT into classrooms are far from trivial. The introduction of new technology changes the context and the possibilities and hence impacts on the practices, constructs and frameworks—even if the technology is not used, as is largely the case in some classrooms. When technology is used for an activity, it changes the task or what the user is required to do. For example, writing with a pencil is a different task from writing with a word processor, even though the words produced may be the same. Thus the use of a word processor changes the construct of writing as an activity: the product is different, the processes used are different, and the actions involved require different cognitive skills. In this situation, ICT is used for writing operational frameworks that guide the use of ICT *and* the activity of writing. The conclusion is that both need to change to reflect the new dynamic.

Such operational frameworks may be partly captured in plans and policies at various levels (national, system, local school, class and home-school), while other aspects may be verbally agreed upon or simply 'understood' on the basis of implication or tradition. The

relations and interactions between constructs, frameworks, practices (actions) and achievements are dynamic. Therefore, frameworks also need to be dynamic and are likely to be better comprised of heuristics or 'rules of thumb' than detailed plans, policies and regulations.

Problems can arise where parts of an operational framework are not adjusted. For example, students may be required to do most of their writing with word processors; that is, the word processor is substituted for the pen. There may be few implications for older students who can individually manage the changes involved. However, such an operational framework for younger students using poorly configured adult software may well be counter-productive resulting in inefficiency, frustration and confusion if the spelling checker is set to the wrong language version for the user. This latter situation has been observed in a number of classrooms, usually as the result of new computers being left with their default settings.

## Scene 3: The policy imperatives

There may be consensus in the current global context of the knowledge society, but ICT has had a chequered history in national curriculum frameworks. In the USA, it took a concerted effort by an independent body (the International Society for Technology Education) to devise a nationally accepted curriculum model for ICT in schools. Primarily skills based, this has been extended to cover the skills that teachers will need and has been embroidered with exemplars of good practice in a large number of subject-based contexts. In the United Kingdom, ICT has variously appeared in national curriculum documents as a component within the area of design and technology; as an overarching separate subject to be taught in other classrooms; and as a subject in its own right. In Australia, the key learning area of technology incorporated ICT in 1995 (Meredyth et al. 1999). This curriculum profile document put information technology into the design-make-appraise cycle, which was used for all the other technology areas but using data as a raw material—where a carpenter would use wood to fashion a table, the information technologist would use data to create an information system.

Such a variation in approaches is only natural for an emerging new discipline area. As the new discipline emerges, academic institutions come to different accommodations to incorporate it into their teaching frameworks. That there should be no common agreement is to be expected, and it is likely that this situation will persist until there is a sustained period in which little or no change takes place in the discipline area.

But what are the policy imperatives that encourage schools to spend relatively large amounts of money in this new discipline area? The pressures come from decision makers, from parents and from students themselves. Parents say that the world of work increasingly depends on various kinds of information technology and insist their children are taught to cope in this new digital age. Decision makers and politicians reflecting community opinion to achieve election support the same ethos. In Reynolds et al. (2003),

these pressures derive from the rationale that ICT is a common part of modern life, and therefore children need to be inculcated in its practices. A related rationale is the need to train new workers to be familiar with the digital technologies that permeate working life. A final rationale, the pedagogical rationale, sees ICT as a way of improving the general educational opportunities of students in schools.

Teachers individually and collectively have to manage and balance these multiple rationales. They are also beholden to assessment and accountability frameworks within their school, district or sector. When the use of ICT can be seen to increase student learning opportunities related to curriculum outcomes espoused by the school, teachers are likely to be supportive. However, many of them realise that these learning opportunities may be tangential, or excluded from the listed learning outcomes they are expected to achieve with any particular group.

## Scene 4: Professional learning—an 'event', a 'show bag' or 'life-changing'

Traditionally, a high proportion of professional learning related to ICT has been focused on the technology and 'what it can do'. The working arrangements are often of expert–novice nature and workshops are frequently located elsewhere rather than in the place in which the professional learning is applied. These one-off 'events' with their take-home 'show bags' can be useful for introducing awareness of new teaching and learning tools. However, the chance of such events leading to school-based change largely resides in the enthusiasm of individuals and a whole array of complex local issues. Undeniably, the hands-on component of such workshops can make a small and significant difference for individual users with minimal experience and little confidence—we all need opportunities to 'learn'. In the workplace, however, the next step forward is not so easy. Therefore, the everyday classroom context needs to be supported by reliable infrastructure, ongoing IT support, enabling administrations and a culture of support.

How to achieve all these desirable outcomes? The past offers little help in this new age of interactive technologies. Our view is that they do not work well in isolation. By themselves, independent events in each of the identified areas of need are not likely to bring about lasting changes in learning. There is need for holistic approaches based on shared views of the goals and how best to achieve them.

### Situated and action learning: constructivist approaches to pedagogy

Placing the integration of ICTs in schools and learning centre-stage, the Seven Steps offer two complementary research-based views of professional learning. These concepts underpin *situated learning* and *action learning*, and together they contribute to *constructivist pedagogies*.

Situated learning relates to the context in which each person operates. There is no predetermined instructional solution. The subjectivities of all the players in the school or

organisation need to be considered separately. The other component in the proposed equation relates to involvement. Reality-based contexts and active participation go hand in hand in teacher education. Action learning, or the 'doing' of change, usually involves constructing personal pathways in collaboration with colleagues and in relation to situated or local issues. In terms of teacher education, Shulman (1999) summarises this to infer the need to grasp the tacit knowledge of teachers' belief systems. Good teaching is more about good reasoning and wisdom than a prescription-based practice. In other words, there are no recipes—the solutions rely on judgement. Pedagogical reasoning, therefore, comes from comprehending the problem from the knowledge presented and recognising that understanding cannot emerge without the working knowledge to arrive at an informed view.

Next, there is need to apply the knowledge through appropriately selected teaching strategies. Followed up with some form of evaluation of the learning that has taken place, the final phase is perhaps the most important in the sequence. The need for reflection on events and to use these for future planning is part of the process of consolidation and affirming teaching effectiveness. 'Time out' is not just a cooling time for recalcitrant students. These 'free' spaces of time need to be part of the professional learning approach, particularly when introducing new skills and technologies outside the teachers' existing repertoire and comfort zone. This is the time factor for digesting change and adapting to new problems. Recognising our personal coping capacities is a very important dimension of our ability to analyse situations and contribute to effective change.

In the constructivist approach to learning, Norton and Wiburg (2003) summarise the following points in relation to the integration of technology:

- 'Teachers facilitate, students do, present, think, construct.'
- 'Learning is problem centred.'
- 'Concepts are explored using a variety of communication tools.'
- 'Technology connects with the world and the classroom and the classroom to the world.' (p. 35)

Hence, technology is a major player in the ways in which we reflect, plan, act and consolidate.

Each of the Seven Steps should be undertaken as professional learning activities. There are specific organised professional learning initiatives that are part of capacity building in any school. We recommend that, as far as is practicable, such initiatives should be undertaken as situated learning and action learning, and as an ongoing cycle that is based on collaboration and builds capacity at many levels within the life and work of the school. The recommended professional learning cycle includes the transfer of the learning into the in-class practices of the participants. In addition, effective professional learning becomes embedded in the school's practices and programs. In short, such professional learning is not an event but an ongoing capacity building process that is focused on new and improved

teaching and learning practices, facilitated by informed leadership, enabled by collaboration, and acknowledged by the school within which it is undertaken. The cost-effectiveness and sustainability of this latter form of professional learning are very impressive. It is also very much appreciated by the participants since it provides ongoing support.

## FINDING SOLUTIONS THAT WORK

To bring about lasting changes, the DEST publication *Making better connections* (Downes et al. 2001) identifies four levels of capacity building needed in schools. These four levels can be seen as developmental stages that schools may go through when trying to insert the new discipline area into an old curriculum framework. The four levels are as follows:

**1** The training of students to use computers at a skilled technical level.

**2** The emergence of Information Technology as a separate subject discipline in which students receive specialist training related to work and employment possibilities in the field.

**3** The integration of ICT into other subject areas to enhance learning opportunities.

**4** ICT as an agent for broader curriculum reform related to the content, time and place of learning.

It is quite clear that the school's approach to ICT will depend on both its rationale for including computers into student learning activities and the level at which it intends to be active in its own community. Schools can quite easily dedicate the use of computers in large numbers to the first and second levels in the *Making better connections* framework. Such use can exclude other kinds of learning opportunity at higher levels within the framework. Furthermore, where the school is part of a statewide systemic approach, the kinds of uses of ICT may be mandated or strongly driven by system processes that once again monopolise the available equipment. We hope that by using this book in constructive ways within your school, you can work to explore the rationales, determine the appropriate level of engagement, and painlessly make changes towards better uses of ICT in the classroom.

As an early example, consider the ways in which students' homes and their school ICT experiences are interconnected. Ask yourself: If students are freely able to move data between school computers and home computers, using USB data sticks, floppy disks, CD-ROMs or similar information-carrying devices, is schooling one or many places? Are teachers empowered to suggest education activities as homework, which incorporate the use of ICT found in students' homes? Or do equity concerns forbid this kind of consideration? If so, what is being done to address the inequitable distribution of computing resources in students' homes? Does the school itself have a role to play? Often the cyclic turnover of computer equipment at the end of its life creates an opportunity to provide some students with a resource enjoyed by many others.

Each of these forms of capacity building requires judgement, leadership and collaboration, at the heart of which are communities of practice supporting the acquisition and/or development and distribution of knowledge informing (and informed by) experience. As indicated above, such learning is highly situated and underpins the development of human capacity as occurs in social settings such as schools. A challenge arises from these requirements in that an individual school may lack the resources to develop the required communities of practice. Certainly our research has failed to find any teachers who had achieved a high level of ICT use in their classes without being part of a community of practice.

The recommendation from our findings is that all the parties involved in the ICT capacity building process need to take the lived experience of those involved seriously, acknowledging both costs and benefits, and resolving the tensions involved creatively and for the benefit of all concerned. This will include collaboratively building on from what is already working well and identifying the resources and opportunities that are encountered along the way: development is a journey involving both specific and general movement. The tasks include particular management decisions, such as those involved in the acquisition and deployment of material resources. In addition, there are subtle but significant social achievements to be realised: building the culture to recognise and support changed practices, roles and working relationships that are able to utilise the contributions of the individuals and communities of practice involved. Schools that report and demonstrate significant achievements with ICT have first made significant gains in these cultural aspects of the life and work of schools. For example, where ICT support people are part of the staff learning how to take full advantage of the opportunities made possible by ICT, more is achieved at lower cost. Equipment is likely to be well cared for; astute decisions are made about acquisition and replacement; the technology matches the practices; the practices make better use of the available technology; and professional learning is ongoing in the midst of everyday activity at minimal cost. The traditional alternative of the separate, somewhat isolated, expert solving technical problems is much less cost effective.

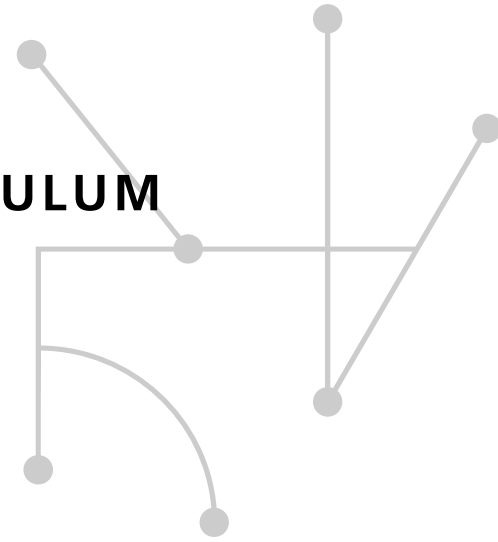
## SUMMARY

Making lasting changes in educational contexts is complex. There is nothing new in this observation. What is new is the dynamic of ICT and learning. Knowing how to make this new dynamic work in learning requires reflection from all interested parties. ICT tools are different from other teaching and learning tools. Unlike books, film and traditional learning mediums, digital technologies are interactive. Teachers can no longer work alone in isolation from other 'experts'. This changes both the way we learn and the context through which we learn. Understanding this needs to start from the situated context, with all stakeholder parties involved in the construction of activity.

***Questions for discussion***

1 How would you rate your personal ICT skills?
2 Who helps you when you have a related problem?
3 What frustrates you most?
4 How do you 'fix it'?
5 How could your context be improved?

# CHAPTER 3
# POLICIES AND CURRICULUM FRAMEWORKS



## MANY FRAMEWORKS

There are numerous frameworks covering and linking various aspects of ICT and its uses, teaching and learning, the curriculum and schooling. Each one has the potential to contribute to the work of the school development 'architect'. This chapter introduces a range of such frameworks, some of which have been formally published, and others that emerged in the course of the research undertaken by the authors. Examples are: frameworks covering levels of ICT use (Downes et al. 2001, p. 2); curriculum reform and the general ability framework (Seaton 2002); key information technology outcomes (Fluck 1998); concerns-based adoption model (Griffin & Christensen 1999); stages of adoption of ICT—Apple classrooms of tomorrow (Dwyer 1994).

Frameworks that help us organise learning with, through or about ICT are useful, as are frameworks that guide us to a new level of technology use. However, there is also the warning that a framework that is reasonable and coherent in its own right may not be reasonable and coherent in certain situations. Indeed, the Seven Steps is one such framework relating school development and ICT. Each school situation has its own culture, history, resources and commitments. Every framework is either derived with a certain range of situations in mind, or emerges from a particular set of circumstances. In terms of the architecture metaphor, no construction and construction methods are suitable for all possible sites, all possible materials, all possible climates and all possible budgets. The same is true for all frameworks, even including the Seven Steps. So the school development 'architect' needs to be discerning and astute in relation to the ambit claims so often made on behalf of ICT. Yet perhaps one of the most significant and creative human activities is to adapt a

framework from one situation so that it is useful in another, quite different, situation. The authors sincerely hope that this book is used for such a purpose.

The class or school does not completely define the situation to be addressed. Schools and teachers are often part of larger education systems that take initiatives in relation to school development in general and the use of ICT in particular. One common strategy used by school systems is to specify certain learning content, activities and/or outcomes in a curriculum framework or some other policy arrangement. The impact on coherence is uncertain since it is possible that curriculum requirements displace pedagogy as the driving rationale for using computers, and create a 'double bind' for teachers if the curriculum requirements are in conflict with the teacher's pedagogical judgements of the situation at hand. Similarly, assessment requirements can displace pedagogy, creating the same kind of 'double bind'. In such situations teachers are expected to use ICT in pedagogical situations for what are really curriculum or assessment purposes. Just as one outcome may have several causes, so several collaborative resolutions of such tensions may be possible and required.

One such possibility relates to the collaboration between home and school through the use of ICT. Notwithstanding some inherent tensions, such as equity in the absence of all students having ready access to ICT outside the school, ICT has the potential to enable students and their families to be better informed about the school, class programs, events and so on, and also to share information in support of the student. There is also potential for students to learn 'any time, any place', and to undertake group tasks without being in the actual presence of their team members. The Seven Steps are useful to those schools interested in pursuing these possibilities.

## INFRASTRUCTURE DEVELOPMENTS

Australia has an impressive record of providing computer equipment in schools. Because the states and territories have constitutional authority over education, each legislative area has taken its own approach towards the provision of ICT in classrooms. As with many other countries, the first indicator of success in this regard was the ratio of students to each computer. In the middle of the first decade of the twenty-first century, this ratio around Australia varies from about ten students per computer in some primary schools to about 4.5 students per computer in other areas. Of course, as the field matures there has been interest in other indicators of provision. For instance, in early 2000 some states were recording the number of Pentium class computers in each school. This was a measure of the quality of each workstation. A more recent approach has been to give the age profile of the computer fleet in schools, and in some cases adopting an end-of-life policy that retires computers from use when they have completed about four years of service. Such a policy aims to ensure all the equipment is kept in reasonably good operating condition, and the hardware does not fall too far behind the expectations for current operating

systems and newly developed software. Other aspects that can now be measured include the provision of networking infrastructure, either through category 5 ethernet cables or the increasing trend towards high-bandwidth wireless or radio networks.

On a global scale, Australia fares reasonably well in the provision of such ICT equipment. The United Nations has shown that computer availability in each country is highly congruent with affluence. And so it is not surprising that Australia ranks highly or in the middle of the range. An interesting comparison is to contrast the level of provision in schools with the level of provision in students' homes. The Australian Bureau of Statistics (ABS) can help in this regard. Generally, over the ten years from 1995 to 2005, computers in Australian homes grew from relatively insignificant to being widely pervasive. This represents a natural curve for the dissemination of innovations (Rogers 2005). The ABS figures show that over this period of infiltration into homes, families with children under the age of fifteen have acquired computers at a higher rate than the rest of the country, with 84 per cent ownership compared with 60 per cent of households without children (ABS 2005, p. 7). This is a strong indicator that parents believe computers can benefit their children. It may be speculated that this belief is related to the idea that computers will improve the overall welfare of children, and this can probably include their educational attainment. However, as stated later in this chapter, the linkage between educational attainment and home computer use has not often been developed by school systems.

## Social developments

Studies of the social effects of new technologies in schools have described slow changes in the attitudes of teachers towards students using computers (Loveless & Ellis 2001). In 1990, teachers expressed a great deal of fear about social exclusion if students were allowed to use computers at school. The typical computer-using learner was described as an adolescent male, often with poor social skills, who preferred to use a computer rather than play with friends in the school playground. Over time, as computers have become more widespread, the computer has become an object of common interest among young people (OECD 2001b). By 1997, teachers were describing the playground comprising various groups among which individuals would flow from time to time. The groups included the students who were interested in fashion and appearance; those whose main focus was sport; groups interested in skateboards and rollerblading; and finally the 'geek gang' where the main common interest related to computers or their use.

## The teacher's view

The way in which teachers represent computers can be highly influential upon the expectations of students. One of the authors of this book had the privilege to talk to students in a special needs class about their use of computers outside lesson times. The students were very excited about this non-curriculum use of a highly motivational tool. When asked

about the kinds of activities they indulged in when allowed to during lunch and other free times, their response was along the lines of 'we are allowed to play games'. When questioned further about the kinds of games they were allowed to play, they proceeded to list a variety of educational software such as the Encyclopaedia Britannica, SpeedMaths and other logic-solving puzzles. Obviously this teacher had decided that the students were to be encouraged to interact with a computer in a variety of ways, and by typifying these examples as games he had managed to open up a large range of learning opportunities that the students may not otherwise have had.

In the converse way, other teachers have particular views about the utility of the computer, which can be explored through their classroom use. The classic example is of the primary school student who has successfully crafted a creative story and has laboured hard to present this in his or her very best handwriting. We have to ask ourselves, what about the learner's reaction when the teacher congratulates the student and asks if he or she would like to 'type it up on the computer'. The student may see this as a just reward for hard work done well. Alternatively, the student may perceive this as repetitive and pointless, because perhaps the most useful attribute of the computer is its capacity to allow the seamless revision of text during the creation process. From an evaluative point of view, we have to question the teacher's judgement. Is the use of the computer a scarce reward for favourable activity, or is it an equal entitlement for each student, irrespective of academic or other excellent behaviour?

In many ways the teacher's choice may be constrained by the availability of equipment. In our research we have encountered classrooms where the standard number of four computers were available for about thirty students. However, in these days of inclusive practices, it is highly likely that one of the students in the classroom will have a medical need to use a keyboard rather than a pen or pencil. This reduces the availability to three computers for the rest of the class—a 25 per cent reduction. Interestingly, we are getting reports of some students who by selective behaviour refuse to use a pen or pencil to create text. This is an interesting development, which we speculate may directly reflect parental attitudes or perhaps beliefs acquired in other ways from home. For instance, if a learner has experienced early success in writing through the use of a word processor prior to entering the school system, then it is unlikely that this student will willingly return to an earlier stage of development as would be required by the kinaesthetic skills of handwriting. Given the combination of two such students in a standard classroom, the availability of ICT to the remaining learners has now been decreased to two of the original four computers.

So the choice between identifying the computer as a reward or as a general entitlement with equal access for all students is masked by these other factors such as availability and reliability.

## Links between home and school

We have earlier described the way in which home accessibility to computers and the Internet has far outstripped availability in schools. Recent surveys (OECD 2002) have shown that this ratio can be as great as seven or eight times. That is, students in the class generally have seven or eight times more access to computers outside school than they do in the classroom. Moreover, it must be understood that the access they have outside school is very often unfettered by the need to share with the similar number of peers and it is relatively unconstricted in duration; for instance, the lunch bell is unlikely to ring when you are at home in the evening or during the weekend.

The reaction of teachers to this situation has been interesting to observe. In the 1990s, teachers would rarely refer to students' home computers, on the basis that they were relatively rare and could be seen as elitist. Over the past decade, the percentage of students with home access slowly crossed the 50 per cent mark between the years 2000 and 2001 (ABS 2005, p. 7). At the same time, educational administrators as recently as 2004 were unable to identify the proportion of schools in high needs areas where this had not been achieved and therefore were reluctant to introduce general policies relating classroom practice to homework. Teachers themselves have been found to generally underestimate the proportion of students in their classes with home access by between 10 and 20 per cent (Robertson et al. 2006). Even when it was clear to teachers that more than 50 per cent of their students had home access, they were still able to identify the remainder without computers at home as being disadvantaged by any suggestion that the home ICT be included into general classroom procedures. This is somewhat at odds with policies that have evolved in relation to books. It is common for Australian schools to have libraries from which students are encouraged, and often required, to borrow a book each week to take home and read. It must be admitted that computers are much more expensive, but no parallel activity has generally been observed to try to develop the home-processing capacity for all students. Given this situation, it only takes a class to have one student who does not have a home computer for teachers to legitimately feel that they should not require the use of a home computer or rely on it in their teaching practice.

A variety of techniques can be used to link schools and homes through the use of information technology. One way is to provide online learning spaces that are accessible through the Internet. Some teachers are trying this, but until *The Learning Federation* online learning objects become much more generally available and understood, this requires quite intense preparation and collaborative effort by schools (see http://www.thelearningfederation.edu.au). Another technique is to consider the use of handheld computers that fulfil the dual function of providing individual computer access at school and at home, and also provide a method for transporting data between the two locations to

facilitate continued work beyond the school (Ray et al. 2000). Some schools have adopted laptop or notebook policies to provide a similar kind of capacity (Oldknow 2001). Two distinct forms of this policy have been seen. The first form is individually very expensive and requires each family to purchase a computer for the sole use of each student. Another model being tried in the Australian state of Victoria is based on the purchase of a bank of computers for general use by the class whenever they are in school, and with a limited capacity for each student to take a computer home on alternate weekends. We have noted that the incidence of computer malfunctions and necessary repairs has been far lower in the former model.

## POLICY INTO PRACTICE

The institutional infrastructural decisions are shaped by the contextual policy frameworks. This section is designed to provide an overview of some international frameworks, and a particular insight into those within Australia. As we will see later in the book, the alignment of policies and practices is particularly important; and in an environment where the underlying technology is rapidly evolving, there is considerable mobility required to maintain this relationship.

### ICT policy in the United States

The federated nature of states in the US has meant curriculum conceptualisation for ICT has not come about purely through governmental discussions. A teachers' association, the International Society for Technology in Education (ISTE), was funded to cooperatively develop guiding documents for students and teachers:

- National Educational Technology Standards—Students (NETS*S), June 1998
- National Educational Technology Standards—Teachers (NETS*T), June 2000
- National Educational Technology Standards—Administrators (NETS*A), November 2001

It could be argued that these frameworks express a lowest common denominator, and some would view them as essentially process-based curriculum guides. Whatever the validity of such an argument, ISTE claims that 'more than 90 percent of U.S. states adopted, adapted, or referenced ISTE's NETS in state department of education documents' (http://www.iste.org/Template.cfm?Section=NETS). Table 3.1 summarises the sections of NETS*S.

An additional framework has been supplied by the National Council for the Accreditation of Teacher Education (NCATE) for the accreditation of pre-service teacher education. This has three main sections:

**A** Basic Computer/Technology Operations and Concepts

**B** Personal and Professional Use of Technology

**C** Application of Technology in Instruction

International Society for Technology in Education (ISTE), 1996

*Table 3.1 Main sections of National Educational Technology Standards for Students (NETS*S)*

| | |
|---|---|
| **Basic operations and concepts** | Students demonstrate a sound understanding of the nature and operation of technology systems.<br>Students are proficient in the use of technology. |
| **Social, ethical and human issues** | Students understand the ethical, cultural and societal issues related to technology.<br>Students practise responsible use of technology systems, information and software.<br>Students develop positive attitudes towards technology uses that support lifelong learning, collaboration, personal pursuits and productivity. |
| **Technology productivity tools** | Students use technology tools to enhance learning, increase productivity and promote creativity.<br>Students use productivity tools to collaborate in constructing technology-enhanced models, preparing publications and producing other creative works. |
| **Technology communications tools** | Students use telecommunications to collaborate, publish and interact with peers, experts and other audiences.<br>Students use a variety of media and formats to communicate information and ideas effectively to multiple audiences. |
| **Technology research tools** | Students use technology to locate, evaluate and collect information from a variety of sources.<br>Students use technology tools to process data and report results.<br>Students evaluate and select new information resources and technological innovations based on the appropriateness to specific tasks. |
| **Technology problem-solving and decision-making tools** | Students use technology resources for solving problems and making informed decisions.<br>Students employ technology in the development of strategies for solving problems in the real world. |

## ICT policy in the United Kingdom

The UK has used a national curriculum in primary and secondary schools since 1996. Originally ICT was conceived as part of the Technology area, but soon moved into an area of its own in subsequent revisions. By 2003, it had become a core subject (having similar priority with English, Mathematics and Science) and was being taught both by itself and within other subject areas (BBC 2003). ICT learning objectives are exemplified by the areas for Key Stage 3:

- Finding things out
- Developing ideas and making things happen
- Exchanging and sharing information
- Reviewing, modifying and evaluating work as it progresses.

The curriculum is available online, and schemes of work together with activities for learners are also available at the UK Standards website http://www.standards.dfes.gov.uk/. Developments of the learner standards have been made for adult learners, emphasising the importance of ICT for life-long learning. Trainee teachers must pass an ICT competency test before obtaining Qualified Teacher Status. The test provides an assessment of the individual's capacity to operate standard office applications on a computer. Initial teacher training courses must include training to prepare for this test, and also ensure teachers can use ICT in particular subject areas (DfEE 1998).

Further developments are being guided by a transformative eStrategy, which highlights the opportunities afforded by ICT to individualise curriculum (DfES 2005). The eStrategy posits six main ideas to be explored over a decade:

**1** Integrated online information service for all citizens
**2** Integrated online personal support for children and learners
**3** Collaborative approach to transforming teaching and learning
**4** Good-quality training and support package for practitioners
**5** Leadership and development package for organisational capability in ICT
**6** Common digital infrastructure to support transformation and reform

The policy points towards transforming learning and teaching, and notes the need to provide sufficient high-quality digital learning resources and the embedding of e-learning and ICT across the curriculum (see Scrimshaw 2004).

## ICT policy in Australia

Australia does not have a common curriculum for all states and territories, but the 1999 Adelaide Declaration on National Goals for Schooling in the Twenty-first Century (see http://www.mceetya.edu.au/mceetya/nationalgoals/index.htm) did embrace ICT within the area of Technology. This was done by making the concept of 'data' analogous to that of other raw materials used by technologists as inputs to processes to create new

products. Subsequent development has been done by individual states and territories, leading to a plethora of emphases in respect of ICT. National policy development has proceeded under the auspices of the Ministerial Council on Education, Employment and Youth Affairs (MCEETYA) taskforce on ICT in schools, which has provided a policy umbrella entitled 'Learning in an online world: the school education action plan for the information economy' (http://icttaskforce.edna.edu.au/icttaskforce/go). This has been developed with additional advice for educational institutions/organisations on the following:

- Contemporary learning
- Content specifications framework
- Leadership
- Pedagogy
- Bandwidth implementation plan
- Online curriculum content
- Online content strategy
- Learning architecture framework
- Research strategy.

A more curriculum-based focus is being developed in the area of teacher standards for professional development and the national curriculum consistency outcomes. The draft for ICT in the latter sees learning activities with computers considered in these five areas:

- Inquiry with ICT
- Creating with ICT
- Communicating with ICT
- Operating ICT
- Ethics, issues and ICT.

A third initiative at the national level has developed from the benchmark testing of literacy and numeracy skills for school students. This is the piloting of ICT skills tests, initially conducted by the Australian Council for Educational Research. It involved a national sample of Australian students (4000 Year 6 and 4000 Year 10) who participated in a series of tests mostly measuring conceptual understanding of ICT and associated operational skills (Ainley 2005).

Beyond these national activities, curriculum frameworks at the state and territory level appear to walk a tightrope that mediates the use of computers in schools for learning in all areas with specialisations relevant to the information economy. Congruent with this balancing act has been the emergence of outcomes-based curricula, such as the New Basics project in Queensland (Department of Education and the Arts, 2004) and the Essential Learnings Framework in Tasmania (AusTeachers, n.d.), both of which emphasise the use of ICT across a range of learning areas.

The Tasmanian framework not only facilitates the sustained use of ICT in a range of learning areas, but also contains specific guidelines about being information literate. The focus of learning outcomes in this strand is on the way each student understands how to effectively access, interpret, transform, create, communicate, evaluate and manage information in ethical ways, using a range of sources. To do this, the learner needs to know the following:

- Information is valuable: symbolic codes
- Information needs and tools
- Locate and manage information
- Evaluate information
- Design and create information products
- Evaluate information tools, processes and products
- Correct use of information and information tools.

## CONCLUSION

School education inevitably responds to political and social pressures over periods of time. Sometimes change is slow, but in the area of technology, while the underlying scientific discoveries are proceeding at an extremely high rate, new developments can outstrip both legal frameworks and social expectations. David Moursund (2005) distinguishes between amplification or first-order effects of technology, and second-order effects. By first order-effects he means incremental changes, which are individually small in nature. Second-order effects are described as being transformational, and are exemplified by the development of new technologies that make previous methods completely redundant.

It is evident that second-order effects cannot be measured using existing learning outcomes. At this point, ICT becomes a disruptive technology. Decisions need to be made about the structure of curriculum, and the way in which either the technology must serve the curriculum or the curriculum requires change to better suit the needs of students.

This is a useful point at which to review the vision or rationale for using ICT in school education. Hawkridge (1989) suggested that there are three main rationales that are worthy of examination:

- ***social rationale***, reflecting the belief that all students should know about and be familiar with computers as a preparation for active roles in society, and especially to become well-informed citizens;
- ***pedagogical rationale***, which realises the role of computers to improve and enhance teaching and learning;
- ***vocational OR economic rationale***, which is necessary for a society to satisfy its requirement to have skilled technological workers, relating learning to future jobs and careers. This rationale can be divided into two sections: the first describes skills suitable for a wide range of employment; the second

section is more appropriate for information economy activities where the training required is exclusively about information technology, software, hardware and the associated skills.

In conclusion, the rationale and purposes of technology reforms are linked to multiple audiences. Knowing the needs of other partners in the growth cycles of a community is just as important as what happens within the confines of one's own environment. Ultimately the social drivers of society are linked into the same global community. Being better informed on the wider issues is good strategy for success locally.

## SUMMARY

Policies and political statements eventually filter to all levels of the organisation. Knowing how other countries have responded to the steps involved in the integration of ICTs into educational contexts is useful at the local level. Reinventing the wheel is not what smart thinking is about. The ability to take what is known and transcribe that into situated learning is the challenge of sound educational leadership. In the next chapter we consider the pragmatics of turning policy into practice.

***Questions for reflection***

1 In your career, how many 'new' policies have you helped to introduce into schools?
2 Which were the most successful and why?

# CHAPTER 4
# POLICY TO PRACTICE—HOW TO 'DO IT'

*The lifeworld of the school is its heartbeat. This heartbeat is weakened whenever the systemworld determines the lifeworld.*

Sergiovanni 2005b, p. x

*The place to begin school reforms is in the effort to understand the ways that schools actually function, what it is they teach implicitly and explicitly, and how they reward the people who spend so much time of their lives there.*

Eisner 2005, p. 143

These two quotations from educators whose life work has been dedicated to understanding the purposes of schooling seem to capture well the problems faced in the new educational environments. While Sergiovanni's writings come from a background in educational administration, Eisner's concerns stem from the arts and curriculum studies. They may be at opposite ends of the educational spectrum, but underlying each of their messages is a deep concern for humanity and the quality of the human experience. It is worth reflecting on the delicate balance required to make an educational environment work 'with heart'. In the current context of accountability-driven legislation it is very easy for the heartbeat of the organisation to be left behind. Taking the metaphor to its extreme, the worst result can be negative consequences leading to dysfunctional behaviours and struggling performers. Working *with* the heartbeat is like seeking to locate what Eisner identified in his earlier writings as 'connoisseurship'. When the relationship between what is happening in the day-to-day operations of the institution is in harmony with the needs of learners and their teachers, there is a kind of elegance and calm that exudes creative energy and optimism. The environment is enabling.

Managing educational environments to achieve this balanced and enabling state is far from simple. It requires bold thinking and creative solutions to grasp the complexity of education stakeholder needs within the climate of twenty-first century change. Multiple interests are involved—the local community, teachers and learners, government agencies, and societal pressure beyond local and national borders. The integration of ICTs into learning processes is being driven by global forces beyond the scope of school-based decision making. Jobs and computers go hand in hand, and so must education and ICTs. These are

the market force rules shaping our twenty-first-century lives. However, on the ground in the schools and local neighbourhoods, life is about making sense of this whole new way of living—not so much in terms of how we live our lives, but in the teaching and learning spaces where the development of understandings and meaning making takes place.

Hence, before the elegant outcomes, as described by Eisner, much thinking and knowledge acquisition are needed. In our view there are three critical steps for educational leaders to undertake *prior* to initiating change. They are *recognition and reflection*, *assessment of opportunities* and *action and governance*.

## PREPARATION FOR CHANGE

### Recognition and reflection

Recognition and reflection are much more than considering that changes are needed. The OECD report (2001a) on ICT in schools states that: 'Compared with many other sectors, education has been slow to make changes in organisational practice and culture through the adoption of ICT' (pp. 30–31). The questions that require answering have a much less specific reference. They relate more broadly to the organisational vision, and are likely to be embedded in the working lives of teachers, schools and the local community. Policy statements can be a major catalyst. However, the text on the policy paper does not provide a prescription for practice. Management of change requires taking the policy and translating its intentions into practice. The method of making these organisational adjustments needs to start at a less lofty level; that is, starting with some reflection on current practices, beliefs and values. Figure 4.1 provides a useful way of thinking through the reflection process. We need to consider that all individuals are likely to have their set of personal beliefs and a unique knowledge base, and a set of skills and perceived competence for

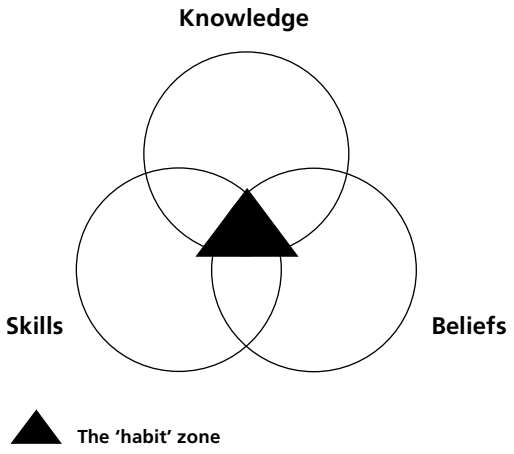



***Figure 4.1 Identifying the cognitive habits that shape our activity***

tasks at hand. The point at which personal beliefs intersect with working knowledge and related skills is the *habit* zone. Given the nature of habits they can reflect unconscious behaviours. Driving a car without conscious realisation of the journey is a good illustration of the idea of habitual behaviour. Personal habits help us to simplify daily life and go about our business with a sense of self-efficacy. Tackling a task for the first time or developing a new skill is likely to highlight the converse; for example, using a computer mouse for the first time. Acute levels of self-awareness and discomfort are not uncommon and can mask our actual or potential competence to do that task. The need to get beyond this point is paramount for any real progress with the new skill being learnt.

Three issues flow from this realisation. First is the need to start with self, and acknowledge to ourselves our own habits—self-revelation is not easy and we may need to seek help for this part of the process. An associated step should be a willingness to reveal our habits; to be prepared for external scrutiny and acknowledge the need for personal life changes. Finally, that which we see in self is also within all of us; everyone has habits and they will all be different. A self-examination process by all members of the organisation would seem to be the logical first step in the process of introducing organisational change. An exchange of ideas through a group work process that targets the school or organisational 'habits' may provide a lead into the mindsets of individual employees. The advantage of this proposed group approach is that it ever so slightly removes the individual from the potential 'furnace' of self-criticism from colleagues. Hence, at the beginning of contemplating an expansion of ICT integration, professional learning is crucial for its successful integration into the day-to-day working life. The message we strive to convey is that this needs to be achieved in a collaborative or constructivist manner where people are enabled to develop mutual trust and acceptance of each other's strengths and weaknesses.

Table 4.1 highlights some of the perceived differences between new and old styles of teaching and learning. E-learning is fundamentally 'next'-generational thinking. Pedagogical principles rely on understanding and embracing the concepts of personalised learning (Becta 2006). Learning happens in an active environment where ideas are exchanged and meanings clarified, unlike the old ways of learning where the teacher as expert assumes that students acquire knowledge and can be tested for this through tests and examinations.

Persisting with 'old'-generational thinking in the current global context is risky. Rather than leading to critical literacies that can facilitate interpretation and analysis of knowledge, there is the risk of rote memorisation and shallow, easily forgotten facts as the take-away outcome of education. 'Learners without frontiers' (Buckingham et al. 2001) describes new age learning: learning happens by 'doing' and being involved in events occurring in the real world of 'now' and/or making the relevant connections. Stale knowledge delivered in outdated delivery modes is not the best tonic for active minds to become engaged.

***Table 4.1 A comparison of 'old' and 'new' thinking***

| NEXT-GENERATIONAL THINKING (CONSTRUCTIVIST) | OLD-GENERATIONAL THINKING (DELINEATED) |
|---|---|
| • People create meanings in different ways—personal systems | • All do it the same way—prescriptive learning, often by rote memorisation |
| • Not all in the same place—personalised mobile spaces such as iPods, handhelds | • All in the same place—process: logical order, linear, rules, control |
| • Not all doing it at the same time—real time, interactive, vibrant | • Same time—seeking order (systems); external frame of reference: rational, rigid, control |
| • Not all using the same tools; e.g. weblogs, chat, bulletin boards, zines | • Same tools for all—print and auditory focus |
| • Leading to the different outcomes | • Similar outcomes intended |
| • Knowledge sharing | • Knowledge acquisition |

Robertson et al. 2004

This is well illustrated in our research observations of learning outcomes related to the use of online interactive learning objects. Where students perceive they can interact in an environment built on negotiated rules and feel they are entrusted by their adult teachers and mentors, the effect is learning pitched more closely to the desired outcomes of understanding. We found that students are more open when they sense the level of maturity in their co-learners involved in the shared online learning spaces. Their identities are more readily revealed and there is a sense of seeing the task as genuine and significant. When this state of revealed identity can take place, the capacity for transferral of the learning to other contexts seems more likely. However, the levels of engagement are less likely to lead to 'deep' learning when the learners feel they are being watched or scrutinised for wrongdoing. The capacity to relax and engage with the task suffers and the response levels from tests reflect this, with shallowness of meaning more akin to learning facts by rote memorisation (see Figure 4.2). 'Shallow' learners were more disposed to using pseudonyms, as if revealing their personal identity might be a display of ignorance.

## Assessment of opportunities

Assessment is the data-gathering exercise needed to identify the starting points. An analysis of strengths, weaknesses, opportunities and threats (SWOT) can help start the process. However, even before the SWOT can take place, some personal reflection is needed. To

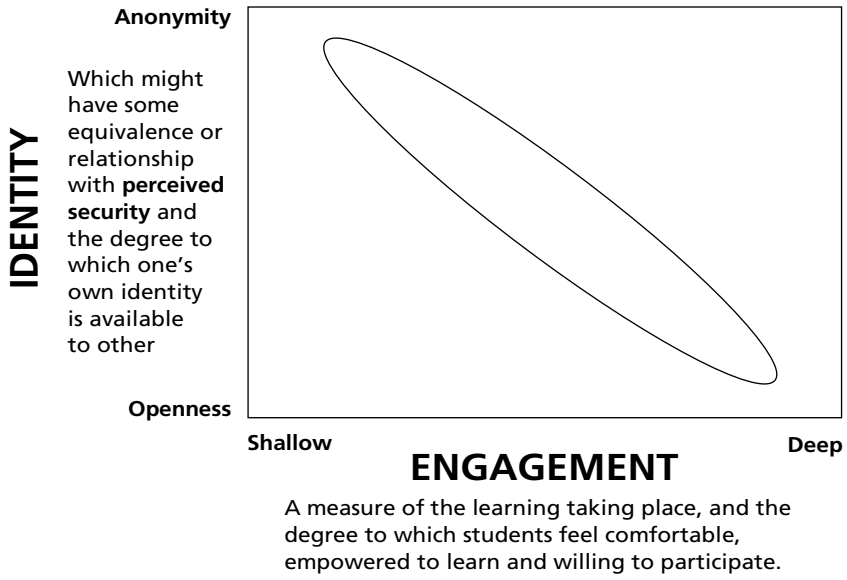



***Figure 4.2 Preliminary relationships for online learning experiences (refer: Robertson & Fluck 2004a)***

spearhead a change process we need to first admit that we have personal predilections that are not necessarily the same as our colleagues. Our capacity to seek the truth relies in part on our ability to take a step back from personal views to fully comprehend the subjectivities of all the participants in the organisation. There is ample research evidence to support the view that the many lenses through which policy can be viewed are a potential cause of organisational friction, anxiety and pessimism. Assuming one of the additional factors in sustained responses is a sense of shared optimism, all these potential negative forces require careful massaging to lead to the desired outcomes. The leadership style of those entrusted with the implementation of the new requirements is likely to be a critical success factor for effective change from the traditional non-digital school spaces to being fully wired and connected.

A practical way of understanding the process is to consider the principal purpose of the teacher's day-to-day activity. The teacher is employed to teach and enable learners to learn. Given a curriculum statement, the teacher must first of all ensure the actual content knowledge is mastered. Next, there is need to decide on the teaching process that will lead to the appropriate learning outcomes. The pedagogical approach required is one that engages learners in the relevant ideas and also motivates them to remain on task. At the end of this learning 'action' period, a formal assessment process will provide evidence of learner achievements and feedback to the teacher on the effectiveness of the process. In this sense, 'outcomes' are facilitated and validated. The teacher provides the scaffolding in the Vygotskian tradition within the 'Zone of Proximal Development' (1986).

If the outcomes in the form of learners' outputs show the desired understandings, then the teacher can derive some satisfaction of having completed a reasonable job. However, if the learning outcomes are not as predicted or hoped for, there is need for a renewed process of reflection. The question then is whether the interpretive lens used by the teacher was appropriate for building the necessary bridge towards understanding. As illustrated in Figure 4.3, the process has multiple variables and these have a layering effect with each additional 'player in the system'. Hence a school with twenty classrooms will have twenty different interpretations and applications of the learning bridge. In part, this will be due to the teachers' different teaching and learning styles; in part, the outcome will be determined by the aspirations and readiness of the learners in the class.

The benefits of this metaphor of building a bridge are instructive. Unless the construction is done by some amazing feat of futuristic engineering, we usually consider a bridge being built from both ends of the gap to be covered. Translated to educational contexts, this can mean starting with each learner's prior knowledge and experience and motivation for learning. The answers will vary for all individuals. This is one side of the bridge. On the other side are all the externally driven agendas of educational outcomes as they relate to the curriculum and reporting requirements. The teacher, as the labourer who builds the bridge through his or her expertise, also needs to consider the needs of other interests, including parents.

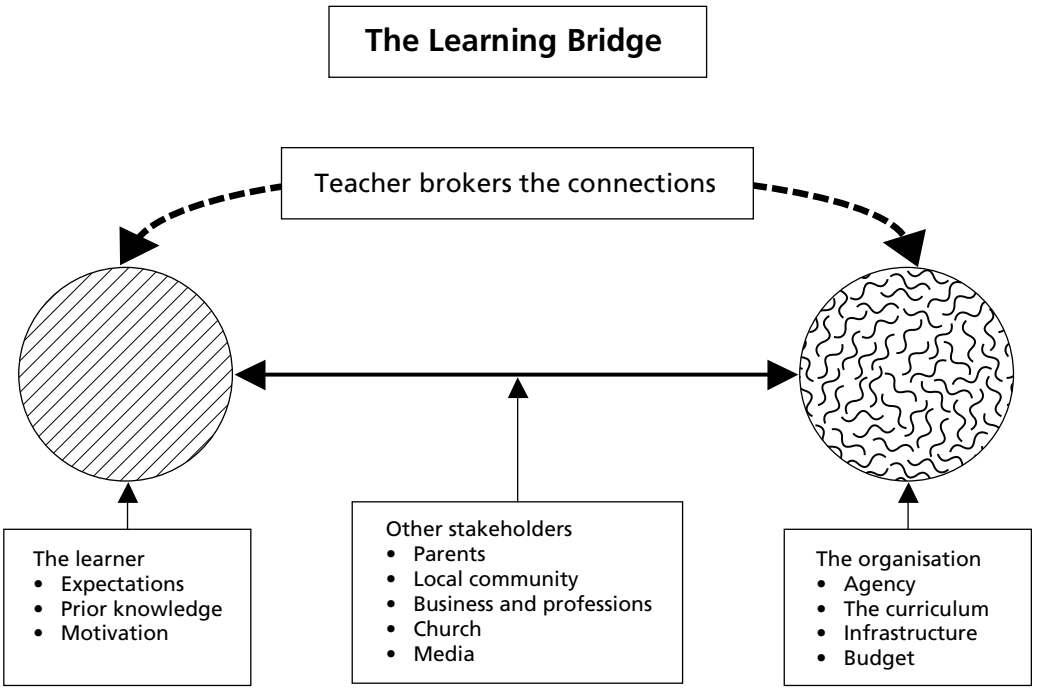



***Figure 4.3 The Learning Bridge***

Similarly, this brokering role can be recognised throughout the layers of the educational system. Educational leaders have responsibilities to build bridges between higher-level organisational requests and the planned action in learning environments. On one side of the bridge are the ministerial ranks of policy developers, and on the other side of the bridge are the practitioners who may have very different and diverse views of education.

The classroom environment as such is a subset of complex interactive variables, replicated throughout the school and its community. Hence, there are likely to be multiple ways of building the bridge to the desired outcomes. All pathways may be legitimate and need to have a 'voice' in the change agenda. In schools, the voices include learners (students), teachers, senior management, support staff (including technicians), and community members (including parents and potential support in industry and commerce, as well as agencies).

Mediating this whole process is the community, especially parents. As reported by the OECD (2001b) in their publication *What schools for the future*: 'It is a truism in education that supportive family environments are critical for students, learning and schools. Yet it is also clear that such beneficial conditions cannot be assumed' (p. 27). Better-educated parents are much more aware of their rights to question. School does not have the 'mystique' it may have once held. Indeed, as the OECD publication reports: 'Parents and others are articulate and demanding. Pressures for greater accountability to render schooling more transparent can be linked inter alia to this factor, as can the problematic standing of teachers as a professional group' (p. 37).

## The politics of change

At the time of writing, the power of 'others' is well illustrated in the Australian education context where curriculum reforms designed to lift educational performance for the twenty-first century are meeting unanticipated obstacles. The federal government's vision for the future was set out in the 2001 paper *Backing Australia's ability*.[1] With considerable financial support for the development of digital learning materials and funds for technology infrastructure, the states have independently developed their curriculum responses. Queensland's *New Basics Project* was the first in the series.[2] Tasmania followed with what has widely been recognised both within Australia and internationally as perhaps the most radical curriculum response. Embracing a futures-oriented world in 2002, the Tasmanian government legislated for the introduction of *Essential Learnings*[3] (ELs). The five Essential Learnings are:

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1 See DEST ministerial papers *Review of Australia's future using education technology* (2004); *Teachers for the 21st century* (2001). Online at http://www.dest.gov.au/sectors/school_education/policy_initiatives_reviews/ *Learning for the knowledge society: An education and training action plan for the information economy* (2000). Online at http://www.dest.gov.au/archive/schools/publications/2000/index.htm

2 See http://education.qld.gov.au/public_media/reports/curriculum-framework/index.html

3 See http://www.education.tas.gov.au/school/educators/curriculum

1. Thinking
2. Communicating
3. Personal futures
4. Social responsibility
5. World futures.

Guiding the process are documents including the *Essential Learnings Framework* (2002), which states: 'The framework will consist of a statement of values and purposes, a description of the learning that is considered as essential, and a set of principles to guide educational practice' (p. 4). Considered to be paramount for preparing young people for the future, the ELs has become the focus of all school-based activity. In the passage of one year the traditional disciplines were removed from their former pedestals and compelled to a secondary role, with their proponents required to rethink discipline responses in the school programs. Disciplines were shifted from centre-stage in the day-to-day organisation of the school timetable and curriculum to a position where the content per se was not the assessable end but how well the student was able to demonstrate learning. Acquisition of content knowledge was no longer the end point—the focus became the process of learning and meaning making.

Visionary in concept and applauded by forward-thinking community leaders, the ELs met opposition from the community of parents. The reporting process seemed so far removed from parental values of what constitutes 'good' schooling that a political backlash almost toppled the whole system, and the minister who implemented the change barely survived re-election. The government received a very clear message regarding the unpopularity of the ELs and their associated reports to parents. The result has been the appointment of a new Minister of Education who has stalled the ELs implementation. Calling 'time out' seemed to be a very shrewd political move. However, it does little to placate the confusion in schools where teachers may have thought the worst was behind them.

So what went wrong? While other states observed with a mixture of admiration and a degree of envy that such a bold change could only happen in a small system, the Tasmanian teaching service got on with the job. The support required to comprehend the enormity of the task of changing from a content focus to a process focus based on learning outcomes was significant. Combined with this was the need for all assessment to take place through an online centrally managed digital repository system. For many of the smaller schools particularly, this looked to be too demanding for the resources on hand. But despite the reservations that it could not be done, and along with the sighs related to extra workloads, the goodwill of practitioners in late 2005 seemed to be emerging triumphant. The resilience of battle-weary teachers seemed sufficient to come to grips with the demands of the ELs. Not so for parents, who as voters demonstrated their lack of confidence through the democratic process.

It seems easy to suggest that the leadership in this change process relied too heavily on public statements and failed to 'listen' to the community disquiet or heed the advice of others such as the OECD reports. In the learning bridge construct, the feedback from media reports and public statement ought to have been sufficient for the government to slow the process—to enable parents to grasp the changes and to provide sufficient education of community members to facilitate the much-needed collaborative spirit. The collaboration at the grassroots of schools was strongly embedded in the development phase and this may have assisted the acceptance of the ELs within schools. However, the community has clearly demonstrated that it did not feel sufficiently part of this process. The management did not build a sufficiently strong structure for the newly engineered edifice to survive. Time will tell if progress has been made and the issues have been resolved in favour of innovation rather than tradition.

The message to be taken from the Tasmanian experience of leading change is that any needs assessment must take a holistic approach and factor in the concerns of all participants in the process. Reporting on Australian Policies for Information and Communication Technologies in Education and Training, Kearns and Grant (2002) describe the 'search for holistic responses [to the integration of ICTs] that foster "seamless interdependence" across educational, social, economic and civic objectives' (p. 10). To achieve this goal requires leaders in classrooms and schools to have knowledge of the 'big picture' goals and the skills to get there. It is interesting to note the response of another Australian state, Victoria, which reflects the 'steady as you go' approach with a more measured timetable. The VELs (Victorian Essential Learnings) allows for a more clearly articulated relationship between the futures-oriented meaning-making processes and the traditional disciplines. The VELs appear more like an 'add-on' rather than a complete overturn of all that is familiar and understood. It will be interesting to track the path of parental influence and impact as the VELs proceed along the implementation path.

## Action and governance

Action that leads to constructive outcomes relies on good governance and enabling leadership. The knowledge society of the twenty-first century relies on rapid changes and responses in teaching. However, 'knowing' this is not enough. There has to be an enabling process for the changes to take place. Leaders can guide this process well but they need the structures and values in place to make it work.

Underpinning the quality of leadership is the quality of the governance. The distinction needs some explanation. In its broadest sense, governance refers to 'a kind of catch-all to refer to any strategy, tactic, process, procedure or programme for controlling, regulating, shaping, mastering or exercising authority over others in a nation, organisation or locality' (Rose 1999, p. 15). In their book *Governing the child in the new millennium,*

Hultqvist and Dahlberg (2001) refer to Deleuze's descriptions of 'societies of control' and 'societies of discipline'. They summarise these to mean:

> *... first, both discipline and control societies are characterised by the self-monitoring gaze; however, in a control society the monitoring is more frequent and continuous than in a disciplinary society. Second, standards in a disciplinary society tend to be fairly centralized and long lasting; however, standards in a control society are more heterogeneous and quickly changing. Finally, a disciplinary society afforded the promise of closure or completion of a project; however, a control society offers no possibility of closure of completion. (p. 135)*

Exploring this notion further in relation to schools is salutary. Traditionally educational institutions have tended to examine outcomes at the end of a long period of teaching. The final examination, as Hultqvist and Dahlberg comment, was a way of bringing closure on a largely self-disciplinary period of self-imposed control. Nowadays, there is 'continuous control' with frequent tests for closer monitoring of activity. Compliance toolboxes and reporting mechanisms have become part of daily life, with educators complaining that they frequently deflect their energies away from the job of teaching. The irony is that this socio-political context of the times comes amid much-needed time 'space' for creating workable responses to the ongoing changes. Today, the control society means that the sanctity of the classroom as the teacher's domain away from the eyes of the outside world is a myth. An open-door policy is inherent in the new 'governmentality'. Foucault (1997) explains this with simplicity: 'To govern, then, means to govern things'. He provides further interpretation by use of an analogy that he relates to a pedagogy: 'Upwards continuity means that a person who wishes to govern the state well must first learn how to govern himself, his goods and his patrimony, after which he will be successful in governing the state' (p. 91).

Acceptance of both the need and how to do governance and governmentality well are part of the challenge facing educational institutions.

Reflecting on her experiences as board member of many Australian schools, Queensland University of Technology Chancellor Dr Hurst (2002) considers that value adding in schools does not come without a great deal of effort. Good governance 'connects with the school [through its leadership roles] and its goals with the general community, increasing understanding, knowledge, commitment and involvement of both'. She adds that good governance requires leaders who can clearly define responsibilities, including regular review processes to ensure ongoing relevance. Good governance can 'change the isolated and insular nature of schools, which is inherent in the way many schools operate'.

Translating this advice to the integration of ICTs in schools, Kearns and Grant (2002) conclude that the 'enabling pillars' are: *learning, technology* and *community*.

Each has a role to play in a dynamic and vibrant school culture. The other ingredient is *partnerships*. Bringing communities together is an acknowledged strength of ICTs—be they in the school, the local school community of parents and stakeholders, or at systems levels and beyond in outreach links to other places associated with global networks. Knowing these communities and being inclusive of their members and their diverse perceptions are integral parts of the process of building partnerships. With the successful mass marketing of affordable computers and Internet connections, issues of equity of access and connection in homes seem to be diminishing in OECD countries. The outcome of community empowerment with ICTs is greater awareness of issues. People in general need more convincing than they may have needed in the past when access to information was restricted and only for the educated mind. Civil libertarians have successfully moved to legislate for rights and responsibilities that demystify many of the legal processes for citizens. Knowledge of rights and responsibilities is more widespread and can be used to build constructive bridges in changing school cultures—provided the governance is enabling.

At the heart of a successful recipe for effective and sustained integration of ICTs in learning cultures is flexibility. When it comes to the leadership style needed, we conclude that the intersection of good governance and enabling leadership is strongly embedded in shared values, shared visions and shared responsibility. Transforming practice needs to be based on the premise that those organisational players who have the power need to be involved at the beginning of the change process. Dissenting voices can be healthy for the review process; however, as the Tasmanian example shows, community dissidents in the fragile period of introducing changes can be destructive and disabling. Part of the leadership task is finding solutions that do not drag out in time and lead to costly blow-out of budgets and workloads. The teacher leads the learning process for learners in the classroom, the school and the community. Building the bridges to attain the goals relies on constructing partnerships and collaborative working relationships. Leading by showing and doing rather than telling as in traditional didactic approaches (at least in western society), is now part of the working culture.

## SUSTAINABLE COMMUNITIES

> *'Many children are less impressed by technology than adults.'*
>
> Grade 4 teacher and school ICT coordinator

This is a pertinent statement for reminding adults of how much there is to learn from young people. Given the opportunity to participate in the learning community, the learners themselves may be our best allies for promoting change. Considered to be the leading proponent in conceptualising learning communities, Etienne Wenger (1998) prescribes four essential components for success.

- The community needs to act as a node for the exchange of information. Unlike a computer database or file, the community is a living and dynamic source of information. Knowledge belongs to the community and can be 'sourced' from any of the members.
- Communities can in turn lead by example. Leading-edge ideas can be explored in this self-mentoring context.
- The community can offer the buffer that individuals may need to nudge them into trying new ideas and creative responses to perceived needs in the school.
- Finally, through its evolution, the community establishes an identity of individuals striving to make a difference to their practice. Active communities do not necessarily seek like-mindedness so much as shared visions. In reality, diversity of views can provide the catalyst for identifying the best strategy for practice.

## Sifting the players up and down

Communities of practice can operate horizontally or vertically. Hence there may be an ICT special-interest group whose membership is largely drawn from practising teachers. This can provide lively support for largely self-directed changes, which can in turn provide a beacon to encourage other colleagues. Rosenberg (2006) would describe these people as the players or 'long-term serious sponsors' (p. 277). Similar to the SWOT analysis, the enthusiasts who try things and adapt their practices represent the strength in what might be a fledgling school community. The next group of 'sponsors' most likely to be encouraged to make changes is described as 'spectators'. They enthusiastically observe from the sidelines and may in time feel sufficiently confident to join the serious players. Less supportive groups are diagnosed 'walking dead' and 'obstructionists'. The latter group can show enthusiasm but are inclined to see barriers at every turn. The challenge for turning obstructive energy into positives can be testing and time consuming for leaders. As Rosenberg comments, obstructionists are often guided by their peers—convincing their peers may be the best strategy they can bring into the community. The 'walking dead' represent the least likely converts, and as Rosenberg concludes are not worth the effort. As he describes 'they have neither the right attitude nor the level of energy needed to be effective sponsors. They just don't care' (p. 277).

While horizontal interest groups such as the special-interest groups are valuable in any school culture, the need to embed re-envisioned pedagogy will require vertical communities. We contend that these groupings need to include the school principal, senior staff, classroom teachers, technical-support person and student representative. The interdependent nature of their roles requires open style leadership that is flexible and responsive to players' needs.

A further prerequisite hinges around developing trust and a sense of genuine concern. Being made aware of concerns in a forum of frank and honest discussion can be

illuminating for all the players. This is a first step in a long process. Sustained change needs to be linked to formal as well as informal practices within the school community. While the catalyst can be a select vertical grouping of enthusiasts, the architect of sustainable communities has to come from leadership that recognises the role of good governance.

## Activity Theory

All of these issues are 'unpacked' in Part B of our book. One of the central concepts applied relates to Activity Theory (Engeström et al. 1999; Leontiev 1978) and its application to educational environments (Jonhassen & Rohrer-Murphy 1999). Complex sets of interacting forces have always been part of the teaching and learning environment (see Stacey et al. 2000). Activity Theory is introduced to provide some insights into the factors that mediate activity. Mediating activity factors include:

- the actors ('subjects' in Activity Theory literature)
- what the activity is intended to achieve ('object')
- the difference that the activity is intended to make ('outcome')
- the principles and regulations that might guide the activity ('rules')
- the social context and other participants involved or related to the activity (the 'community')
- how the activity might be undertaken in terms of who does or contributes what to the completion of the activity ('division of effort').

Each of these factors influences the others to mediate the activity. Conflicts and tensions may exist between the factors because of poor decisions. Similarly, development may introduce conflicts or tensions because original arrangements that worked well previously may be less satisfactory when other factors are changed. Many of the factors mediating an activity are determined initially in governance processes. For example, in almost all schools the governance of ICT tends to focus on the acquisition and deployment of equipment and the provision of support and professional learning. However, in only a small proportion of schools governance also attends to the application of ICT in the life and work of the school; that is, the reason for using ICT and the difference that using ICT is intended to achieve. These latter schools tend to make better and more sustained use of ICT, where staff and students report being able to demonstrate the use of ICT easily and widely in their everyday activity.

## SUMMARY

Our solution for integrating ever-evolving new technologies into learning environments is a stepped process that starts with the local context. The Seven Steps discussed in the chapters that follow reflect the background issues explored in chapters 1–4. By way of leading into Part B, this chapter brings together the policy and agency issues identified in chapters 1, 2 and 3. If you have worked through the preliminary advice offered in this chapter and

delved into some of the background readings related to strategies for understanding 'activity' in the workplace and how to develop 'communities of practice', then you will be well prepared for Part B of our book.

***Questions for discussion***

1 Consider a teacher from whom you have learnt a lot. What were the qualities of that person that best suited you?
2 When you go about learning a new skill, what steps do you take?
3 How would you best describe your personal learning style?

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# PART B
# THE SEVEN STEPS



In this section each of the Seven Steps for the professional learning model that we advocate is outlined in a separate chapter. There is nothing sacred about the number seven, nor is this a parable for 'right' practice. We hope that each chapter will illuminate a different part of the puzzle and provide a reference for ongoing reflection and development of ideas. We see our proposal as the beginning of a conversation that will be ongoing, dynamic and, above all, engaging.

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# CHAPTER 5
# STEP 1: STARTING OUT WITH THEORETICAL UNDERPINNINGS

In Part A, we analysed the ways in which computers are increasingly dominating the everyday life of almost every member of the community. The result of this phenomenon is that schools and workplaces are required to adapt their practices in teaching and learning.

As our research has shown, the first step of the journey is always the most difficult. Successful integration of ICTs requires organisational change (Mulford et al. 2004). Hence, the technology is a small part of a much bigger stack of cultural shifts. Change can be painful, but this can be eased by proper planning and distributed ownership of tasks at hand. From our school-based research involving interviews with hundreds of teachers and school leaders, in some cases a few individuals grasp the potential of new ways of working, at other times it is taken up by a small group. Whatever way an organisation chooses to begin the process, reform and re-direction are facilitated by consensus as a basis for commitment and action. This will involve consultation with stakeholders, staff and clients (Sergiovanni 2005a). The information provided in this chapter provides an overview of supporting theory and examines ways to build communities of practice.

Our Seven Steps model is leading towards a better understanding of the principles underpinning the use of ICT in classrooms including online learning. These principles should help inform the ongoing analysis, design, development and implementation of improved teaching and learning practices involving ICT. These principles are also the key elements of reflective practice, continuous improvement and the development cycle (see Figure 5.1 on page 52).

To this end it is helpful for groups starting out to establish the relationships between their current:

- purposes
- activities
- technology
- experience, and
- learning approaches.

These first steps in the reflective cycles can also be undertaken as a SWOT analysis (see page 37). The point of this exercise is to gather the base data for developing a plan

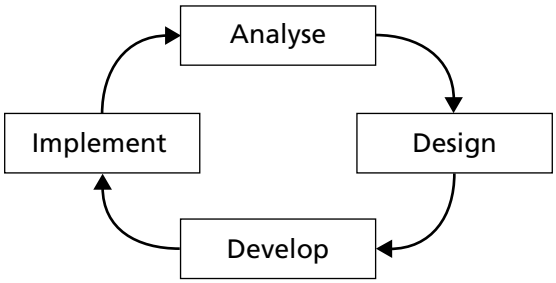


***Figure 5.1 Reflective practice cycle***

of action for the integration of ICTs into the teaching and learning environments. This can be undertaken as a personal exercise or within a small-group context.

The reflective process may, and perhaps should, highlight the need to seek new knowledge concerning learning and teaching theory as well as practical matters related to personal contexts. This may take some time and Step 1 needs to allow for this period. Next, if the reflective process is to proceed within the school context towards whole-school improvement, then there are four groups of people who need to be involved. They are:

- senior management including the school principal
- ICT coordinators
- practitioners
- technical support people.

In our Seven Steps model we assume that these four groups of people are involved in all of the steps. The role of senior management/principal is to initiate and promote possibilities within the school. This includes, for example, allocation of the budget for the purchase of infrastructure and related professional learning. ICT coordinators, on the other hand, are responsible to form teams, and develop team commitments and actions as well as timelines to complete particular tasks.

Commitments and tasks include things such as checking for access and reliability in classrooms and school intranets as well as maintaining the school access to the Internet.

The technical support is vital at this stage and requires support and advice to maximise the effectiveness and efficiency of the proposed project. For instance, having purchased the equipment is the starting point for conversion of a school culture to ICT integration. There needs to be technical back-up to access and install appropriate software and develop relevant digital storage systems. Most importantly, the technical support is needed to nurture and encourage classroom practitioners to use the machinery and see its virtues.

Consider the following scenario. It captures well the juggling that takes place in the daily life of teachers.

**A DAY IN THE LIFE OF A TEACHER**

Suppose you're a high school teacher. You have five classes and a few prep periods. You teach about 100 students a semester. You have papers to grade, homework to assign, tests to prepare. You're told you have to use computers but you also have to follow the curriculum, and what if the two don't match? What if the computer breaks down or there's only one to be shared by all the students in the room? If there's a lab, you need to schedule time to use it. And the technology is neither reliable nor flexible enough for you to count on it. Elementary school teachers have a similar problem. They have fewer students but even more subjects to cover and very little time to prepare (see Figure 5.2).

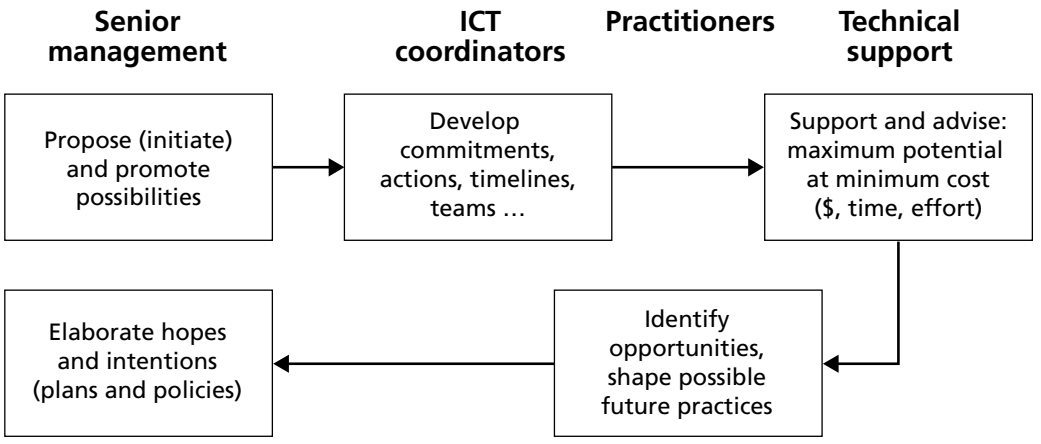


***Figure 5.2 Step 1: Starting out—finding a basis for action and commitment***

Responsibilities of classroom practitioners include the identification of opportunities and the shaping of possible future practices. At the end of the first step, it is the role

of the senior management/principal to elaborate on plans and policies to guarantee a successful start of the process. Larry Cuban (2001) describes the scene in graphic terms.

> *This persistent dream of technology driving school and classroom changes has continually foundered in transforming teaching practices. Although teachers have slowly added a few technologies to their repertoires, techno-reformers have seldom been pleased with either the pace of classroom change or the ways that teachers have used new machines.*[1]

In summary, Step 1 is an initial phase of raising awareness and seeking a shared commitment of colleagues to commence the change process. We advocate this as the preliminary phase towards establishing a community of practice with the capacity for ongoing sustained change. Some development of shared understandings is needed during this phase. Each of the major players needs to be involved. Knowing why, how and what to change in relation to integrating ICTs into learning environments is an iterative process rather than a laid-down prescription. Then the process of change can really begin. The following sections provide ideas for this reflective process and strategies for groups to use during their journeys.

## WHAT HELPS IN STEP 1?

- Knowing the rationale or values and purposes for the use of ICT
- Developing pedagogical connections between teaching and learning
- Knowing about teaching processes
- Defining learning
- Communities of practice: building commitment and making it easier
- Collaboration in all aspects and stages

### Purposes and rationales

In order to commit to particular purposes one needs to be confident about the rationale for such a commitment. Rationales are complex notions to do largely with values and practicalities. Any rationale for the use of ICT in a particular situation must provide a basis for why ICT should be used to help achieve the associated purposes; that is:

- the targets are feasible and desirable for those involved
- activities are undertaken in context
- activities are purposeful
- activities result in experiences that are personally rewarding.

Our research shows that schools report holding a range of rationales for incorporating ICT in their class programs, including one or more of the following common kinds of statements:

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1 See http://www.edtechnot.com/notcuban.html

- Students will need to be able to use ICT
- A (potentially) useful/powerful set of tools
- Access to information (knowledge)
- We (school) need to be seen using ICT
- Basic skills 'similar to literacy and numeracy'
- Strategic to the school's purposes
- System/Community expectations
- 'You don't have too many computers do you?'

The last statement is from a principal quoting a number of parents in the process of enrolling their young children at the school. This is somewhat in contrast with the principal of a very similar school in which the parents had 'pushed' and actively supported the early adoption of ICT. The support came in the form of encouragement, finance, expertise and actions. The implication is that parents too have rationales for their commitment to the incorporation of ICT into class programs.

From the above list, four major rationales for the use of ICT for educational purposes emerge:

**1** Strengths of ICT
- ICT is a potentially useful and powerful set of tools.
- Access to information is crucial for all citizens.

**2** Community expectations
- ICT is part of our world, and
  - the community expects it
  - we (school) need to be seen using it
  - computers in all classrooms are a basic learning tool
  - children do (and show) some of their work using ICT.
- But also 'You don't have too many computers do you?'

**3** Children need ICT
- ICT is part of our world—children need to experience and use it.
  - They need to be able to use ICTs for future employment.
  - ICT skills are basic skills similar to literacy and numeracy.
  - The curriculum should embed ICTs.
  - Classroom practices need to be aligned with common practices such as using word processing and the Internet.

**4** ICT is strategic to the school
- ICT is strategic to school purposes. It underpins the development of practices we will require to provide for learning in the future. This requires:
  - developing staff competence
  - rethinking and redeveloping classroom practices
  - preparing for different teaching and learning arrangements.

In brief, the rationale for using ICTs in schools can no longer provide educational environments with an option. Our daily lives are embedded in computers and schools need to keep up with societal trends. Part of this process is professional leadership to ensure that teachers' professional learning is regularly updated with practical applications within the situated context. Step 1 involves finding out what that local situation is and how to design appropriate pathways to improvements that will enhance learning and support teachers' needs.

## Teaching with ICT—the pedagogical connections

Teaching involves the use of a pedagogy in which the teacher provides two major contributions (see also Figure 5.4):

- Scaffolding: informing the learner's actions/activities
- Mediation: reflecting on and making meaning from the learner's experiences.

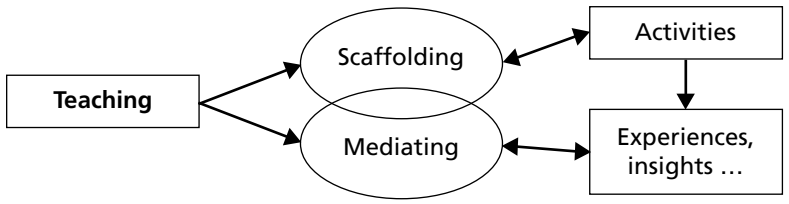



***Figure 5.3 Teaching as scaffolding and mediation***

As Figure 5.3 shows, there is a plane along which the teaching process proceeds. The pathway taken by necessity will involve some interventions and differing mechanisms for the support of learners. Technology of all kinds is used to scaffold activity. Since information and communication are fundamental to scaffolding and mediating learning, ICTs can be used to scaffold some aspects of learning activities. Mediation generally requires some interaction/communication with another party in order to provide enlightening responses to existing knowledge, activity, experiences and products. The communication aspect of ICT may provide the means for mediation in a wide range of circumstances. Some of the features of this process follow, along with examples.

- Explicit teaching: Teaching supports learning in different contexts. Explicit teaching provides specific scaffolding for the learning of particular knowledge. Mediation is provided in this context as required.
- Teaching as facilitation: There is one teaching spectrum—at the other end of the teaching spectrum is facilitation of open-ended learning tasks. The balance between scaffolding and mediation in this context depends on the respective value placed on the products, experiences and knowledge (learning) involved.

- Negotiated study: A negotiated study may be placed at various points along the teaching spectrum depending on what is being 'negotiated'—product, experience and/or knowledge.
- Behaviour management: Scaffolding of behaviour includes rules, agreements, contracts, coaching, prompts, visual measures such as signals, consequences as implemented by the school or teacher, for example, time-out and suspension. Mediation of behaviour includes conferencing, feedback, and improved awareness of the implications including formal and natural consequences. Figure 5.3 'illustrated' the nature of scaffolding and mediation in learning to dance and learning to develop meaning from the experience of dancing. In a more elaborate form, the following model may be helpful: consider the above in terms of the following process outline (see Figure 5.4).

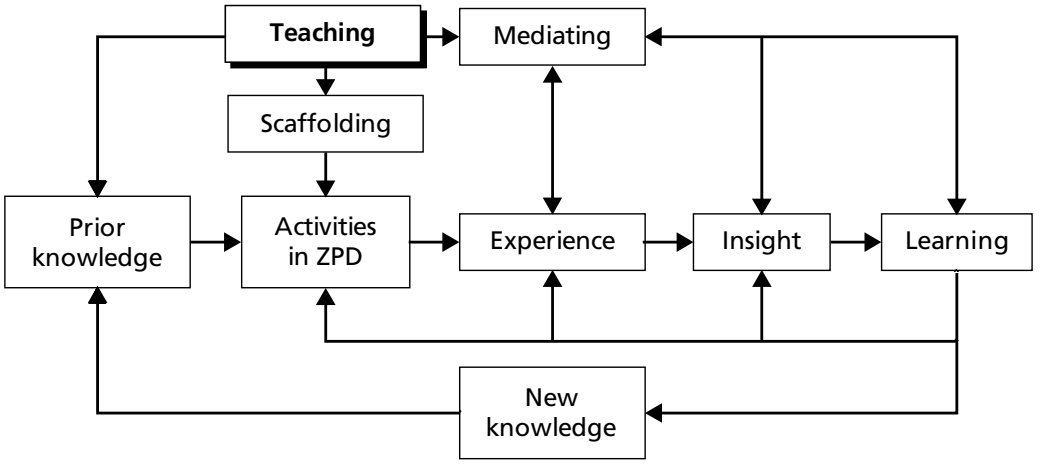



***Figure 5.4 Teaching as scaffolding and mediation—the elaborate view (ZPD = Zone of Proximal Development, Vygotsky 1986)***

## Teaching processes

### In general

Teaching processes are those things undertaken by the teacher in order to promote and support learning by the students. Working from the basic pedagogy, the teacher carries out the following overlapping processes of establishing a working relationship, rapport and a sense of shared purposes and working together to:

- achieve agreement on learning focus
- check on prior learning
- design the learning task to scaffold learning activities
- undertake, monitor and mediate activities and learning

- check and evaluate the learning achieved and the learning processes used
- reflect on self as a learner
- identify opportunities for the transference of learning.

For the processes to be successful they must integrate successfully with the learning being attempted by the student.

In order for these teacher skills and teaching processes to be 'authentic' they must be meaningful to both teacher and learner as they engage in a collaborative endeavour that will result in learning. This leads to key notions of teaching and learning.

**1** Teaching as:

- achieving a working relationship that enables the mediation
- placing learning activities in the zone of proximal development (ZPD)
- scaffolding learning activities, and
- mediating of learning experiences.

**2** Learning as action learning made up of:

- learning activities
- prior knowledge
- generated meaningful experiences
- insightful questioning, and
- resultant learning.

The steps and processes involved in teaching and learning have the overwhelming characteristics of being iterative and overlapping. This is likely to be one reason why a systems approach is rarely adopted in relation to education.

### Teaching online

There is something of a paradox in teaching for online learning: the teaching is usually separated in time and place from the intended learning. This is often masked by the fact that the online learning can be happening in the classroom in which both parties are present simultaneously. However, the teacher and students are often working in parallel rather than together because online learning is facility dependent: while the learner uses the computer, it is common for the teacher to be fully engaged with the rest of the class. Indeed, as observed in our research, the limited capacity of classroom teachers to provide timely support to students using ICT is a major constraint on classroom computer use. The notion of 'computer use' that prevails in a classroom may exacerbate or ameliorate this issue. If the computer is seen as a single-user device and learning is seen as a teacher-student activity, the working knowledge available to the user is limited to the working knowledge of the current user unless the teacher is available. On the other hand, if the computer is seen as a device for shared use and learning is a highly collaborative activity, then the working knowledge available to the user is greatly increased and the demands on the teacher are likely to be minimal.

This leads to questions about the respective roles and modes used by various parties. It may be useful to think in terms of modes such as:

- Teaching:
  - establishing rapport
  - choosing the learning focus
  - checking on prior learning (available knowledge and skills)
  - designing the learning task.
- Scaffolding learner activities: the teacher provides direct or indirect guidance and/or support in the use of the materials and equipment being used to undertake the learning task.
- Mediation:
  - Proxy tutoring: the teacher arranges for guidance and/or support to be provided by/or available from a third party such as a parent, peer or resource person.
  - Online mediation: email, instant messaging, online discussion, and chat and other Net facilities can all be used to provide some online mediation of learning.
- Independent learning activities or self-mediation: the student carries out the activities in the learning task independently of any immediate support or guidance:
  - At a low level, the learner may be guided by resources through a learning task largely designed by the teacher and based on 'worksheet' resources.
  - At a higher level, the learner will be selecting the learning tasks, designing the processes and acquiring resources to be used.
- Mediated learning activities: the learner receives responses to his/her actions that prompt learning by the student.
- Reviewing: the teacher checks with the learner regarding:
  - the learning achieved—making learning explicit
  - the efficacy of the processes and resources used
  - insights gained by the learner into his/her learning
  - the potential transference of learning achieved.
- Assessment: the teacher and/or learner appraise the learning for future reference, for example, teacher planning, reporting, formal assessments.
- Transference of learning: promoting the transference of the learning achieved to new situations.

The next consideration is what might constitute the teaching skills involved in the above. However, 'teaching' is an ambiguous term and may mean what a teacher does while interacting with learners, or simply what a teacher does, or more probably something in between these two extremes. Thus it may be more useful to identify teacher skills.

This is likely to bring about greater clarity since skills should be able to be identified and categorised in easily understood ways, for example:

- Planning
- Arranging
- Teaching (various modes such as those listed above)
- Assessing and evaluating
- Transferring learning.

## Learning

For the purposes of Step 1 in our model the teaching processes and the essential teacher skills consider the needs of the learner in terms of the major aspects of the learning being attempted, namely:

**1** Modes of learning:
- with teacher
- with tutor
- independent

**2** Context of learning:
- in class
- online
- independent

**3** Tasks being undertaken to support learning:
- planning
- arranging
- doing
- reflecting
- refining

**4** Activities:
- actions
- interactions
- production
  - products
  - experience
- transference of learning

**5** Resources required to undertake the activities:
- purposes
- opportunities
  - time
  - relationships
- equipment

- facilities
- prior knowledge/skills

**6** Reflection on:

- methods
- achievements
- implications

**7** Outcomes: new capacities and opportunities

There is potential to build on the above in a way that leads to systemic improvement of:

- pedagogy
- teacher skills
- teaching processes, and
- learning from action and experience.

The one ingredient missing to make these connections can be the shared visions of all members of the school or institutional community.

## Communities of practice

The notion of communities of practice is based on a social theory of learning and draws heavily on the work of Vygotsky (1978). That is, much (professional) learning and innovation occurs in a social context of mutual relationships and shared experiences. Specifically, the term 'communities of practice' emerged from the work of Wenger (1998), Lave and Wenger (1991) and others such as Rogoff and Lave (eds, 1984). It brings together notions that can be readily observed in effective (professional) learning, including:

- *Community*: learning as belonging, endeavours worth pursuing, and participation recognised as competence
- *Identity*: learning as becoming, as well as personal histories in our communities
- *Meaning*: learning as experiences around which people negotiate meaning
- *Practice*: learning as doing and as mutual engagement in action.

In his book *Communities of practice: learning, meaning and identity*, Etienne Wenger (2002) articulates several dimensions of practice.

- Practice as meaning, including negotiation of meaning, participation and reification or giving some 'abstract' form to our experience
- Practice as community, as a source of coherence resulting from mutual engagement, joint enterprise and a shared repertoire
- Practice as learning resulting in emerging structures, the engagement of new members and enhancing practices
- Practice as boundary that connects with other communities of practice.

Thus, communities of practice develop when a group of people are collaborating based on an agreed body of knowledge with a view to enhancing a shared repertoire of

practices. Communities of practice can be found everywhere. They develop naturally to overcome the limitations of formal organisations and institutions. Given the complexity, uncertainty, ambiguity, fluidity of membership, and need for adaptability that characterises contemporary life and work, communities of practice arise as a 'natural' response to the obstacles to situated success and wellbeing.

At the heart of communities of practice is an ongoing process of negotiation of meaning, and in this sense the construct has two complementary meanings:

- Navigating the territory of purposes, policies, activities, practices, experiences, knowledge (both tacit and explicit), and existing and potential meanings.
- Achieving higher levels of agreement on the meaning of the practice and all associated with it.

This negotiation is undertaken through insightful questioning, such as through the action learning process.

**Communities of practice and professional learning**

Improved professional practices are the intended outcomes of professional learning. Participation means contributing and benefiting from the learning being undertaken by members of the professional group. The core learning process is around negotiating the meaning of:

- experiences
- policies
- purposes
- detailed activities and arrangements of new, improved or traditional practices
- significance
- concepts
- rationales
- understanding
- relationships, and
- division of effort (see also Activity Theory, page 46).

Activities are professional if they are likely to be enhanced by high-order knowledge, skills and experience drawn upon by the practitioners. In addition, a professional practitioner is required to exercise judgement and choice, and to design and implement a suitable response to the situation at hand. Institutional plans, explicit purposes and policies may help inform the practices involved, but these artefacts, having been developed beforehand, cannot fully define all aspects of the response required by the situation at hand. Thus, professional learning is greatly enhanced by participation in one or more communities of practice.

Communities of practice bring consistency and coherence to those aspects of practice that cannot be achieved through literal enactment of plans and policies. Thus, the kind of collaboration that emerges within communities of practice supports:

- the development of standards
- the achievement of higher levels of sustainability
- management of change
- rapid deployment of practices
- adding of value, and
- reducing costs.

## Collaboration and change

Our research has shown that the complexity of incorporating ICT into teaching and learning is such that the level of collaboration in a school or class has a greater impact on the use of ICT throughout the school community than vice versa. In this context ICT has been used successfully to further develop the use of collaborative processes. On the other hand, no situation has been observed where there is ongoing successful and extensive use of ICT in teaching and learning in a school and/or class without a substantial commitment to collaboration. In classes with a low commitment to collaboration, a temporary transformation may occur resulting in a significant increase in the level of collaboration during the specific ICT-based exercise.

With collaboration, change becomes easier and safer. Experiences—good and bad—are validated by others. Problems can be solved by drawing on the knowledge, experience and networks immediately available. Shared achievement leads to shared celebrations of success. Everyone can be a contributor and a beneficiary. Inherent in this process is a sense of belonging.

There are several relevant dimensions to considering ways of introducing collaboration into the integration of ICTs. They relate to the school culture and ongoing professional learning. These are discussed below.

### Collaboration and culture

Cultural shifts to new forms of practice can only be achieved together! If the changed practices are adopted as 'normal' practices, they become part of the culture and need less support. The way to achieve sustainability of new or improved practices is to ensure that they become part of the culture. This provides a useful definition of implementation: 'Something has been implemented when it has become part of the culture or day-to-day happenings in the organisation.' When a transformation of teaching and learning occurs in our culture, it almost always involves higher levels of collaboration. Collaboration is usually characterised by:

- shared purposes
- enthusiasm for the activity and a sense of achievement often demonstrable by the products of the activities

- skill and knowledge contributed
- a sense of belonging as a result of having contributed.

### Collaboration and success with ICTs

Collaboration in ICT-related professional learning is based on:

- clarifying shared purposes and related practices
- improving access to resources
- using shared experiences to develop and refine teaching and learning practices
- enhancing the working knowledge available to the practitioner, and
- increasing the likelihood of the practices being successful.

A school culture that includes high levels of collaboration is likely to be much more successful in the use of ICT. The close link between action and learning means that, in a collaborative culture, they are both supported by members of the culture. Thus the learning becomes part of the culture and is readily available to its members. Learning that is matched to shared purposes is readily translated into new or improved shared practices. Collaboration enhances the rapid and extended deployment of the improved or new practices into the life and work of the group.

### Collaboration in professional learning—summary

Collaboration makes professional learning readily accessible since the required knowledge, experience and products are more readily available from co-learners, on-site tutors, and mentors, and there is greater likelihood of improved follow-up at all stages of the learning process. The results are that learning is:

- more efficient and effective
- more sustainable
- closer to JIT (just in time) delivery
- closer to JIP (just in place) delivery
- faster with fewer hold-ups in the learning process
- less expensive or cost efficient as a result of the above efficiencies.

### The future—communities of practice

One of the most comprehensive and well considered notions of collaboration is that of communities of practice (see Figure 5.5); that is, a group of colleagues who share knowledge, a community, a shared practice that they strive to enhance for themselves, each other and those they serve by learning through enabling participation of the members of the community of practice, and by negotiating meaning. This is valid for most aspects of human endeavour. In relation to education, this has the potential to lead to an understanding of pedagogy as negotiation of meaning.

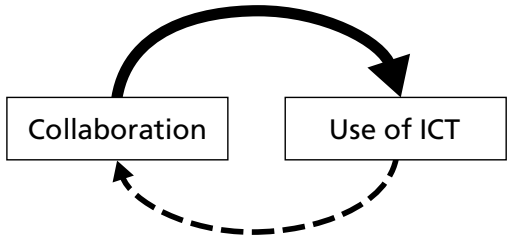



*Figure 5.5 Collaboration and the use of ICT*

## CONCLUSION—RECOGNISING THE LANDSCAPE

Figure 5.6 represents our efforts to summarise the scope of any whole-school or institutional approach to the integration of ICTs. ICTs can be used to support the development of collaboration if the user can identify with the shared tasks and purposes. The contribution of ICT can be in terms of joint activities, working together to use tools and other resources, and the creation of shareable and meaningful products and experiences. A collaborative school and/or class culture greatly increases the likely success of incorporating ICT into class programs, as:

- students are already familiar with collaborative approaches
- having shared purposes is the norm
- preparation to use ICT in class programs is likely to be better informed, leading to better matching of technology to tasks and a greater likelihood of the technology being available within the window of opportunity
- the school/class members will have ready access to an increased working knowledge of ICT

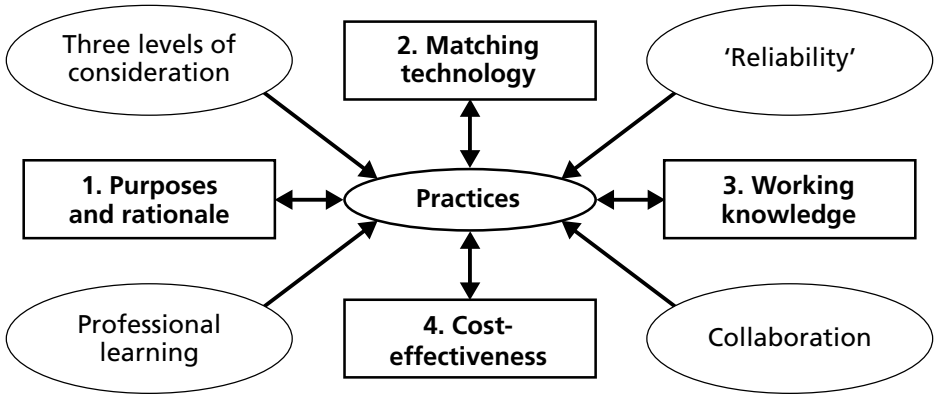



*Figure 5.6 Key success factors in using ICT*

- action learning is more 'natural' in such contexts
- available resources are more cost effective when shared than when computers and peripherals are seen as single-user devices.

## SUMMARY

In Chapter 5 we introduced the concepts that need to be part of the information-gathering exercise for getting started. Step 1 is about preparation. The preparation process starts with the participants involved, including management, practitioners and support personnel. There is need to analyse the local context. Learning is situated and knowing the representative views of all in the organisation is one of the key success factors. Other key success factors are locally driven activities determined by collaborative efforts that can lead to strengthening communities of practice. Chapter 6 describes Step 2 when groups come together for planning.

***Suggestions for further investigation***

1 Perform a SWOT (strengths, weaknesses, opportunities, threats) analysis for the pathway from current practice to the proposed new way of working.
2 Decide who is with you and who is not. What threats will most deter the former, and what opportunities most attract the latter?
3 Consider the variables in Figure 5.6 within your own context. A mind map of these interacting forces may help the process 'stay on track'.

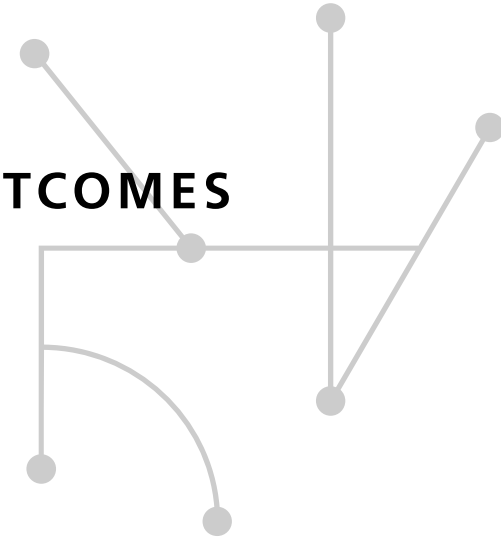
**Further information**

Anderson L, *Guidebook for developing an effective instructional technology plan*, National Center for Technology Planning USA.
Online at: http://www2.msstate.edu/~lsa1/nctp/Guidebook.pdf

Australian Educational Computing: http://www.acce.edu.au/journal/default.asp

Ray, B, McFadden, A, Patterson, S & Wright, V 2001, 'Personal digital assistants in the middle school classroom: lessons in hand', *Meridian: a middle school computer technologies journal*, vol. 4, no. 2 Summer, viewed 20 December 2006, <http://www.ncsu.edu/meridian/sum2001/palm/index.html>.

# CHAPTER 6
# STEP 2: AGREEING OUTCOMES



Once the relevant knowledge base to inform decision making has been built, the targeted change can begin. Agreeing Outcomes has been identified as the second step in the seven-step process. This step identifies an assessment of the status quo of current good practice and needs for improvement. In other words, decision makers are required to identify areas of good practice as well as those requiring improvement. Normally this will occur in small representative groups. As outlined in Step 1, the roles represented need to include all the strategic partners in the learning process. In schools, this will involve the principal, a senior manager, the technical-support person, interested teachers and students. For reasons of democratic decision making and ease of collaboration we recommend groups of six to eight people. Larger groups are more difficult for achieving cohesion and more likely to lose focus during the process.

In this chapter we provide guidelines for recognising the arrangements needed for the integration of ICTs. How to achieve these prerequisite understandings requires holistic understanding of how educational institutions work. The first part of the chapter attempts to capture the scope by means of flow charts. The second part of the chapter includes some comment on a more general level of relatedness to ideas frameworks presented. Finally, we reference some findings from a related part of our research that lend support for our views.

## GETTING STARTED—SCOPING THE CONTEXT

Despite the widely held rhetoric, not all schools have teaching and learning as their prime application of ICT.

For example, some have as their primary ICT focus:

- school administration
- reporting to parents
- presenting themselves to their communities (in publications and on websites).

Of course many schools have made the incorporation of ICT into teaching and learning their prime application. However, their purposes vary in that some schools are using ICT to improve or enhance current practices, whereas other schools are utilising ICT to introduce new practices in an attempt to achieve a transformation of their teaching and learning practices. The intended transformations are often based on more open-ended purposes and more collaborative working relationships between students and between teachers and students. Proposals for change are usually based on promises of a better future; these promises are based on the benefits that will flow when the change has been fully implemented and is working well.

Reality is that most changes also involve a number of counter-productive elements. Change increases the need for resources, while decreasing productivity (at least initially):

- Change does not happen in a vacuum; thus it involves competition between the proposed changes and what is already happening (at least during the implementation phase).
- Change requires preparation, which may involve the acquisition of new knowledge, skills, materials, equipment and facilities.
- Change is disruptive; it requires that the organisation prepare for new tasks while still doing the existing tasks.
- It is often necessary to run parallel systems during the changeover from one system to the next.

In social systems such as schools where the financial costs appear largely fixed and financial benefits are often poorly understood, change is often falsely seen as 'cost neutral', especially by those who are proposing the change but do not have to achieve it. People are often reluctant to give up what works reasonably well (or what is familiar) for the promised but as yet undemonstrated benefits. As a result, the additional costs of implementing change are often hidden because they are created by, and/or passed on to, the people involved (teachers, students and families) and/or deferred to a later time and place.

Convening the project team is a crucial task. Our research has shown that at this stage it is critical to bring together the administrative leader(s) of the organisation with technical support staff and practitioners. If this initial project is to have any success, the support of the upper levels of the hierarchy needs to be seen and voiced. Also, to avoid impractical or person-power intensive (and therefore unsustainable) changes, the implementation team requires the informed views of the technological crew. Since the practitioners are putting the changes into production working with clients, they also need to be equal partners in the conversation. There are good reasons for having this

diversity at the start of the project; a challenge is to keep the group small enough to reach agreement about the way success will be evaluated.

The role of senior management is to propose outcomes and match these with resource allocations (see Figure 6.1). Examples of specific roles include:

- practitioners to negotiate learning outcomes and timelines
- ICT coordinators to refine and broker core process outcomes
- technical support to assist, research and advise on technology.

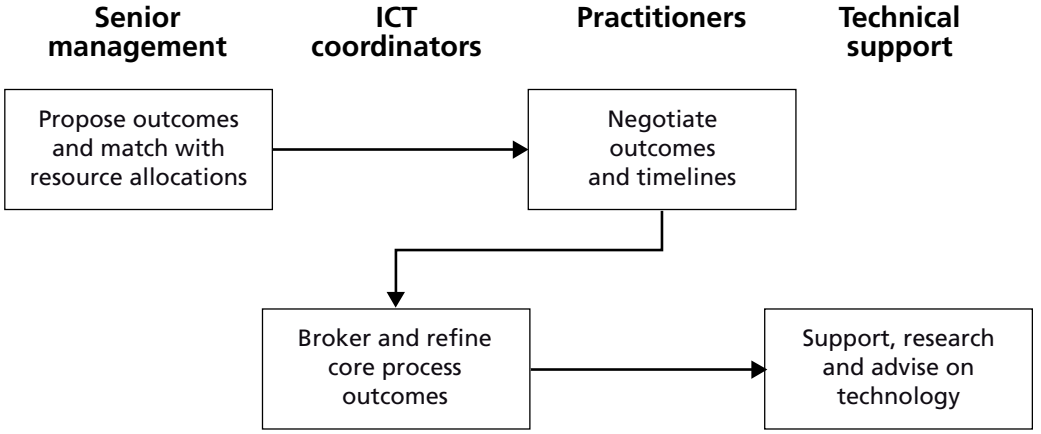



***Figure 6.1 Agreeing outcomes to be achieved***

Collaboration across levels of the organisation is required in order to achieve the alignment that will enable ICT to be well managed and well used. Alignment of goals for the use of ICT between the policy, procedures and practice levels of an organisation is a key requirement for innovative change to proceed. Goals agreed to by stakeholders will help to ensure that they are known and understood and will receive support. As set out in Step 1, collaboration works best when people are jointly working towards a shared goal. People may begin by clarifying what that shared goal might be. Effective leadership promotes awareness of the significance of the goal and confidence in individuals' capacity to achieve the goal in collaboration with others.

Much of this process is about sorting issues of *governance* and *alignment* with the organisational and school purposes.

## Governance

A key function of a school or school system is to exercise governance in order to ensure the success and wellbeing of those involved. This means that the members of the school can have the ways and means to achieve the intended purposes of the institution. In Chapter 4 there is a more detailed discussion of what we mean by governance. In this chapter our

aim is to take that theoretical knowledge and translate it to the reality of the school or educational environment in which the change process towards further integration of ICTs into the teaching and learning practices are intended.

The use of ICT in teaching and learning requires implementation at three levels, all of which have an impact on 'reliability' of outcomes.

**1** School: governance, professional learning, infrastructure and services, capability
**2** Class: teaching, learning, programs and learning outcomes
**3** Activities: action, experiences, knowledge, products, insight.

Adding to these there are four key success factors that impact substantially on the teacher's experience of 'reliability. In order of importance they are:

**1** Purpose (and rationale for the use of ICT)
**2** Matching technology
**3** Working knowledge
**4** Cost-effectiveness.

(Note, reliability is more widely discussed in Chapter 7.)

There are several practical dimensions to this important area throughout the Seven Steps to integration, and we return to these issues in successive chapters. At this beginning phase there needs to be a focus on more general practicalities.

### Governance as practical decision making

In relation to the school's use of ICT, sound governance means that the decision making within the school regarding ICT must be consistent with the chosen values, purposes, policies, plans and allocations of resources available to the school. There are numerous strategies for practical decision making, including:

- pursuing what looks like a good idea (which may or may not be fit and timely)
- relying on policy (which may be lagging behind current needs)
- being in the lead (which may be costly in terms of errors and omissions)
- waiting until everything is known (which may result in lost opportunities).

The latter is an interesting strategy. In our research we have worked with one school that has a deliberate policy of being six to twelve months behind the leading edge of technological developments. This clever tactic means technology is purchased more cheaply and the process of introduction is less stressful because others have identified the glitches and sought solutions. Hence the implementation phase is safer and better informed. At the same time, all the advantages of being in or close to the leading group of practitioners most of the time remain.

### Sound governance—four steps

There are four steps to sound responsible governance.

Conceive → Design → Develop → Incorporate

1. *Conceive* the contribution ICT can make within the life and work of the school. This is the motivational phase during which there will be need to focus on colleagues' working knowledge of ICTs and their possibilities, access good working models for inspiration and seek ways to acquire the knowledge needed for implementing changes.
2. *Design* the arrangements that will facilitate the contribution. That is, ensure:
   - collaboration, vision, purposes, culture and alliances
   - people's understanding, knowledge and skills, and capacity to act and initiate
   - infrastructure arrangements are in place
   - actual use of ICT applications occurs
   - ongoing reflection keeps the process on target and vibrant.
3. *Develop* the arrangements to make the contribution feasible. These will need to be in sequenced stages.
4. *Incorporate* the use of ICT into the life and work of the school. This process will include integration of the elements with each other so that the concepts, design development and use of ICT are consistent over time. This should result in a realistic provision by matching effective infrastructure and people who are competent, confident and motivated to utilise the provision made.

In brief, the purpose of the decision making and the development of staff commitment and matching infrastructure is to make the application of ICT within the life and work of the school (or school system) possible.

**Governance and resources**

Regardless of responsibilities, achieving good governance makes heavy demands on the time, energy and resources of those involved for developing and managing the infrastructure and developing staff capabilities. However, as our research has indicated (Webb et al. 2005), without resolution of these matters the application of ICT within a school is likely to be ad hoc, inconsistent, often ineffective and bewildering to teaching staff and others within the community.

## Alignment

The ideal use of ICT involves activities that are:

- purposeful
- desirable
- acceptable
- feasible, and
- within the available window of opportunity (times, places, interests and attention).

If these dimensions match up, there is a sound basis for proceeding. This means that as well as the activities themselves, consideration needs to be given to existing and proposed

purposes *and* both formal and informal policies. Existing folklore may mean that the ways in which the school goes about its daily activities need to be reviewed. Freeing up time in the school timetable and available space may be precursors to implementing a new phase in the school's activities. Technology can be used to reshape activities, products and experiences. Thus, the use of new technology will have an impact on what is appropriate in terms of policies. Also, technology may change what is possible, which may well have implications for the purposes. Indeed, it is an early finding of our research that to ensure successful and productive activities, it is essential to align the big three Ps:

- **Purposes**
- **Policies**
- **Practices**

For educational reasons, the ideal practices position the three Ps in a context that considers the individual differences of the school community. These differences compound the complexity of operationalising the alignment. People have different sets of experiences and teaching and learning styles. Their belief systems stem from personal circumstances not necessarily related to the needs of this change process. In brief, the community is made up of individuals who need to be convinced of the need to change. Their learning needs and learning styles fall within the alignment construct (see Figure 6.2).

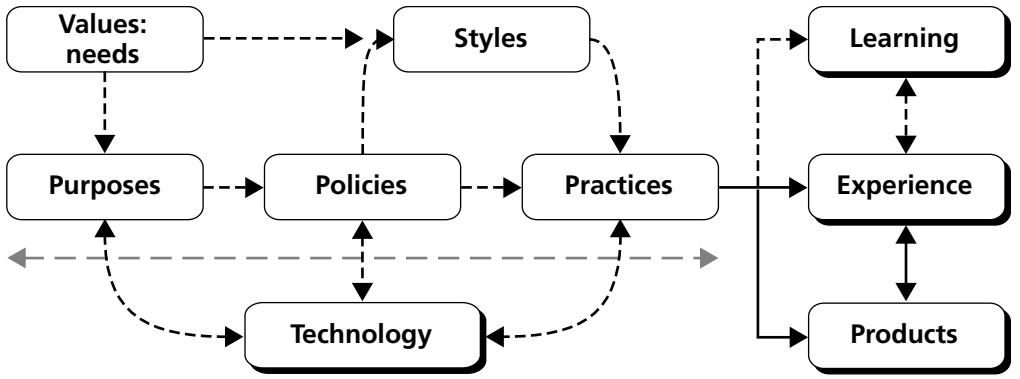



***Figure 6.2 Alignment with technology***

Purposes, policies and practices exist at, across and between all levels of any organisation. Any system exists to help ensure the success of all its components, and thus the achievement of outcomes that match its goals and purposes. It is therefore essential to achieve alignment through the organisation, which will assist in reporting, enabling and supporting. Figure 6.3 attempts to capture all these dimensions. Insightful system alignment such as that proposed in Figure 6.3 can lead to the creation of useful products, meaningful experiences and valuable learning for all!

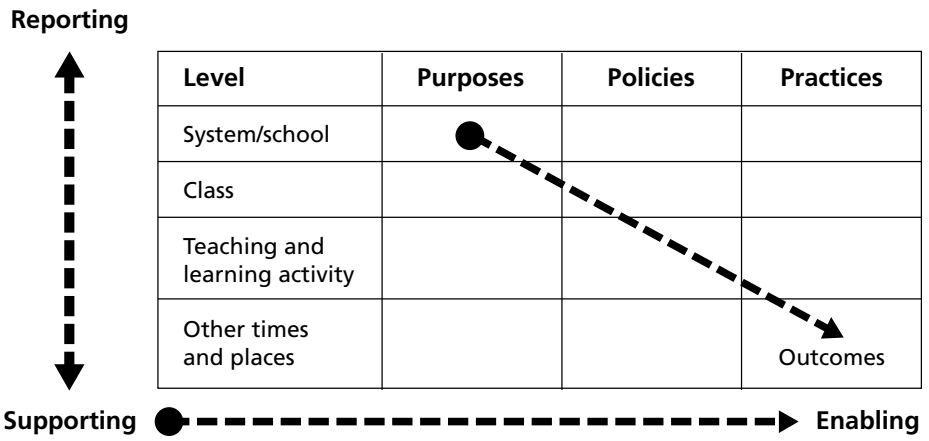



*Figure 6.3 System alignment*

### Alignment and scaffolding

A fundamental use of ICT is to scaffold the learning activities of students. Where the use of ICT is incorporated into learning activities in class programs, the school/system should provide scaffolding that will support this end. This will require consideration at each of the three levels of governance (schools, class and activities) regarding the uses to be made of ICT. Alignment between these three levels will help improve the scaffolding of in-class use of ICT, and the use of ICT to scaffold student learning. In brief, for sustained change in the learning environment there needs to be much more happening across the whole-school context. Change in one area has inevitable effects on the whole organisation. The organic nature of schools and educational contexts requires major thinking in, around and outside the day-to-day practices.

## Summary issues

- The 'tentative theory' derived from the information-gathering phase during Step 1 and the group formation phase of Step 2.
- The current reality (success factors); that is, what is working, what is not working, and what else is possible? When?
- Baseline measurements: get data (sample case studies).
- Most initiatives have the hope of achieving some form of transformation of teaching and learning.
- This transformation may involve consideration of a different curriculum balance.
- Attention to stages involved in the adoption of ICT.
- How the use of ICT is related to the construction of knowledge.
- The role of action or 'doing' in learning.
- What is possible, feasible and measurable?

## CHANGING ORGANISATIONS TO TRANSFORM PRACTICES—REFLECTIVE COMMENT

Some writers are suggesting that we are in a period of organisational transformation, moving from organisations as hierarchical structures with strong line management controlling the activities of staff according to policies in order to achieve the outcomes chosen by the organisation (Hargreaves 2003). That is, hierarchical organisations focusing on managing people and their discourses are committed to:

- outcomes
- performance of individuals
- well-defined roles
- power
- problems to be countered
- change as difference
- information distribution
- policy as regulation
- teaching as education
- working ON others
- acquiring resources
- working from the future to the present
- compliance
- competition
- analysis
- targets to be achieved
- results
- accountability
- lower variation as uniformity.

The other dominant discourse is built around flatter structures with loosely coupled network arrangements that extend beyond the immediate organisation. Partnerships and associations enable knowledge, support and other resources to be gathered and applied towards mutually realising the opportunities and resolving the complex challenges they face. Networked organisations tend to focus on:

- processes
- service
- effective relationships
- solutions
- improvement (change as movement)
- knowledge
- multi-level capacity building
- principles

- learning and the construction of knowledge
- working with others
- creating and releasing resources
- working from present lived experience to the future
- creation and sharing of meaning
- cooperation
- synthesis
- measures that will inform effort
- success and wellbeing
- collaboration
- consistency.

The tension between the two discourses is obvious. The former is about control and the latter is about inclusion of voices, shared ownership and empowerment for the people involved in the organisation. This ongoing debate is fuelled by the common experience that more traditional organisations are unlikely to have sufficient knowledge, support and other resources that are required to responsibly undertake their increasingly complex activities. Regardless, notions of hierarchy still have a role to play. There are situations that arise that can only be resolved satisfactorily by the use of hierarchical arrangements. Operating systems have to be chosen, organisational commitments made and priorities set. Also, tensions can arise because networks cannot be controlled, and the richness and variation of their contributions may make situations more difficult to resolve. Participants in network organisations contribute knowledge and relationship, neither of which can be commanded—they can only be volunteered. Thus, network organisations require a different form of management that includes substantially more leadership than is common in more hierarchical organisations. The heads of hierarchical organisations are usually in a stronger position to command, control and arbitrate, which can be expedient and effective.

Overall, our in-school research observations strongly support network initiatives. Teachers who reported using ICT easily and well also reported having extensive professional support networks involving colleagues, family and friends. Similarly, schools and classes in which ICT was being used easily and well enjoyed the benefits of supporting networks within and beyond the school or class. Readers may recall John Naisbit's (1982) notion of the high tech–high touch 'megatrend'. He would suggest that the organisational trend towards networking parallels the equivalent technological trend.

In order for schools and teachers to bring together sufficient knowledge, support and other resources for the successful use of ICT, they need to participate in networks of schools, colleagues, students, families and communities that enable new practices to be developed and implemented and old practices to be enhanced and extended. The ongoing activity of these networks supports change and can support sustained

transformation. Without support networks, principals and teachers reported change as being difficult to achieve and even more difficult to sustain. Figure 6.4 tries to summarise these conclusions.

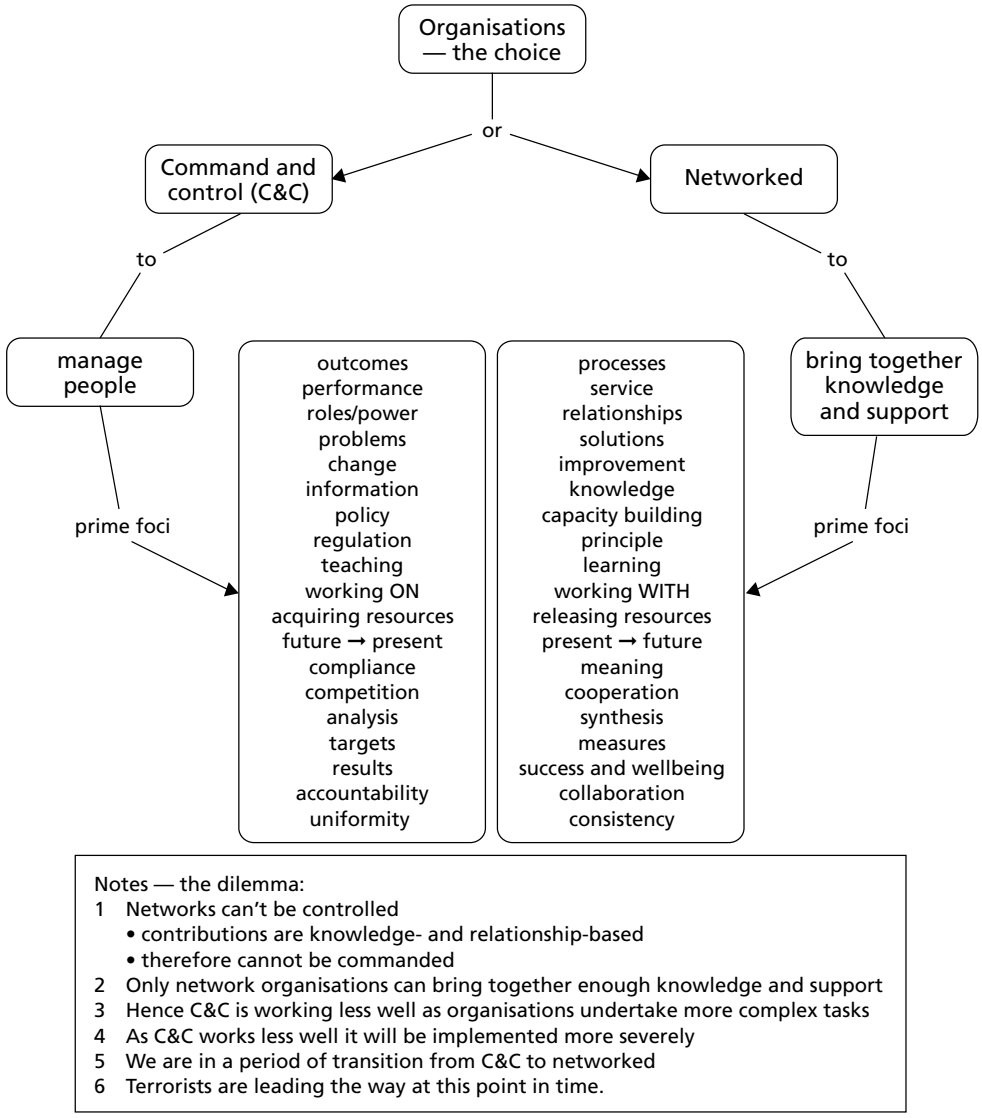



***Figure 6.4 Controlled versus networked thinking***

In brief, for Step 2 to be successful, the working group identified to initiate the change will be required to work within the constraints of the organisation at the time. Sustainable change leading to transformative practice can fall on the sword if the structures are not well embedded into the mindsets of the school community. The culture needs to

evolve towards a set of beliefs that match the vision. Eventually the vision will and can become part of the working culture of the school.

## SUMMARY

In Step 2 the real job of building the working environment for change takes place. All the key players are involved. The importance of involving senior personnel in the process is to ensure that the needs of the practitioners are well understood and the infrastructure is made available to support the ongoing endeavours. Alignment of activities is connected to policies, purposes and practices. These levels contribute to the operational functioning of the school as a community. Embedding communities of practice in the daily life of the organisation is widely recognised as the best practice strategy for effective and lasting change.

***Suggestions for further investigation***

1. What are the externally measurable criteria by which the success of this change process could be evaluated?
2. Quantify the resourcing (financial and human) implications of both the implementation and sustaining phases of the new practices.
3. Is there evidence of other organisations that have undertaken similar changes? Were these evaluated?

**Further information**

Association of Assessment Inspectors and Advisers 2002, *Secondary assessment practice: self-evaluation and development materials*.
Online at: http://www.aaia.org.uk/pdf/finalbooklet.PDF

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# CHAPTER 7
# STEP 3: IDENTIFYING CONSTRAINTS

The SWOT analysis from Step 1 will have given some early warnings about possible disruptions to the change process. Step 2 will have provided a wider appreciation of the points of negotiation available within the initial SWOT. The involvement of senior school management in this phase helps guarantee that energies are not wasted on unproductive pathways. At the same time, some of the ideas presented by practitioners (including classroom teachers) that they see as on their 'wish list' could be converted to 'possibilities' if the person who ultimately has responsibility is part of the information-sharing process. However, as the implementation moves forwards, any difficulties must be effectively dealt with by the project team. Strategies for dealing with constraints may require seeking alternatives or project re-design if a necessary resource is unavailable (see Figure 7.1); consultations with expert authorities to dissipate the blocking effect of gate-

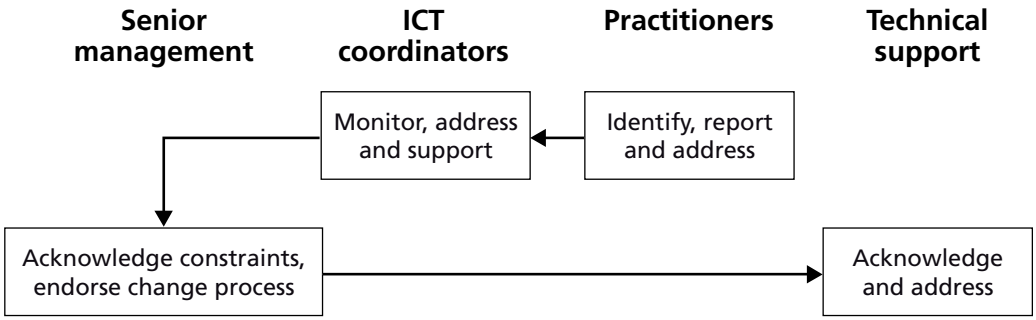


*Figure 7.1 Flow chart demonstrating the process of Step 3: Identifying constraints*

keepers; and adoption of incentives to address concerns related to morale or motivation. The choice of strategy will depend on the local context and the nature of the constraint.

Schools are rich and complex organisations. There is so much about them that could be improved—that is, made easier and better. Reality is that the elements of schools are interconnected in so many different ways that achieving a specific focus and attainable outcomes can be very difficult. The implications are that:

- there are more things to improve than can be addressed at any given time;
- improving almost anything will have a flow-on effect to many other things;
- improving some things will have a much greater overall benefit than other things;
- thus, there is a sense in which some things are like constraints;
- constraints are often misunderstood based on assumptions that are believed to apply equally well to factories and schools; and
- constraints are commonly assumed to be resources, skills and motivation, but are usually things like knowledge and policy.

Goldratt's *Theory of constraints* (1999) has developed a continuous improvement strategy based on a comprehensive understanding of the best improvements related to three key questions:

**1** What to change?

**2** What to change to?

**3** How to bring about the change?

That is:

- Identify the constraint.
- Decide how to better manage the constraint (now and in the future).
- Make this decision your top priority.
- Improve the situation so that this is no longer the constraint.
- Identify the new constraint, and so on, continuously.

In this chapter we add additional layers to the Seven Steps process by focusing closely on the constraints that working lives in educational environments encounter. These include issues related to home and school links, adoption stages, reliability of the infrastructure and how to conceptualise the new information context. The focus further develops our need for sharing and learning in partnerships.

## INFORMATION TECHNOLOGY—COST AND VALUE

Information technology or IT has two parts: *information* and *technology*. Using a simplified view, the value is largely in the information and the cost is largely in the technology. Thus, it might be useful to think in terms of the cost–benefit ratio of information and the cost–benefit ratio of the technology. Clearly in both cases the benefits (value of the information) should be substantially greater than the total cost of working with the

information and the means to do so. Table 7.1 provides a summary of some of the issues to consider.

***Table 7.1 Information and technology***

| | VALUE | COSTS |
|---|---|---|
| Information | Information acquired<br>Processed (value added)<br>Transferred (value returned) | Time<br>Effort<br>Storage<br>Maintenance |
| Technology | Efficiency (reducing costs)<br>Effectiveness (adding value): by increased accuracy, completeness, currency, timeliness ... | Hardware<br>Software<br>Training<br>Operating<br>Vulnerability<br>Maintenance<br>Development<br>Facilities |

Part of the analysis of current contexts for designing ICT integration programs needs to include both components. For instance, as part of our research project, we gathered information from classrooms on the ICT provision based on appraising workstations and associated devices, arrangements and services, including:

- Make and Model
- RAM [in Mb]
- HDD (free) [Gb]
- OS
- Processor
- Peripherals: sound
- Peripherals: microphone
- Peripherals: CD-ROM
- Start-up—power on to login [s]
- Start-up login to desktop [s]
- Web-browser
- Time to load www.acce.edu.au [s]
- Time to download selected file [m:s]
- Time to transfer seven items from floppy [s]
- NWC installation time [s]

- Time to start Word 2000 [s]
- Time to open uni web page in Word [s]
- Time to print preview uni web page in Word [s]
- Other installed software.

This information was to demonstrate its worth when it came to matching perceptions of users to classroom use of and integration of ICT hardware. We concluded that fewer good machines are better than several poorer or widely varying machines. In fact, we would now advocate schools investing in fewer laptops and more handheld personalised devices that reflect the mobile phone culture (Becta 2003b, Palm Education Pioneers Program 2002: see Vahey & Crawford 2002).

The following anecdote highlights the need to separate the technical support from the professional leadership roles. Separate ICT coordinator and technician roles take away much of the wastage of ineffective teacher time in the quest to move forward.

> The dentist of one of our team members has given up on computers for handling bookings—the practice (one full-time dentist and two part-time dentists) has gone back to the traditional appointment book. The judgement has been made that cost of failure of the technology far outweighs the benefits involved. The decision to abandon their IT was presumably based on the judgement that the (added) value of the information using the computer did not justify the costs of the computer.

[Note: The decision may have been sound but no doubt there were other possibilities such as developing the system in some way . . . but this would, presumably, involve both costs and benefits.]

## THINGS TO CONSIDER IN THE CLASSROOM

While not advocating recipes, our research has revealed a number of do's and don'ts. Our overall advice is: Do not compromise the educational program just to tie in something that is spectacular or new in terms of ICT. Be flexible enough to take genuine opportunities when they emerge. ICT is a set of tools, so avoid being distracted by the bells and whistles.

### Motivation

Children are less likely to be impressed by ICT than adults. The corollary to this statement is that adults may have a distorted and hence unreliable view! If the teacher feels ill at ease with the computing task, then learning in partnership with the class can be a basis of setting a new pattern of peer learning and mentoring. The students may have the knowledge and skills

to scaffold one another, and as research is showing (Becta 2006), teachers who make this assumption are faring well with ICT integration. The other immediate benefit is the motivation for the often disaffected students, as the following example illustrates quite powerfully.

Tommy is a Year 8 student in a secondary school. Aged fourteen, he had displayed all the signs of being a 'behaviour management' problem. Teachers in the school labelled him a 'handful', with little optimism for his educational future. Along comes the new teacher who is skilled with using global positioning systems (GPS). Rather than compel Tommy to 'sit still', he demonstrated the GPS handheld tool and introduced him to the fascination of satellite navigation systems. Tommy was asked to map the cross-country course for the forthcoming athletics carnival in the school. The success of this was 'inspirational', as some of his teachers observed in the staffroom over the coming days. Tommy's self-esteem was lifted, his sense of empowerment validated by his teacher and, perhaps most importantly, he had something special to share with the other students in the class.

## ICT knowledge and skills

While the story of Tommy might inspire teachers, there is a fundamental hurdle to overcome. It is difficult to train students comprehensively in specific ICT skills that the staff may lack. ICT skills need practice and repetition, building towards confidence and competence in order to make them useful. Specific teaching of ICT use is necessary and well worth the investment of time, effort and resources. Introducing ICT in school and class programs is a huge but rewarding task, so the effort to learn related skills is worthwhile.

## Groups and the quality of learning

We notice from our research and that which is emerging in other settings (Becta 2006) that ICT-related teaching and learning is often done in groups (or batches). That is, because the available computers are insufficient for whole-class activity at the same time, the ICT learning access needs to be managed in small groups. The result is that the quality of the learning experience tends to decline as the batches progress. Contributing factors include the following:

- Time between introducing and undertaking the task increases for later groups.
- Most competent students are also more likely to seek to be first. They are perceived to be more confident and keen.
- First groups are likely to get the best deal, for example, more support, attention and supervision.

- There is increased likelihood of subsequent tasks overtaking or distracting from the original task for later groups.
- This makes it difficult for all groups to complete an ICT task to a satisfactory level.

## Home and ICT

Seventy per cent of Grade 3 (eight-year-olds) interviewed in our research project identified an older member of their family as their prime source of learning how to use computers. By Grade 5 this had dropped to 50 per cent, but the figure for learning at someone's home (own, friends, peers, extended family and especially grandparents) remained high. The implication is that ICT at home represents a substantial learning opportunity. The following factors contribute to learning with ICT at home—as well as elsewhere.

- Being able to access a computer at home provides more opportunity and flexible access (JIT).
- The family provides a supporting network for learning through its members, extended family, friends, visitors and family contacts.
- The family provides social support for learning, which is important to members of a caring profession.
- Having ICT at home enables better time management.
- Being able to focus on learning to use ICT in a supportive and consistent environment shortens the learning cycle.
- Having more control over resources creates part of the conditions necessary for self-managed learning.
- Gaining additional experience more rapidly leads to the acquisition of spontaneous concepts (Vygotsky 1978).
- The home situation will likely include members at a range of stages of development in relation to the use of ICT. Thus, family members might provide a number of complementary roles as co-learners such as validating experiences, tutoring (operating knowledge/troubleshooting), and as mentors.
- The family's collective working knowledge is greater than any member's individual working knowledge and is available usually at short notice for operating the ICT and troubleshooting problems that arise.
- Since the ICT at home belongs to the family, it is also their responsibility to learn about the limitations of ICT and the demands of managing it.

### Parent endorsement

A Parent Advisory Group in ICT can be a great help with access to parent skills at all levels. Parent contribution can help to make cabling, maintenance or purchasing new equipment

very effective and cheap. The challenge is to achieve the right balance between the necessary educational focus and dealing with the business and support issues.

## LIMITATIONS

Technology is not the only limiting factor on activities. Other major limitations include the three Ps:

- Purposes (what we hope to achieve)
- Policies (what is deemed feasible and acceptable to do)
- Practices (what we attempt to do)

and

- contextual factors such as those identified in Table 7.2.

***Table 7.2 Technology and limitations on activities***

| | | |
|---|---|---|
| Time | Structures | Transition |
| Location | Risk | Order |
| Effort | Authority | Who |
| Devices | Dependency | Consistency |
| Reliability | Authenticity | Preparation |
| Quality | Access | Collaboration |
| Durability | Speed | Usefulness |

Many technological 'applications' are intended for use in 'unintended' ways. Our observations suggest a number of interpretations for practice that reflect the class-based realities of the equipment. Often the views of the practitioners are at odds with the system's views where there tends to be a belief that if the infrastructure exists, then all problems can be locally resolved. Nevertheless, it is this localised experience that feeds into practice.

### Reliability

Part of the dynamic is linked directly to reliability. Early in our research (2002) the issue of reliability arose, with many teachers reporting:

*The computers are unreliable.*

*You can't rely on IT.*

*I have to plan each lesson on the basis that the technology will fail!*

*Every time they change the system I have to reteach what I've already taught.*

Not surprisingly perhaps, more recent investigations, especially in interviews with class teachers, have revealed that this is a complex issue concerning much more than correct functioning of the technology. In a general sense, most teachers use the term 'reliability' to mean that they can rely on being able to use the technology as intended within the window of opportunity available.

**Windows of opportunity**

Classroom learning is managed as a sequence of cumulative, often short, tasks. Therefore, any loss of opportunity can be disruptive and difficult to manage in the short term, and difficult to retrieve in the longer term. Students need to be purposefully engaged with their learning tasks almost continuously and thus classes tend to operate based on very narrow windows of opportunity. Student engagement with learning tasks can be 'fragile' and particularly vulnerable to disruption. The time required to overcome a typical reliability problem tends to be greater than the duration of the window of opportunity involved.

There are many sources of difficulty in relation to the teacher being able to rely on effective use of the ICT. Some are listed below—in loose alphabetical order, not order of importance.[1]

- Access and permissions: denied, unknown, lost or forgotten passwords, authority not available
- Auto-correct: over-riding user hopes and intention
- Availability: number of devices inadequate to undertake the tasks in a coherent fashion
- Compatibility: none, partial, at a cost, for example, in importing graphics files
- Configurations: class machines look and feel different from each other, screen configuration, software installed, making it more difficult to identify things needing attention
- Connections: slow, dropping out, cables missing
- Development is disruptive: new server set-ups, new versions of software installed
- Equipment: not connected, consumables exhausted (such as printer cartridges, out of paper), components are missing (laptop with floppy or CD-ROM drives)
- Equipment differences: most classes have a mixed bag of PCs, leading to student preferences for certain machines above others and a strong preference for using only the better ones
- Files damaged, lost, deleted or not saved

1 See Reliability matrix: http://www.educ.utas.edu.au/users/ilwebb/Research/reliability.htm

- Filtering: a teacher selects or prepares online resources only to discover that resources are filtered at the level associated with the student's login
- Inappropriate file names: misnamed files (a student's story about Eric the Purple Dinosaur gets saved by Word as 'Once upon a time in a land far away there was a young boy who had a dream.doc' in My Documents by default (and no one noticed!)
- Memory failure (the human kind): a student was writing a story last Tuesday but can't remember which machine he/she was using, nor what the file was saved as or where it was saved
- Operational knowledge: don't know how to use
- Permissions (see Access above).
- Poor maintenance: insufficient disk space, flat batteries, fragmented files, lost shortcuts
- Software configurations: saving to My Documents rather than class share, incorrect language (such as US English by default)
- Software/computer mismatch: computer not powerful enough to run latest versions of software and/or hard disk overloaded (slow, freezes . . .)
- Software versions: trying to use templates made with previous or incompatible versions
- Technology does not work: freezes, drivers missing or not installed, globe blown, not plugged in, component not switched on, power supply needs to be reset, battery flat
- Technology not available: for example, equipment taken by another class, being repaired, securely locked away (and key not available)
- Troubleshooting: can't identify problem, don't know how to solve it, necessary assistance not readily available, uncertain about whether one should fix it
- User routines: not known, not followed to prevent difficulties, inadequate training
- Windows of opportunity: too small (task design, groupings), not open (preparation), closed (unable to troubleshoot)
- Working knowledge: inadequate, unable to operate and/or troubleshoot the equipment successfully

It is not uncommon for two or more of the above difficulties to occur simultaneously. This makes troubleshooting more difficult and hence increases the working knowledge required. Working knowledge in this context is that which is sufficient for a person to be able to operate and manage (including problem solving and troubleshooting) locally in real time and thus apply the technology to the achievement of their purposes by using it to carry out the necessary activities. That is, improving the reliability means improving

the match between the technology and the practices in which it is used. There are several dimensions to this matching, including:

- time
- place
- ICT functions
- devices
- interfaces
- access
- operational demands
- user knowledge and understanding, and
- selection.

**So what to attend to?**

Teachers and IT personnel use the word 'reliability' in somewhat different ways. Perhaps for IT personnel it means that the devices containing the technology are installed and in good working condition. For teachers, 'reliability' relates directly to their capacity to make prompt and effective use of the devices. In most schools it appears that equipment gets less attention the further it is located from the servers. This means that problems with classroom PCs must be reported before being addressed. There is a mutually supportive need that relies on flows of information between the expert and the user (see Figure 7.2).

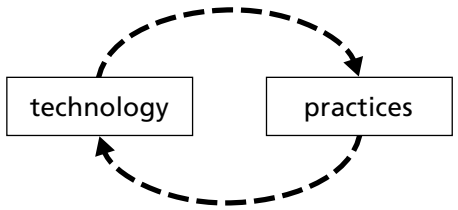


***Figure 7.2 Practice and IT operational cycle***

It is common practice for schools and their professional staff to defer to technical staff on most matters relating to technology. This is inappropriate and unfair to technical staff who are expected to achieve outcomes beyond their technical expertise. Most of the above difficulties involve technical, organisational and/or professional issues. For example, software and hardware configuration may need to be carried out by IT personnel, but in a consistent organised way, in order to meet the requirements of different users. This means that responsibility cannot be assigned solely to IT personnel or to school management or to the professionals. It needs to be a collaborative ongoing effort between all concerned!

### The future—a focus on practices?

Dealing with 'reliability' is best done as an ongoing collaborative activity—it involves a range of interactive practices (technical, organisational and professional). Schools that have developed a community of practice around reliability are getting much better value from their efforts and use of ICT in the class programs. The focus is likely to move away from attention being on the technology as the prime source of difficulty, to a focus on in-class practices and the way in which ICT is being prepared and incorporated into these practices. Part of that process is best served by achieving increased homogeneity of provision, at least within a class, then across a grade or school sector and preferably across the school, and system.

## SUBSTANCE, FORM AND TECHNOLOGY

A recurring difficulty in discussing education is a lack of clarity about the places of substance and form in teaching and learning. At a recent conference of school principals, a group of students was asked 'What can schools do for me?' The students' responses appear to infer two dimensions of schooling. These are *substance* and *form*.

Substance has to do with success and wellbeing, values, purposes, accessing opportunities, participation, engagement, belonging, (working) relationships, actionable learning ('applicable in everyday life'), achievements, teaching as mediation. Form defines how the substance is expressed: attendance, time, place, (working) arrangements, membership, (working) roles, policies, processes, products, scaffolding, and teaching as scaffolding. Substance is largely associated with the learner, and form is largely determined or managed by the teacher/school/system.

To be managed by technology, any substance must be in a form that is amenable to the specific technology. Consider water and levers: in its liquid form it is difficult to lever water. However, in one solid form—ice—it can be levered; in another solid form—snow—it is less amenable to leverage. Consider also the transport of oil: oil is readily amenable to pipeline, pumping and tanker technology, but not so readily amenable to conveyor-belt technology.

### Substance, form and ICT

There are two major issues to do with substance and form in relation to ICT. The first is the issue raised in the previous paragraph. That is, the information and/or communication must be in a form that is amenable to the technology being used. Typically, information must be codified in some way that will allow the information to be processed. The need for information to be codified prior to the application of ICT is a major issue in teaching and learning. Only a small proportion of the information traditionally used by teachers and learners is in a codified (or even codifiable) form. That is, much of the critical information used in teaching and learning is not readily amenable to management with ICT. This is perhaps one of the

reasons that ICT has had such little impact on the core work of teachers despite classrooms having computers for twenty years. When teacher information is codified (as in assessment and reporting), it is generally in a form that is of more suitable use by adults, so teachers are more likely to use ICT for assessment and reporting than for direct instruction.

**TEACHING COMPARED WITH THE BUSINESS WORLD**

The nature of teachers' information contrasts with the nature of the key information in commercial transactions. Commercial activity usually involves transactions that can be readily and universally codified in terms of a range of variables including quantity, date, time, cost, product ID or barcodes, order number, supplier ID, and customer ID. To date, there is not an equivalent framework for educational 'transactions'.

The second issue related to teachers' need to distinguish substance and form in the students' achievements. Of course substance and form are closely linked. It can be common practice for an explicit form (for example, an electronic document) to be taken as an indication of substance. That is, the document is an indication of student achievement: their competence with ICT and/or knowledge related to the document's contents. On the other hand, some teachers are reluctant to accept ICT-based 'homework' because of the difficulty of establishing the substance of the authoring student's engagement with, and achievement in, the learning task that has resulted in the document.

Similarly, assisted and automated processing by ICT-based tools can produce student work in a form that masks a lack of substance in terms of the learner's achievement or capabilities. For example, one Grade 3 teacher in our research study reported his reluctance to allow his students to use the word processors on the class computers until he had established (the substance of) their current literacy competencies.

### Change and improvement

The introduction of new technology is advocated on the basis of the improvements that will follow. But how are change and improvement related to substance and form? Improvement is fundamentally about achieving better substance. The form may or may not change. On the other hand, it is possible to change the form without improving the substance. Thus there are several dangers in managing change and improvement:

- confusing form and substance
- treating form as substance
- thinking a polished form reflects improved substance
- investing in form rather than substance.

This leads to the 'baby and bath water' challenge. The substance (baby and baby's wellbeing) must not be lost when the form (bath water) is removed or changed. In simple terms, the policy challenge is how to achieve transformation of the substance. The trap is that form is often easier to specify than how to achieve improved substance. Paradoxically, a transformation may not involve substantial change of form, but a transformation definitely involves a significant change of substance.

### Organisation for substance and form

Organisationally there are also issues related to substance and form. ICT may contribute by making alternative arrangements feasible, as in 'flexible delivery'. In this sense, ICT may enable students to engage with the substance of a program while participating in a different form of the program. There are significant implications for both planning of form and assessment of substance. Indeed it is common for matters of form, such as attendance, to be used for assessment. In this situation it is likely that attendance (form) is being used as a measure of engagement (substance). Form is largely the specific arrangements made to support or demonstrate learning (substance). That is, 'one form does not fit all'. Given that different students will require different support and may need to be able to demonstrate their learning in different forms, the following principles may apply:

- It may be necessary to provide/allow flexible forms to achieve consistent substance.
- Providing/requiring uniform forms is likely to lead to inconsistent substance.

Finally, quality is best achieved through consistency of substance rather than uniformity of expression of the substance (one form).

## TEACHER CONFIDENCE

There is a complex of issues that relate to teacher confidence with respect to their ability to incorporate ICT in class programs. From the experience of engaging with the technology, in the presence of other users, the teacher acquires some spontaneous concepts leading to some understanding and knowledge of the technology. Through reflection the teacher becomes familiar with the ICT tools and the purposes to which it might be put. Such experience is important in order for the teacher to become confident about tools and their possible uses and purposes.

### Cognitive (abstract) requirements

The teacher may acquire, through instruction, abstract concepts of ICT and a range of ICT-based tools and their possible uses and purposes. This understanding complements experience and leads to the acquisition of the necessary knowledge and skills to select, operate and apply (or enable others to select, operate and apply) the tools, and to achieve purposes and be confident about tools and achievement of purposes.

## Maturation of concepts (Vygotsky 1986)

Over time with continued activity, the spontaneous concepts move towards greater abstraction and become more useful as generalisations. Similarly, the abstract concepts move towards greater concreteness and make greater contributions to actual activity. This merging of the concepts leads to the acquisition of a single mature concept, which can be further enriched by subsequent experience and instruction—even the most successful classroom users of ICT want learning opportunities and support at their own level.

## Social-cultural requirements

Knowledge and purposeful activity cannot be separated (see Activity Theory, page 46). The use of ICT in classroom activities is normally purposeful. In addition, knowledge and activity are socially constructed. Thus meeting the threshold requirements at both the experiential and cognitive levels is easier and more meaningful where the teacher as learner is confident of support, for example, as a member of a community of practice.

## Time and place considerations

There is enormous competition for a teacher's time and attention. Making arrangements that support experience, abstract knowledge and the maturation of concepts requires consideration of issues of time and place. A spaced learning approach is vulnerable to disruption and distraction. Activities are situated; that is, they do not occur in a general sense but in actual times and actual places, and each situation has its own specifics including length of opportunity, resources available, competing interests, previous history of success and/or failure, policies and traditions, degrees of support and expectation.

## Comfortable and confident—positives and negatives

Comfort with technology is about:

- accepting its limitations
- confidence in its potential to be useful
- confidence in oneself and one's associates to select, operate and apply the available technology appropriately.

To be both confident and comfortable with the incorporation of ICT into class programs, teachers need:

- sufficient experience of the technology to be convinced that it can be used in their own situation to achieve the intended purposes;
- sufficient understanding of the technology itself to be confident about their ability to operate (or enable others to operate) the available technology to the achievement of the intended purposes;
- sufficient support and encouragement to make the endeavour significant and successful.

However, not all experience is positive and the basis for confidence may be put in doubt. The following have been observed to reduce confidence and to make the teacher less comfortable with ICT.

- Unreliable 'technology' frequently raises the issue of teacher confidence.
- Unsuccessful efforts cast doubts over the reliability of the technology and/or the working knowledge of the users.
- The effort involved may raise doubts about the cost-effectiveness of the use of ICT in the endeavour.
- ICT may be applied to inappropriate activities (for example, young students publishing long stories).
- ICT may be used by inadequately prepared users.
- ICT may be applied when in fact it is inadequate for the task (for example, the 'bandwidth' issue).
- Knowledge of ICT may be lost because of little opportunity to act on recent abstract learning and/or to extend recent experiences.

Some teachers report being 'bewildered by technology', by which they seem to mean that they are uncertain whether they know enough to select, operate and apply the technology appropriately in their class programs—they are yet to find a useful starting point.

## CONCLUSION

Constraints to successful integration of ICTs operate very largely at a personal level. While not denying the realities of the system's interests and external funding sources when it comes to implementation, there is a need to acknowledge the complexities of human interaction within the places of learning, which include school, home and other places. Borderless learning contexts interact with the limitations and reliability of existing infrastructure. Understanding the perspectives of the users and taking them seriously without judgement is a constructive way to overcome constraints.

## SUMMARY

Step 3 is about getting to the nitty gritty of ICT integration. Constraints are all too readily used as interference for working towards best practice. Constraints can operate at the management level and include support personnel and systems-level policies. Understanding the complexity of the teaching and learning spaces is the best way forward for sustained changes. Obstacles and constraints can be overcome if there is persistence and the shared goodwill to work collaboratively on issues for resolution.

The next chapter focuses on the process of action learning and how to make change happen.

***Suggestions for further investigation***

1 What are the contingency plans for anticipated difficulties?
2 Is there agreement among the team about best-case success and marginally successful outcomes?
3 If this project was implemented in another organisation, how would they deal with similar constraints?

**Further information**

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Online at: http://www.dest.gov.au/sectors/school_education/publications_resources/school_innovation/chapter_4.htm

Harvey, TR 1995 (reprinted 2001), *Checklist for change: a pragmatic approach for creating and controlling change*, Allyn and Bacon, London.

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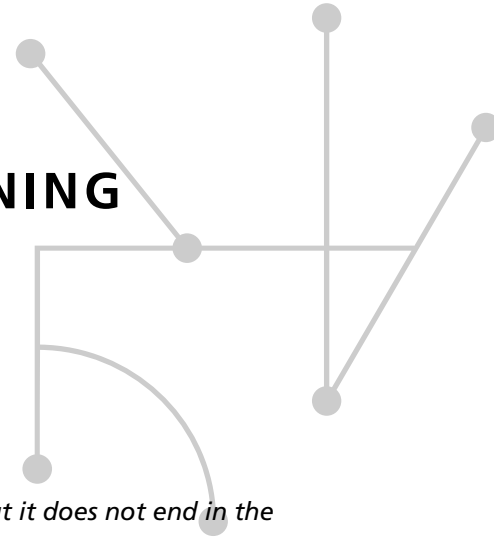
# CHAPTER 8
# STEP 4: ACTION LEARNING



*... knowing begins and ends in experience; but it does not end in the experience in which it begins.*

CI Lewis 1934, 'Experience and meaning', *Philosophical Review*, vol xciii, p. 134

So far in the process of the *Seven steps to ICT integration* we have focused on theoretical underpinnings like how to build communities of practice and working collaboratively but realistically to assess the constraints on practice as a means of avoiding failure. If all this prior knowledge is assumed, then the project is poised for focused action.

Our approach is based on the principles of action learning. Not to be confused with the more commonly applied action research, 'action learning' involves the application of a specific pedagogy. Developed by Revans (1980) it is consistent with other views of learning that assume that knowledge, learning, action and experience cannot be meaningfully separated. It also implies that knowledge is continually constructed and re-constructed in order to be able to act. As such it is also consistent with action research at an organisational level and the notion of professional practice as in teaching and other professions.

During this central part of the change process, the practitioners begin to implement new ways of doing things or initiate entirely new kinds of learning activities. In action learning, these experiences become part of a conversation with the other members of the project team and other practitioners. This first-hand experience equips those involved to investigate the working knowledge required for the change process to be effected. Working knowledge encompasses the range from logistic and pedagogical processes needed to organise the learning of others, to the operational skills for achieving results through technology. The experiences can lead to insightful questioning, which helps the participants understand the nature of the transformation in which they have been involved. Figure 8.1 provides an overview of the process. However, before becoming too involved with the

process of action learning we need to take time out to define what we mean by 'working knowledge'.

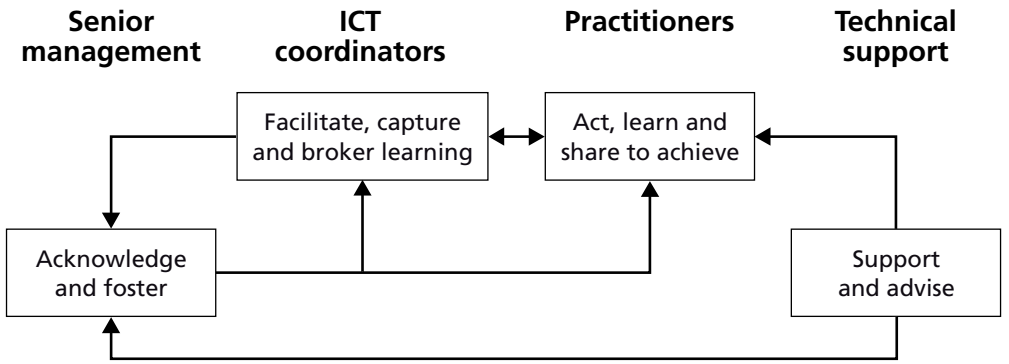



*Figure 8.1 Step 4: Action learning*

## WORKING KNOWLEDGE

Working knowledge is more than simply knowing how things work. Rather it is a body of knowledge that is sufficient for a person to be able to operate (including problem solving and troubleshooting) locally and in real time. Applying the technology to achieving a purpose by using working knowledge to carry out the necessary activities is the goal (see Figure 8.2). How to get there often requires a lot of energy and support. Working knowledge is likely to comprise:

- relevant experience locally and in using the technology
- related programmed knowledge: local arrangements and technology
- methods of inquiry in order to solve problems and address issues that arise
- consistent strategies in order to deal with the situations encountered.

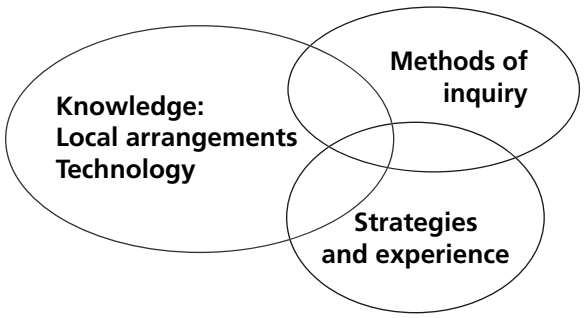



*Figure 8.2 Knowledge, inquiry and experience*

As teachers are required to lead learners, mediate learning and manage technology, a working knowledge of technology is sufficient to enable the user to manage it. Working

knowledge is shared with peers; that is, others who are at a similar stage of development as users of the technology. Thus, it is most often learnt in context and in collaboration with friends and colleagues. The measures of a satisfactory working knowledge include the following:

1. Confidence that 'it is not me' or a feeling of personal defeat in relation to the technology; something else about the device is the problem.
2. Systematic courses of action on hand to respond to situations that are likely to arise.
3. The likelihood of learning best from a recent novice who has already 'agonised' through the steps to success. This peer learning can involve students and teachers. The construct of 'peer' in this sense is another person who shares similar needs or is of similar rank in relation to their knowledge and skill development.
4. Programmed or learnt knowledge about the technology and the equipment in which it is embedded and the local arrangements in which the technology is to be used.
5. Substantial experience of the technology and the local arrangements.
6. Insights into the interplay between the technology, local arrangements and the prerequisite knowledge.

Such a body of knowledge includes a substantial amount of recent first-hand experience arising from personal action in the field of endeavour and in the local (or similar) context. The value of this experience provides knowledge of, and insight into, local arrangements and practices, including provision, resources and permissions needed. Knowledge of a range of common situations that cause problems can provide insight in and solutions for more recent problems, thus adding to the toolbox of working knowledge.

The consequence is that such first-hand experience may lead to, and be underpinned by, a set of relevant generalised or programmed knowledge, for example, about the kind of technology available. Generalised knowledge can be important because some tasks are only done occasionally. It can be more 'practical' to work from general knowledge than trying to recall specific experiences in detail. In addition, such generalised knowledge may be useful in bridging between previous similar experiences and the specifics on the current situation being addressed.

Some of this generalised knowledge relevant to ICT involves an understanding of what the machine is doing behind the scenes, which can be useful in isolating possible courses of action as well as identifying the possible causes of the current problems. This involves not so much 'what to do', but rather 'what is happening'. Training that focuses on 'what to do' to operate particular software may not develop a working knowledge required to be a user of technology. There can be a big difference between being able to do some certain (anticipated) procedure with particular software and being a confident user of technology.

The major value of a sound working knowledge is that a user of technology is able to stay focused on their purposes while choosing the ways and means of achieving them. The ways and means may include the technology in general and specific applications in particu-

lar. That is, the user has some choices of what to do or actions based on some insight into what may or may not be happening. This is a combination of experience and knowledge to diagnose the particular need. Rather than simply drawing on specific programmed knowledge, the user can draw on a sense of 'what to do next' in order to remove an obstacle or to progress smoothly towards the achievement of the intended purposes.

## ACTION LEARNING

### Knowing and action

Revans's (1980) construct of a pedagogy built on action learning is adapted in our research as the preferred method of problem solving in educational settings. His basic proposition is that we have two sources of learning: we learn from 'experts' and from thinking about our own (shared) experience. This involves programmed knowledge (P) and insightful questioning (Q) (see Figure 8.3).

- *P = programmed knowledge:* We learn from what we are told or shown by others

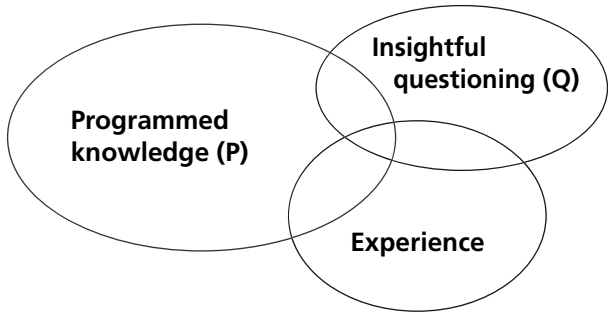



***Figure 8.3 Action learning: knowledge, insight and experience***

  by accepting explicit knowledge. This kind of knowledge is necessary but not sufficient to enable us to deal with the complex, messy, ever-changing reality of our own experiences. This kind of knowledge can be a basis for being clever.
- *Q = insightful questioning:* We learn from what we can think for ourselves. This kind of learning is required to make sense for our unique and sometimes unusual experiences; that is, from our experience we develop tacit knowledge. Such knowledge includes insights about ourselves (including our own knowledge and ignorance) as well as the world in which we live. This can be a basis for wisdom. Our own thinking is derived largely from insight into our own experience. This requires some questioning techniques that extend the insight to be achieved:
  - What don't I know?
  - What are the concepts involved?
  - How does it work?

- How did my actions help?
- Is this consistent with what we know?
- How does this explain our experiences?
- Where are the obstacles and constraints?
- To what extent are my purposes realistic, feasible and desirable?
- What questions might I ask in order to begin finding out?
- How does this add to what we know?
- Who else is struggling, as I do, with the complex problems of reality?
- What are our values, motivation and lived experiences?

Thus, the processes involved in insight are largely deconstructing and relating experience and knowledge, in order to reconstruct 'new' knowledge and prepare to test the new knowledge through new activities and experiences.

## Action learning redefined

Technology is used for doing things, and in doing things we acquire experiences. For the purposes of this project we have re-defined Revans's concept of action learning to more explicitly include experience and the actions (A) from which the experiences arise.

Therefore, for this project:

Action learning = P + Q + A

There is a logical link between action learning and the use of ICT. The use of ICT in teaching and learning can enable students to have easier and more extensive access to existing ('programmed') knowledge and also richer experiences from which to learn. In addition, ICT provides some tools that may assist in the development and resolution of insightful questions, for example, concept mapping and databases.

### Making sense of observations

In the course of reflecting on the wide range of observations made in our research through in-school observations, action research projects, conferences, workshops and discussions, some key themes have emerged around the early notions of action learning. One view of these themes is modelled in Figure 8.4.

This model attempts to capture the following propositions:

- Practices involve activities.
- Activities result in experiences, products and the acquisition of explicit knowledge, albeit that such explicit knowledge is of a low order.
- Experiences can be expressed as tacit knowledge.
- Through insightful questioning, explicit and tacit knowledge can be:
  - compared
  - related

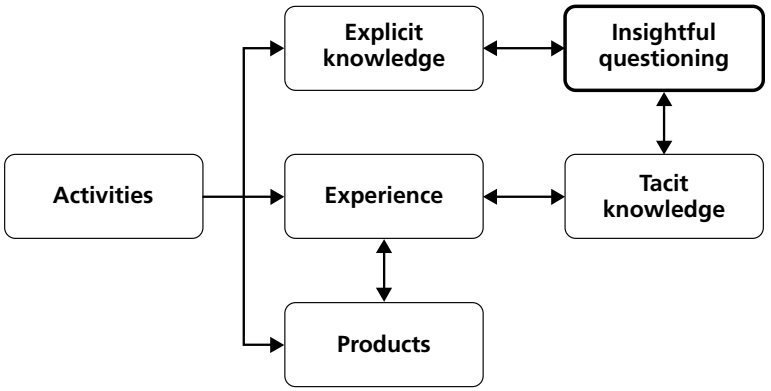



*Figure 8.4 Action learning*

– reconciled
– enriched.

Our observation that collaboration is vital in ensuring that ICT is used easily and well in teaching and learning, and that professional learning is also successful, has reinforced the notions of communities of practice (see Step 1). In communities of practice (Leach & Moon 1999, Sachs 2003), groups of people collaborate to improve both their tacit and explicit knowledge to identify their shared repertoire of actions and practices. They do this through participation as learners and teachers in the community where teaching and learning involve negotiation of meaning. The model also appears to be consistent with the work of Vygotsky (1978) in that his concept of maturation includes both abstract as explicit knowledge and concrete or tacit knowledge levels. The implication from Vygotsky's meaning is that the *insightful questioning* is undertaken as social construction of knowledge learning in which action, learning, knowledge and social engagement cannot be meaningfully separated. That is, the insightful questioning is undertaken through scaffolding activity and mediating experiences.

## Learning forms

The action learning model helps to inform consideration of various forms of learning, their sources and how they might be achieved.

1 **Learning about … (P):** Acquiring programmed knowledge is basically learning about the new idea or construct to be learnt (see Figure 8.5).
2 **Inquiry—wondering (Q) and learning why (P + Q):** Insightful questioning leads to consideration of what one knows and what it might be possible to know and, in particular, wondering why (see Figure 8.6). When related to available knowledge, insightful questioning leads to learning 'why', which may add to the available knowledge.

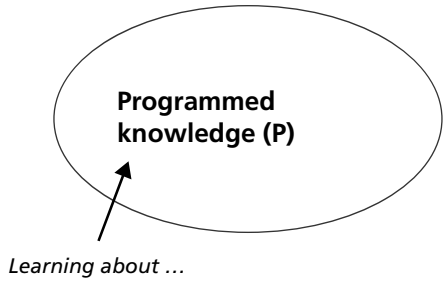



*Figure 8.5 Learning about ...*

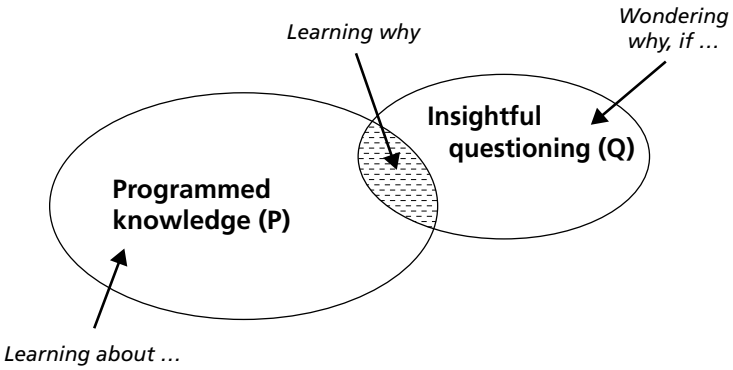



*Figure 8.6 Inquiry*

3 **Learning what to do (P + A):** Programmed knowledge, activity and experience are related in a time sense. We learn about something as part of learning what to do. For example, learning about ICT in order to know what to do to operate the devices involves existing knowledge and actions that result in experiences that may lead to 'learning about', as in trial-and-error or experimental activities (see Figure 8.7).

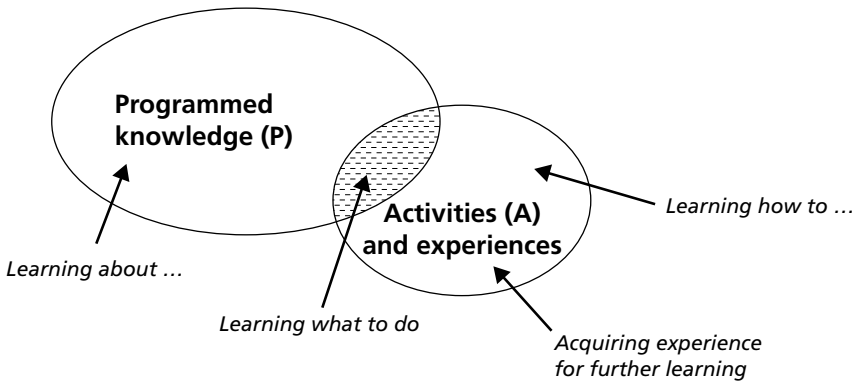



*Figure 8.7 Learning how to ...*

4 **Learning how to … (A + Q):** Recipes and manuals are rarely enough. Knowing the activities involved may be necessary but is rarely sufficient (see Figure 8.8). We need to know how to carry out the activities, and this can only be learnt by doing and being aware of doing. This is also a form of learning what works and at its simplest level may be simply trial and error, with insight being used to bring some system or order to the 'trial and error' (see Figure 8.8).

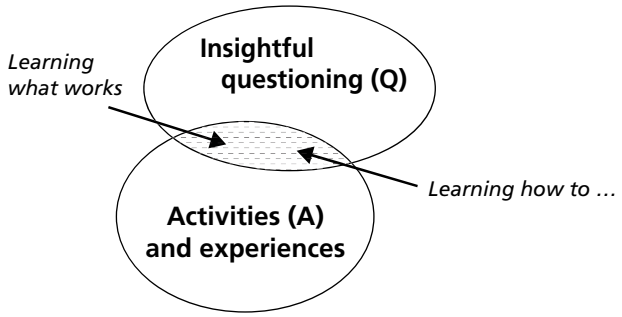



*Figure 8.8 Learning what works*

5 **Learning from experience (Q + E):** At a deeper level the learner may derive certain concepts from the experience; postulate possible explanations for the experience, plan and undertake subsequent activities to test the ideas generated by this process, and evaluate the results of the planned activities. Thus, with an increased level of insight, the learning takes on the characteristics of experiential learning and action research (see Figure 8.9).

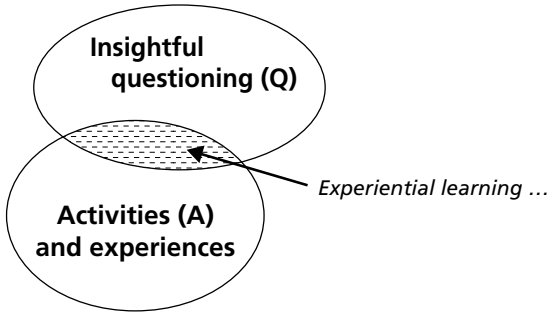



*Figure 8.9 Learning from experience*

6 **Learning to apply (Q + P + A):** Learning is not usually an end in itself. Rather, learning may be a means to a higher purpose. That is, the learning needs to be applied successfully in order to achieve its potential and purpose. Action learning is a style of learning that integrates all the above forms including:

- Learning about ...
- Wondering why ...
- Learning why ...
- Learning what to ...
- Learning how to ...
- Adding to personal knowledge (and the knowledge of others).

At the heart of action learning is the intention to act on the basis of what one has learnt by acquiring the relevant available knowledge (or adding to it insightful questioning), and from activity and experience in order to make the judgements that are necessary to act responsibly.

### Situational learning and action learning

Situational learning requires knowledge of, and insight into, the particular situation being encountered by the learner in order to make crucial judgements, namely:

- What is desirable?
- What is feasible?
- What are the implications?

Thus, action learning tends to be situational.

To summarise, action learning provides a strategy at the individual level for analysing personal need, which can be added to the SWOT applied to the organisational level. The next step is to shift this thinking into the context of ICTs.

## Action learning and ICTs

### Online learning objects

One of the online learning tools being used in classrooms are learning objects, which are interactive multimedia online digital learning and teaching tools. Mostly designed as stand-alone learning tools they can be usefully applied to illustrate the concepts of action learning and ICT integration.

Learning objects are devices that scaffold learning. They can be installed on a computer or be available on CD-ROM, online or any combination of these. While most are explicitly focused on *delivery of content*, other approaches can be more subtle and creative; for example, using self-tests to expand the learners' understandings and insights and to support the transfer of knowledge beyond the immediate topic or course. In order to be incorporated into a class program, the object is usually subjected to some selection process by those responsible for the program. This selection process may benefit from contributions from others, such as other colleagues, school policy or reviews in professional or promotional materials. The selection process may be initiated by the identification of a need within the class program, or an opportunity to access a particular recommended learning object (see Figure 8.10).

As with all processes it is possible that any of the steps involved may be a constraint.

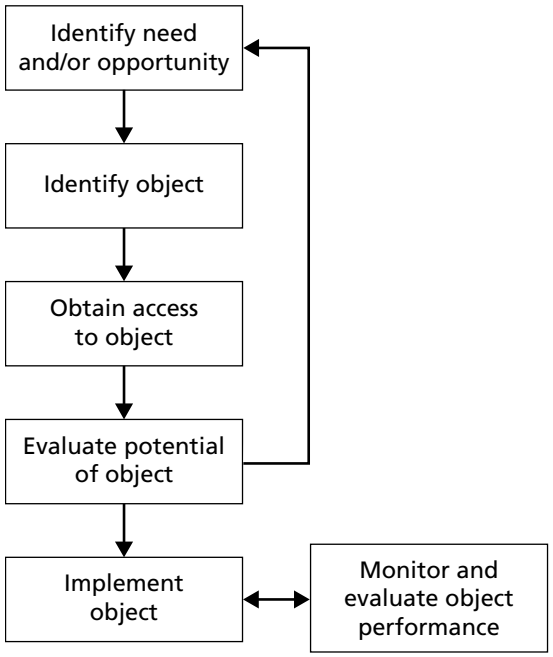



*Figure 8.10 Selecting a learning object*

### Windows of opportunity

Typically the above selection and action process must be completed within a reasonable window of opportunity. The significance and ongoing nature of a need is likely to expand the window of opportunity. On the other hand, many factors may shrink or consume it, including:

- Competing needs
- Competing opportunities, especially easier alternatives
- Difficulties identifying suitable objects
- Difficulties obtaining access to suitable objects
- Difficulties evaluating the object(s) once identified, especially becoming sufficiently familiar with the object(s) in order to make the necessary judgements
- Difficulties implementing the object(s), especially technical difficulties including inadequate hardware, software and slow connections.

Having been selected, a learning object must then be incorporated in the class program in place and time. A common advantage of online learning objects is that they generally provide teachers and learners with some increased flexibility in terms of place and time. However, the learning is still shaped by both teacher through pedagogy, and learner through

engagement. The value of the learning object is made up of its content and the extent to which it contributes to the scaffolding and mediation of learning (see Figure 8.11).

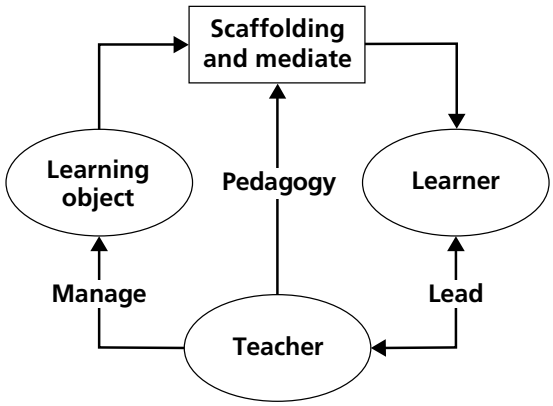



*Figure 8.11 Teaching and learning object*

### Learning objects and action learning

A learning object can be helpful in prompting and capturing:

- the recall of existing knowledge
- the recall of previous experience
- action on the part of the learner
- insightful questioning that leads to new knowledge.

In this sense, the use of learning objects can be consistent with action learning (see Figure 8.12).

Each step in the above processes requires knowledge, experience, insight and judgement on the part of the teacher(s) concerned. Efforts to meet these requirements can be

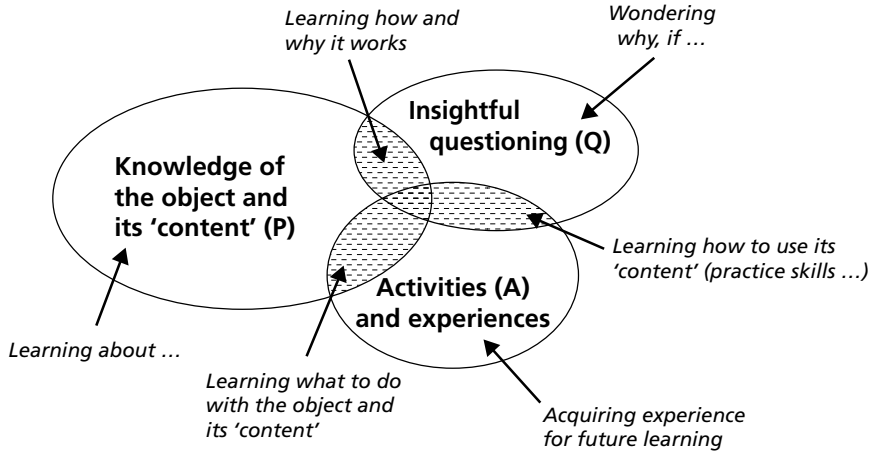



*Figure 8.12 Learning objects and action learning*

supported or supplemented by professional colleagues. For example, the evaluation of the potential of a learning object requires some familiarity with its content, structure and 'operation'. An experienced user of the object is likely to be able to provide an efficient introduction to the object, important insights about its strengths and limitations, and knowledge of the requirements to support its effective implementation. The alternative of 'discovery by the potential user' is likely to risk consuming all of the window of opportunity, and more. The added danger is that such an experience is likely to provide the teacher with the 'insight' or rationale that 'learning objects are more trouble than they are worth'!

On the other hand, membership of a professional learning community can provide teachers with the scaffolding they require to be able to successfully select and implement learning objects for the benefit of their students. From the observations made in our research, teachers who are having success incorporating ICT into their class programs are also members of a professional learning community, either within their own school or a wider circle of colleagues who communicate regularly. Such learning communities include an interest in the use of ICT to support student learning.

There are some design issues to consider. Many learning objects work well for the learners (as learners). However, at present few learning objects appear to give much consideration to other users, such as teachers (Robertson & Fluck 2004a, 2004b). In future it is to be hoped that learning objects will routinely make provision for all users including teachers who are involved in the selection and implementation of learning objects as per the above process model.

### Learning pathways

Action learning leads to the identification of several forms of learning. Most learning of any significance involves undertaking a complex set of learning activities covering several forms of learning (see Figure 8.13).

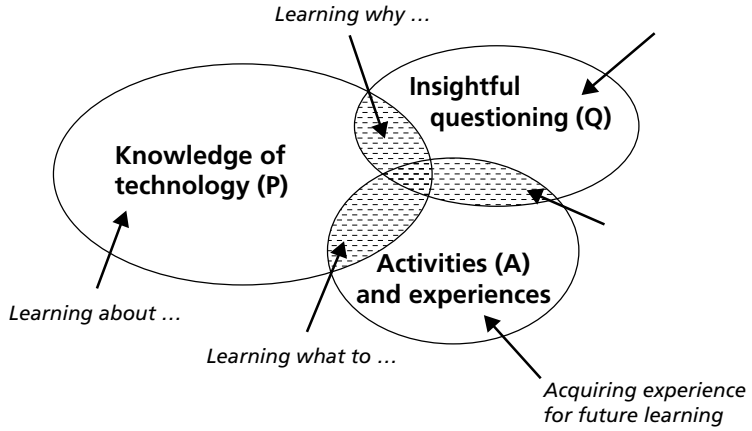



***Figure 8.13 Forms of learning***

One form of learning is likely to lead to another and require another form to complete the task.

**EXAMPLE: THE PENGUIN**

(P) learning about ... penguins may lead to ...
(P) learning about ... birds or Antarctica or ..., which may lead to ...
(Q + P) wondering why … penguins' feathers don't freeze ..., which may lead to ...
(P + A) learning what to do ... in very cold conditions ..., which may lead to ...
(Q + P) learning why ... some materials keep the cold out and others don't …
(A + Q) action that results in learning what works ... (and why); for example, an experiment with wet and dry objects in a freezer ...
(P) which may lead to ... knowledge of (learning about ...) air as an insulator and oil as a water repellent ...
and so on ...

The result of all this learning activity is knowledge (P) that may be applied in a situation. Some of this knowledge has been constructed by the learner through insightful questioning (Q) and drawn from activity and experience (A) as well as related other knowledge (P). The learning moves towards increasing maturity and scientific understanding.

**Reflective task**

Consider a recent learning task undertaken in one of your classes and map the pathway of learning activities taken by the students in terms of the forms of learning involved. What are their strengths and weaknesses in the different forms of learning? Consider also how the insightful questions were generated. We apply technology to our activities by operating the devices in which the technology is embedded (see Figure 8.14).

- The operation of technology requires expert programmed knowledge (P) about the technology and how it works.
- The application of technology may require insightful questioning (Q) into the situation in which technology is to be used (purposes, methods and implications).
- Through insightful questioning (Q) it is often possible to extend our programmed knowledge of technology (P).

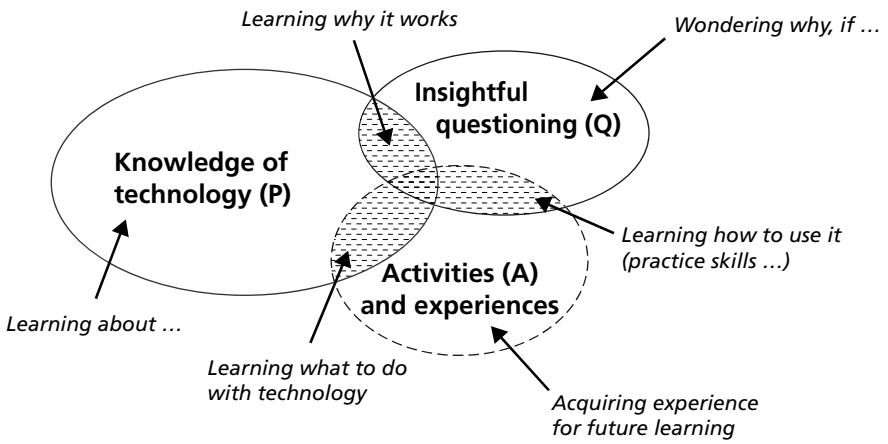



***Figure 8.14 Technology and action learning***

- Learning to use (operate and apply) technology: L = P + Q + A.
- Learning what to do with technology is largely about the operation of devices (P + A).
- Understanding technology requires knowledge and insight (P + Q).
- The skilled use of technology requires insight into how the technology works and 'hands-on' experience. Users typically extend their capabilities well beyond their received knowledge (P) by achieving insight into their experiences using the technology (Q + A).
- At a higher level this can lead to application and even potential innovation using technology: that application and innovation require knowledge and insight and action (P + Q + A).

**EXAMPLE: THE CHAINSAW**

- The operation and maintenance of a chainsaw requires expert knowledge (P); whereas,
- the use (application) of a chainsaw in a sensitive environment may require insight into the implications within and beyond the environment; hence
- L = P + Q + A

## Emerging learning concepts

Vygotsky (1978) reported that a concept emerges separately in two planes: the abstract (scientific) and the spontaneous (see Figure 8.15).

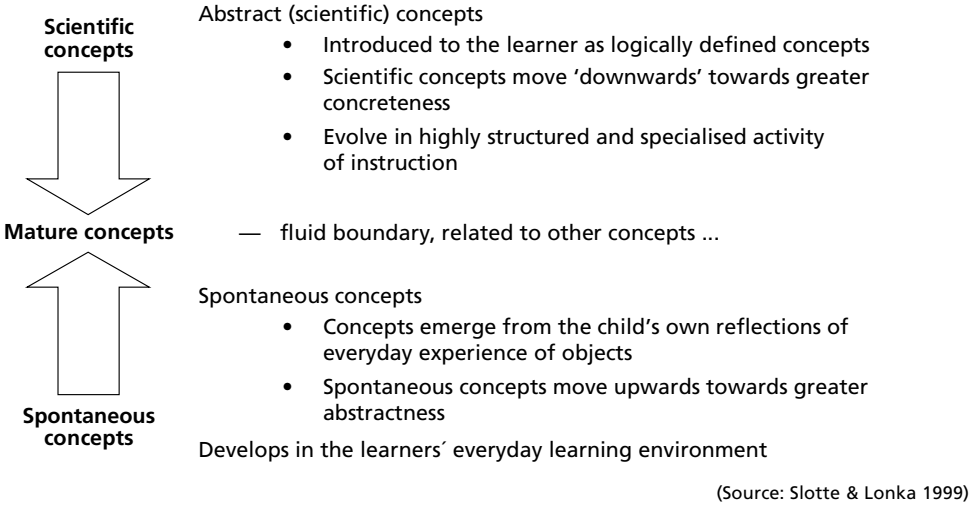



***Figure 8.15 Learning of concepts***

The extent to which an introduced concept is grasped will depend on the learner's other concepts. A learner who has little experience with ICT may have few or erroneous or spontaneous notions about the matter at hand. Much of the language of ICT is different from everyday language, which is likely to further compound the difficulties for the learner striving to achieve a mature concept. Furthermore, a tutor with a mature concept of the technology may have difficulties communicating with a beginner: it can, indeed, be sounds without mature concepts. Teachers and ICT professionals must be able to work together in order to ensure the successful incorporation of ICT into teaching and learning. However, this raises several challenges for both parties. Consider the arrangements represented in Table 8.1, which attempts to summarise the common starting points for collaboration between educators and ICT professionals.

***Table 8.1 Collaboration between educators and ICT professionals***

| | PROCESSES | TEACHERS | IT PROFESSIONALS |
|---|---|---|---|
| Education | Generalised | 'expert'<br>mature spontaneous concepts | 'novice'<br>limited spontaneous concepts |
| Technology | Specific | 'novice'<br>limited abstract concepts | 'expert'<br>mature scientific concepts |

The summary table suggests the likelihood of difficulties; teachers and IT professionals approach education and technology from very different perspectives. They have different roles ('expert' or 'novice') and knowledge bases including range and nature of concepts. Their core processes for their own professional activities differ. People may or may not be aware of the relative maturity, or otherwise, of their concepts, which are likely to compound the difficulties in collaboration. As practising educators, teachers are largely guided by their insights from experience of 'what works'. That is, they work from generalised processes, which they customise as required on a moment-by-moment basis from their experience (Webb et al. 2005). These notions are often well-developed spontaneous concepts. In the busyness of teaching, teachers are rarely able to indulge in clarification of the underlying scientific concepts of how and why their practices work. On the other hand, IT professionals need explicit scientific information in order to develop and manage ICT-based tools and artefacts that may be useful to educators in the processes being undertaken.

One of the most consistent comments from teachers interviewed in our research relates to their interaction with ICT support staff. Teachers greatly value those ICT support staff who assist them in the development of understanding of the technology being used at the time. Having an IT problem solved by an IT expert without explanation is thought by teachers to be only very marginally better than not having it fixed at all!

## Learning and curriculum

### Curriculum components

From the action learning model it becomes reasonable to understand curriculum as:

- bodies of knowledge to which access might be achieved
- the methods of enquiry or processes of reflection and insight
- personal and shared activity and experience (see Figure 8.16).

This tripartite understanding of the curriculum provides a basis for rich experiential learning tempered by access to existing knowledge and mediated by teachers and other

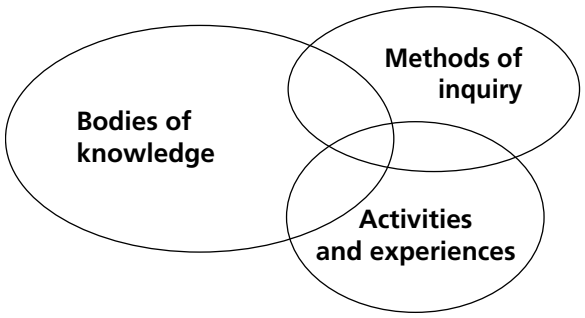



*Figure 8.16 Curriculum as action learning*

learners. This could lead to utilisation of the experiential learning cycle (Kolb 1984). Explained below, the simple learning cycle appears to capture the main features of experiential learning, action research and action learning.

### Experiential learning cycle

At its simplest, it consists of two stages: action and reflection in an ongoing series of cycles. However, the reflection gains its point by leading to learning, which in turn leads to changed behaviour in the future:

action → reflection → action

We can therefore expand the reflection component. We want to take into account that it is partly a critical review of the last action. It is also, partly, planning for what will happen next (see Figure 8.17).

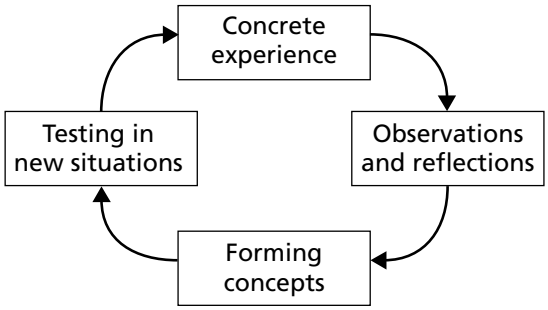



***Figure 8.17 Experiential learning cycle (adapted from Kolb 1984)***

## Learning structures and ICTs in the classroom

Our research observations in classrooms have also revealed much about the learning structures possible. The common learning structures identified in Table 8.2 are described and analysed in terms of the number of effective computers available to the students in the class, the students' working knowledge of ICT and the capacity of students to work independently with minimal direction and support. These factors are shaped further by other factors such as the learning tasks involved, the physical characteristics of the classroom and the cultural factors in the school and class.

The cultural factors include the concepts of teaching and learning held by the teachers and students. Clearly, teachers' concepts of teaching and learning impact on their assessment of the students' capacity to be withdrawn from the class and to work in groups or teams, and the capacity of students to work independently and, hence, the working knowledge they might require for a successful learning experience. Similarly, the students' concepts of teaching and learning are likely to shape their willingness to participate in the arrangements

made by the teacher. Students who expect that learning will not make demands on them may not respond well to the complexities and frustrations of using ICT.

***Table 8.2 Students' concepts of teaching and learning based on numbers of available computers***

| PCs | LEARNING STRUCTURE | WORKING KNOWLEDGE | STUDENT INDEPENDENCE |
|---|---|---|---|
| 1–3 | Withdrawal from class | Low to medium | Medium |
| 4 or more | Rotation of scheduled tasks in groups (e.g. webquests) | Medium | Medium |
| | Rotation of team tasks (e.g. group projects) | Medium to high | Medium + |
| 3 or more | Collaborative class projects with dynamic groupings | Medium to high | High |

**Note:** In making sense of in-class observations it has been necessary and important to distinguish between groups and teams.

Our observations further reveal that groups are often made up of a number of individuals (and sometimes pairs) working on identical or similar tasks in parallel. Teams, on the other hand, are made up of a number of students who share responsibility for the achievement of a shared goal: the members of the team collaborate and contribute to the achievement of the team's goal and benefit from the support of other members of their team.

## CONCLUSION

Knowledge-based improvement—for example, being informed and reflecting on experience and prior knowledge—are fundamental for advancing any project beyond rhetoric. The need to carefully design the project period requires a philosophical position from which to proceed. Action learning provides that process and enables teams or groups of practitioners to monitor their activities in structured ways that also facilitate ongoing reflection. The need to be prepared to change direction can be simply managed if the baseline information is being collected from the project's beginning. Step 4 is the period of greatest activity, and the period during which there is most to gain.

## SUMMARY

Step 4 of the Seven Steps is the 'action' phase. Recognising what you know already and applying insightful questioning to that knowledge is the recommended strategy for knowing what changes to initiate and introduce into the teaching and learning environment.

***Questions to consider***

1 What are the issues that remain unknown after the action learning phase?
2 What would be the key piece of advice I would pass on to someone else attempting the same kind of changes?
3 How could I test a revised procedure to compare it with my experience?
4 How is thinking about the learning activity different from actively 'doing' the activity?
5 What conditions assist you to feel comfortable problem solving in groups?

**Further information**

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# CHAPTER 9
# STEP 5: PROFESSIONAL LEARNING FOR EMBEDDING ICT

Having worked through the action learning methodology there will be an expanded awareness of many of the key success factors associated with professional learning.

Professional learning is much more than just learning about ICT. Step 5 involves an expansion of working knowledge. Some learning about ICT is necessary but will not prove sufficient. Teaching and learning are situated activities—they are only meaningful in terms of the place in which they are occurring. In this chapter we explore various theories of professional learning. They help to inform the process of action learning and enrich the outcomes for the project teams.

Of interest to this discussion is a parallel conversation related to the traditional concept of the apprentice and 'master'. Guile and Young (2001) comment that renewed interest in the apprenticeship system in part recognises the value of this 'on the job training'. The notion of apprenticeship 'directs us away from the idea of learning as transmission towards learning as a process' (p. 59). As a social theory of learning, the apprenticeship concept refocuses the attention onto the interactions between 'cognition, context and practice' (p. 60). From the professional learning perspective, the apprenticeship approach is instructive for helping us to reflect on the process of acquiring the working knowledge necessary to be able to incorporate the use of ICT into the daily practices of teaching and learning. Developing support networks and in effect joining or creating a 'community of practice' to support personal efforts should clarify the tutor and mentor roles in context. Unlike the apprenticeship relationship of the expert and novice, these roles will vary depending on the task at hand. The teacher is both the novice and the expert, depending

on the context and the degree of past knowledge. As indicated in Table 9.1, the expertise can vary considerably.

***Table 9.1 Professional learning cycle***

| |
|---|
| **Step 1: LEARN (in collaboration with others)**<br>• Clarify the focus of the learning (ICT and professional practices)<br>• Create/identify opportunity (engage with learning group, sources ...)<br>• Learn about ICT: concepts, operation, intended uses, case studies ...<br>• Plan trial use<br>• Intentions and expectations: activities, experiences, knowledge ...<br>• Context and arrangements<br>• Action plan: actions, resources, timelines, support, products, experiences |
| **Step 2: DO (in collaboration with others)**<br>• Make arrangements<br>• Carry out plan<br>• Observe<br>• Gain insights into the activity—technology, experience, knowledge, products ... |
| **Step 3: STUDY** |
| **Step 4: ACT (in collaboration with others)**<br>• Act on practices:<br>– refine and enhance existing practices<br>– create and develop new practices<br>– integrate (embed) new or improved<br>– reduce less effective<br>– cease or replace ineffective<br>– extend use of effective practices and transfer to new contexts<br>• Revisit from time to time or as required<br>• Contribute to a community of practice<br>• Identify emerging opportunities and needs |

We conclude that as the action learning phase of the change process proceeds, the focus of staff activity moves to practitioners and ICT management. Once the new ways of learning begin to become accepted into practice, the learners and teachers involved

have the opportunity to express opinions on ways to improve the process. For example, a convoluted computer login sequence is criticised, and this is a problem that needs to be handled by ICT management. Some solutions will require mutual respect and education as part of the professional learning process: teachers and students may benefit from technology-based tutorials on identity management. Other solutions may be available through adaptation of technological resources, for instance, obtaining identity information from an alternative source. As Figure 9.1 shows, professional learning is best understood as an ongoing collaborative cyclic process rather than as an event.

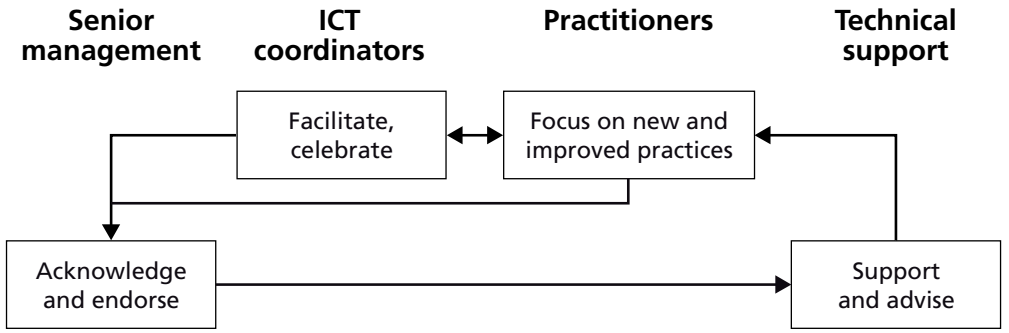


***Figure 9.1 Step 5: Professional learning***

## KEY ISSUES IN STEP 5

- Embedding ICT in the curriculum
- Principles of professional learning
- The professional learning cycle
- Tentative theory
- Stages of adoption of ICT

## ICT integration into the curriculum

Technology cannot be integrated into classroom programs overnight. According to Sandholtz et al. (1997), technology integration includes five stages: entry, adoption, adaptation, appropriation, and invention. Each stage has its own patterns of change and support requirements.[1]

### Entry

Instruction is traditional, with teacher-directed activities. Some common instructional technologies include chalkboards, textbooks, workbooks and overhead projectors. As they

1 For more information see http://k12.albemarle.org/murrayelem/principal/doe99/tchruse.html

begin to use computer technologies in the traditional environment, teachers typically encounter problems such as resource management. Technical issues may be demanding. The support needed for educators at the entry phase includes providing time for planning with peers and opportunities for staff to share experiences with non-participant colleagues (see Chapter 8 Action Learning).

**Adoption**

When teachers move into the adoption phase, they begin to show more concern about how technology can be integrated into daily lesson plans. Traditional whole-group lecture and seat work still dominates instructional strategies. Nevertheless, technology is now being used to teach students how to use technology. Common activities include keyboarding, word-processing or drill-and-practice activities. Teachers begin to anticipate problems and develop strategies to solve them. Although technical issues still exist, at this stage the teachers begin to perform basic troubleshooting on their equipment such as fixing paper jams or changing the ink cartridge in the printer (Sandholtz et al. 1997). Technical support and training for computer-assisted instruction and word-processing software are necessary at this stage (Dwyer et al. 1991).

**Adaptation**

Adaptation to and integration of new technologies into traditional classroom practice occur. Lecture, seat work and recitation continue to dominate classroom practice; however, during 30 to 40 per cent of the school day, students use word processors, databases, some graphic programs and computer-assisted instruction packages (Sandholtz et al. 1997). Productivity is a major theme. Students produce more, faster. Teachers have learnt to use computers to save time rather than create additional demands.

According to Dwyer et al. (1991), there are four support issues. First, encourage peer observation and team teaching, and develop a flexible schedule that permits these activities. Second, introduce and discuss alternative pedagogies. Third, because productivity is important at this stage, train staff to use such software tools as spreadsheets, databases, graphics, hypermedia and email. Fourth, introduce videodiscs and scanners.

**Appropriation**

Appropriation is more of a milestone than a phase. Personal appropriation of the technology tools by individual students and teachers is the catalyst to this change in technology use. Teachers' personal attitudes towards technology become the benchmark for this milestone in instructional evolution. Teachers understand technology's usefulness, and they apply it effortlessly as a tool to accomplish real work. More interactions between students are observed, and students work with computers frequently. There is evidence of project-based instruction, collaboration and cooperation, and creative schedules. At this

milestone, encourage routine peer observations and group discussions. Discuss alternative assessments. Encourage professional growth through conferences and presentations. Finally, examine technology integration goals.

**Invention**

Teachers experiment with new instructional patterns and ways of relating to students and other teachers. They reflect on teaching and question old patterns of instruction. Teachers begin to see knowledge as something students must construct rather than something to be transferred. Interdisciplinary project-based instruction, team teaching, and individually paced instruction are hallmarks of this phase. Classroom interactions change. Student experts surface to assist their peers and teachers with technology. Students work together in more collaborative ways. To support teachers at this level, advocate collaboration between teachers and encourage them to write about and publish their experiences. Create an ongoing support system with others outside the district through email and the Internet. Finally, integrators should share their knowledge by mentoring other teachers.

## Principles of professional learning

'Practices' are the bridge between success and professional learning. This is well illustrated by the outcomes of the professional learning action research projects we describe in Part C of the book. The message is that there is a close relationship between the achievement of the key success factors and professional learning. The key success factors are those things that will ensure the success of the practices being undertaken using ICT, namely:

- high-order purposes and rationale for using ICT
- the matching technology is available within the window of opportunity
- the users have the necessary working knowledge to select, operate and troubleshoot the technology being used
- that the endeavours (practices) are cost effective
- professional learning is about the development and use of new or improved practices that incorporate ICT.

Figure 9.2 on page 118 attempts to illustrate the relationships between professional learning, practices and the key success factors. The complexity is apparent within this framework. Hence the need for professional leaders to take bite-sized bits of the puzzle and build strengths gradually. In the early stages, small projects are the best.

Professional learning is not simply about the use and potential of ICT. For example, the professional learning may focus on:

- adopting new purposes because the technology makes them feasible
- expanding the window of opportunity for the users
- increasing the cost-effectiveness through improving the value and extending the use of the products.

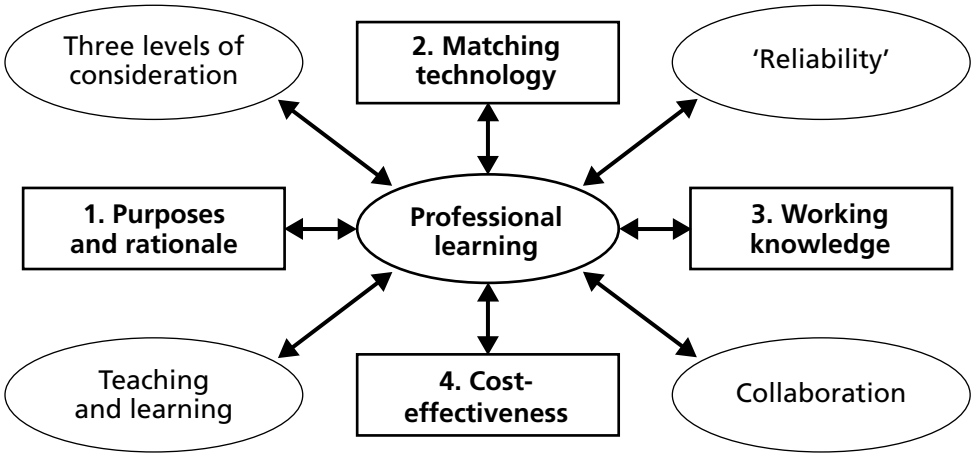


***Figure 9.2 Professional learning as a key success factor***

In addition, professional learning is closely related to the place given to ICT by the school or group in which the professional learner participates. As indicated in other chapters, sound management of the use of ICT in teaching and learning requires consideration of its use at levels of the classroom, the school and its wider community. At its best, professional learning is achieved within a community of practice: such an approach is likely to minimise costs and add considerable value while speeding up the development and deployment of new or improved practices. Ultimately the practices are embedded in the life and work of the school, but for this to be possible within a school, the school must commit itself to the support and development of collaboration and the negotiation of meaning.

## Action learning cycle

Our research experience shows that action research projects help to discern a professional learning cycle. At each step in the process, the roles, responsibilities and tasks change according to the intentions, opportunities and capacities of the group. Management of the cycle is shared and collaboration allows for customisation to meet the needs of particular learners. Management is more a matter of leadership and facilitation rather than direction. The results include greater knowledge of and access to available knowledge resources. In many ways the process is one of knowledge management rather than simply training and skill development. As stated previously, the professional learning cycle has four steps:

Learn → Do → Study → Act

The principal features of this professional learning cycle are captured in Figure 9.3. The engagement of the learning group relies on more than the central or immediate issues of concern. It becomes clear as the process develops in a school that the members of each group learn about themselves as participants and also about each other. Ideally

the members learn to like each other and respect each other's talents and strengths. This affective dimension helps to strengthen the commitment to the project's goals. Morale is lifted and a renewed sense of optimism can help boost the chances of successful completion of projects.

We assume that professional learning is aimed at improving professional practices through introducing new practices, making previous practices easier and/or more effective. A process for the continuous improvement of professional practices is implicit in the professional learning cycle.

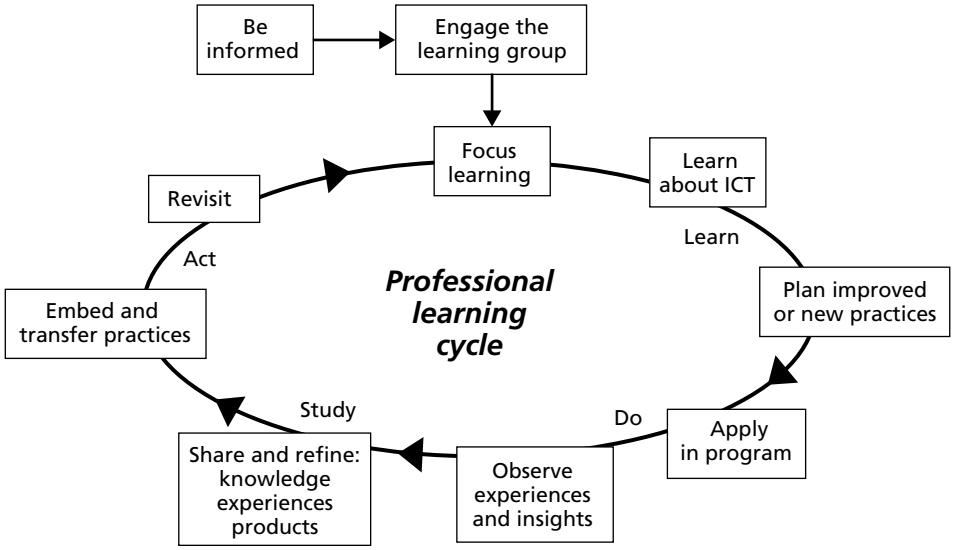


***Figure 9.3 The professional learning cycle***

This cycle involves a redefinition or new version of the professional learning process. While it may represent what has been intended by most professional learning initiatives, the above model specifically incorporates steps that might otherwise not be carried out. The typical one-off workshop may enable the teacher to 'learn about ICT', but the remaining steps are often a matter of personal initiative. Much workshop learning is largely about abstract concepts for the learner and, unless supported by action and experience, will not be complemented by spontaneous concepts. Isolated abstract concepts are rapidly lost. ICT is used in learning and other activities, and action learning provides a useful framework for considering ICT in class programs.

Ancient Chinese wisdom may apply here:

- 'I hear and I forget'—abstract concepts
- 'I see and I remember'—if the observations are of real phenomena
- 'I do and I understand'—hence the need to take the learning into actual classroom practices.

## Tentative theory

In-school observations (Robertson et al. 2006) support an emerging 'tentative theory' that has the potential to inform the development, management and use of ICT in relation to teaching and learning. There are *four key success factors* that together ensure that ICT is used easily and well in the life and work of the school:

1. Purpose and rationale that emerge in 'local' conversations and persist as discourses
2. Matching technology that is readily available, functional and reliable
3. Working knowledge that is readily available to the users
4. Cost-effectiveness, in that the valued added through the use of ICT is worth the time, effort and other investments made, including hardware, software, facilities, and support

Scaffolding the successful use of ICT requires explicit consideration at three levels attending to governance, classes and activities. This consideration needs to be informed by an understanding of the key success factors and the current situation in the school.

***Table 9.2 Adoption stages of ICT***

| STAGE OF ADOPTION | CHARACTERISTICS |
|---|---|
| Entry | Learn the basics of using the new technology. |
| Adoption | Use new technology to support traditional instruction. |
| Adaptation | Integrate new technology into traditional classroom practice. Here, they often focus on increased student productivity and engagement by using word processors, spreadsheets and graphics tools. |
| Appropriation | Focus on cooperative, project-based and interdisciplinary work—incorporating the technology as needed and as one of many tools. |
| Invention | Discover new uses for technology tools, for example, developing spreadsheet macros for teaching algebra or designing projects that combine multiple technologies. |

For more information on this particular framework, see p. 16 of the ACOT 2000 report [http://www.apple.com/education/k12/leadership/acot/pdf/10yr.pdf] and also the work of Sandholtz, Ringstaff & Dwyer 1997.

Reliability is a critical and complex issue that needs to be managed comprehensively by being informed by the current situation and anticipated future needs, and supported by services and professional learning.

Professional learning for ICT integration into practice is best if:

- focused on practices
- situated in the life and work of the school as an ongoing cycle
- undertaken as a community of practice.

Adoption of ICT tends to follow a sequence of developmental stages, such as those outlined in Table 9.2 opposite. They reflect a growing confidence with the use of the technology and a growing awareness of its potential in the context of teaching and learning.

## CASE STUDY: A SYSTEMS APPROACH TO ICT IN SCHOOL EDUCATION

To conclude this chapter, we include a case study taken from some of our research data. The case study examines the incorporation of ICTs into class programs and, in particular, the issues of computer reliability and the nature of teachers' working knowledge required to support the use of ICTs in class programs. In addition, the case study outlines possible links between learning structures, student competence and the availability of computers in the classroom. Finally, there is discussion of the link between technology and activity as a basis for the adoption of an action learning approach to pedagogy with possible implications for transformation of teaching and learning.

### A SYSTEMS APPROACH TO ICT IN SCHOOL EDUCATION

The project draws data from classes of students in grades 3, 5 and 7 using a Tasmania-wide survey conducted in late 2002 and intensive observations in selected schools. Participating schools were in the state or Catholic education systems.

The following model (see Figure 9.4) was adopted as a starting point for the study to describe the basic flows of information that may involve the use of ICT. The study so far has shown that the model is grossly simplistic. For example, home is typically only one of several locations in which many students regularly access computers outside of the school.

Class teachers are expected to plan, arrange and manage the use of ICT in the context of strong competing demands from within the class program and from external sources. These competing and conflicting demands often cause the reality and the rhetoric of ICTs in classrooms to be at odds. This is not to deny very impressive use of ICTs by many teachers. However, the variation between classrooms within the same school and between different

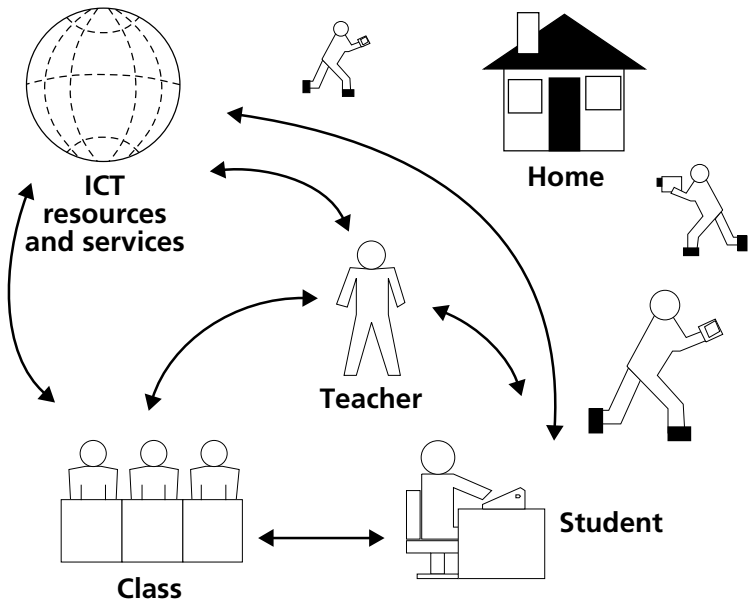


*Figure 9.4 Information flows with ICT*

schools is quite marked. Teachers cite making arrangements for the use of ICTs and troubleshooting situations that arise as major concerns.

The survey data revealed that teachers found computer workstations available (90 per cent of respondents) and accessible (93.2 per cent of respondents found this accessibility moderately or very easy). However, 38 per cent of respondents claimed that classroom workstations were unreliable. This prompted additional investigation through the classroom observations to examine the reasons for the teacher responses.

### *Reliability*

Workstation unreliability was reported as so common that teachers said they had to 'plan on the basis the ICT will fail'. This issue has been identified as a major reason for teachers' reluctance to adopt ICT (Cuban 2001). Further observations indicated that 'reliability' is a complex issue extending well beyond the reliable correct functioning of the devices in which the technology is embedded. In-school observations in the Tasmanian primary schools in this study have confirmed Cuban's observations that the causes of failure were due to technical, managerial, historical, policy and knowledge matters. Several strategies are suggested below to resolve these matters.

***Technical 'problems'***

The way in which the school systems involved in the project provide technical support to schools clearly skews the level of reliability of the devices involved. Servers and networks receive the most intense support. Devices in classrooms typically receive little or no attention until they fail. It was commonly observed for well-managed networks to be serving a very mixed bag of computers and peripherals that were configured poorly and thus difficult to use. Screen settings on similar machines in some classrooms were found to vary from 600x480 to 800x600 to 1024x768 pixels. In many cases, the machines within a classroom had different operating systems and different software and different versions of the same software. In addition, the software was not always configured to make it easy for users. It was common for Word to be configured to save to 'My Documents' on the C drive when in fact the policy was that students should save to their own folder in the class share of the school server. The cost of documents 'lost' because of this simple configuration oversight can be high: wasted time and effort, frustration and loss of self-esteem, and disruption to the teaching tasks as efforts are made to find the lost item.

The system policy to appoint the most senior support personnel as Managed Network Specialists to look after the school servers and network ironically seems to have contributed to poorly managed resources in classrooms. This was further aggravated by the fact that the older and less capable computers were often in classrooms where there was least support. The best machines (requiring least support) were often used in administration roles close to the source of support. These more reliable machines tended to be used for similar tasks from day to day, by fewer users and were likely to be well configured for useful shortcuts and software setting for their intended purposes.

On the other hand, many classroom machines were used for a much broader range of applications, for much shorter periods of time by many different and inexperienced users. As such they require far greater resilience. However, many classroom machines have shortcuts left over from previous learning tasks and may not have the software or peripherals installed that are required for the next set of learning activities. The support required in this context might be described as ongoing and pre-emptive. An apparent paradox is that few teachers know enough about ICTs to identify what might be 'pre-emptive', and the same is true of many technicians who have the

technical knowledge but lack of knowledge of the needs and practices of classroom users.

### *Working knowledge*

Increasingly, learning involves actions and activities that may be enhanced by the use of appropriate technology. In order to take advantage of technology, users need to have sufficient knowledge and experience, that is, to have a working knowledge of the technology. Working knowledge is considerably more than simply knowing how things work. Rather, it is a body of knowledge that is sufficient for a person to be able to operate and manage (including problem solving and troubleshooting) the technology, locally in real time. This has led to the notion of a 'working knowledge' of technology. To elaborate upon the nature of working knowledge and the way in which it is best acquired, further analysis is needed. Investigations in this area have considerable potential to inform professional development and have already led to an increased focus on the reliability of ICT in the classroom. Reliable technology requires less troubleshooting and thus people can be effective users of the technology with a smaller working knowledge.

Teachers have reported greater confidence in their own working knowledge when it is based on their own relevant local experience of using the technology. Local experience gives insights into local arrangements, the technology that is actually available and methods of inquiry that will help solve likely problems and deal with issues that arise. Locally delivered professional development is valued by teachers because they believe they are more likely to acquire consistent strategies in order to troubleshoot when the situations occur.

### *Peer support*

Teachers reported that peers often share their working knowledge. That is, teachers can learn well from colleagues and others who are at a similar stage of development as users of the technology. Learning about ICTs frequently has a social dimension. In many cases, both teachers and students regularly report that learning about ICTs often occurs in context and in collaboration with family, friends and colleagues.

### *Role of mentors*

Seventy per cent of Grade 3 students interviewed identified an older family member as their prime source of learning about how to use ICTs. Teachers

who are the most comfortable with ICT are frequently those with their own personal professional support network of colleagues with whom they share experiences, insights and knowledge of strategies, resources and ICT itself. This support network is frequently extended by the regular use of email.

***Measures of success reported***

The measures of a satisfactory working knowledge as expressed by teachers were increasing ease of using the devices and the capacity to place any problem realistically with the knowledge that action is possible. Teachers identified as a developmental milestone their realisation that a difficulty with the ICT 'is not me—it is something about the device' and 'there is likely to be something we can do about it'. Teachers usually try to increase their working knowledge when faced with a problem situation. They valued technical support staff members who assisted with the acquisition of working knowledge while helping to solve the immediate problem. Teachers consistently reported that the difference between poor and 'wonderful' ICT support staff was not their technical expertise, but rather their ability to help the teacher understand the situation and the course of action that will resolve it.

Thus, achieving homogeneity of the well-maintained classroom ICT environment linked with the acquisition of a working knowledge that enables the teacher to operate and troubleshoot the technology being used, are proposed as the cornerstones of any strategy to implement ICTs into class programs. Reliability and homogeneity of the technology help to reduce the working knowledge needed by users.

Homogeneity is not simply an issue within a classroom; as one keen Grade 3 student who was a high user of his home PC reported: 'I don't know where to find things on these [classroom iMac] computers.' The student's difficulties were compounded further by the very limited use made of the classroom computers. There is a clear implication that working knowledge needs to be maintained and developed by ongoing experience.

***Learning structures***

In-class observations were made of some thirty classes in twenty schools. Observers collected data through structured observations focusing on classroom arrangements and class schedules. In addition, there were surveys of students about their actual access to computers within the school and in other places, their preferred ICT and other activities, and their favourite websites. This data

was supplemented by interviews of a cross-section of students in each class for more detailed insights into their attitudes and practices in relation to ICT. Furthermore, observers interviewed the class teachers of the observed classes, principals and ICT coordinators.

### *The number of classroom computers*

As a result of these observations, we have been able to identify a number of different working arrangements relating to student use of ICTs. The learning structures observed in classes appear to be based on the number of computers, the IT working knowledge of students and the ability of students to work independently. It should be noted that establishing the effective number of computers has not been a straightforward task in many classrooms. The performance, location and orientation of classroom computers have an impact on their 'effectiveness'. Students will avoid using slow, unreliable and non-networked machines. In one classroom students used only two of the five working computers during four days of observation. Student access to classroom computers often requires teacher approval, which may not be granted if the teacher judges that he/she is not able to provide adequate supervision and/or support. Thus, the location of computers in a classroom annex may mean that they are, in effect, not available except in special circumstances; for example, when a teacher aide is available to assist and supervise students. In other situations, computers outside the classroom may be readily available. Some teachers in adjoining classrooms make 'overflow' arrangements for students from each other's classes to be able to use the computers from both classes. Similarly, one class next to the school library was able to increase the effective number of computers available to students from the two in the classroom to nine by including the library machines with considerable ease.

### *Factors in learning structures*

The learning structures identified in Table 9.2 are described and analysed in terms of the numbers of effective computers available to the students in the class, the student working knowledge of ICT, and the capacity of students to work independently with minimal direction and support. These factors are shaped further by other factors such as the learning tasks involved, as well as the physical characteristics of the classroom and cultural factors in the school and class. The cultural factors include the concepts of teaching and learning

held by the teachers and students. Clearly, the teacher's concepts of teaching and learning impact on their assessment of the students' capacity to be withdrawn from the class and to work in groups or teams, and the capacity of students to work independently, and hence the working knowledge they might require for a successful learning experience. Similarly, the students' concepts of teaching and learning are likely to shape their willingness to participate in the arrangements made by the teacher. Students who expect that learning will not make demands on them may not respond well to the complexities and frustrations of using ICT. One Grade 3 student reported a strong dislike of using computers in class and avoided them whenever possible despite being an avid online gamer out of school. He would 'much rather use a pencil and paper'. Several students reported similar attitudes in relation to drawing and painting.

## CONCLUSION

We conclude that professional learning in situated contexts is the most rewarding for long-term benefits of the school, its culture and achievement of its purposes. The notion that professional learning is linked to the apprenticeship model is worthy of consideration. The learning cycle relies on the ongoing stimulus of colleagues to better inform the change process. Collaboration and action are part of the reflective process involved in professional learning.

## SUMMARY

Step 5 in the process towards integration of ICT into teaching and learning contexts relies on embedding the professional learning acquired in the previous action learning related to Step 4. The embedding process relies on seeking strong connections with the day-to-day practice in the school setting and monitoring progress on a regular basis. Professional learning is a cycle of ongoing reflection, collaborative planning, action and evaluation.

In the next chapter we consider the importance of 'going public' with the outcomes.

***Suggestions for further investigation***

1 Have you identified specific areas of concern in the implementation stage of the project?
2 Through dialogue with project team members, has a range of possible solution sources been identified?
3 Are there specific professional development requirements for team members that emerge from the action learning process?

**Further information**

Education Network Australia: Professional learning information and opportunities can be found using a search term at the URL http://www.edna.edu.au/edna/search?qt=professional+learning

Elearning 2004, *ICT professional learning strategy 2005–2007*, Department of Education and Training, Victoria.
Online at:http://www.sofweb.vic.edu.au/ict/pdfs/ICT_pl_strategy_final.pdf

# CHAPTER 10
# STEP 6: SHARING OUTCOMES AND PRACTICES

Now is the time for celebration! This stage embeds new practices into the life of the organisation and begins by sharing experiences, insights and outcomes. Towards the end of the designated project period, it is important for all the participants involved to collectively reflect on their achievements. What better way to do this than to invite people from outside the organisation to see what has been achieved? This can be a purposeful exhibition that highlights the differences between previous norms and the new ways of learning that have been introduced. By making these changes explicit to an external audience, they become clearer to the students and teachers who have been involved. Part of the exercise is to identify difficulties and how they were solved, and to highlight successes and compare them with previous practice. Laying out the story is one way of making it real for the organisation, and also to evoke the interest of similar organisations contemplating similar journeys.

Identifying achievements, especially in terms of increased alignment and new or improved practices, becomes part of the culture when they are recognised publicly. Celebrations and sharing these achievements are not frivolous activities but declarations of intention that reinforce achievement and its ongoing authority. Celebrations help to authenticate the process. They form part of the evaluation process from which to draw feedback for ongoing improvement. Transferring and embedding these practices into the life and work of the institution is a key step in the process of change (see Figure 10.1).

In this chapter we consider these issues in the form of a retrospect related to two examples of the professional learning process. The first example describes the Seven Steps

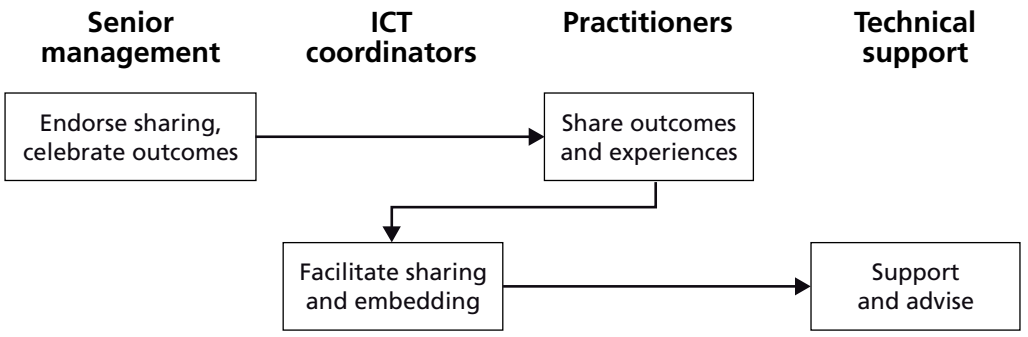


***Figure 10.1 Step 6: Sharing outcomes and practices***

process in the context of four participating schools. We detail the steps through which the journeys of these four primary schools developed. In the second part of the chapter we chronicle the public version of this celebration. This was a time when the four school teams presented at a conference in the presence of other project presenters—ministerial, senior administration, the press, publicly invited and IT industry-based representatives. This public declaration helped affirm the quality of the activities and their value in the wider context of our community.

## SCHOOL-BASED CASE STUDIES OF ICT-RELATED PROFESSIONAL LEARNING

The outline that follows describes the steps taken in each of four primary schools during the final school term of 2003. Each context differed in terms of its demographics, school culture and learning expectations. Together they shared a common interest in school-based improvement in their practices and a strong desire to act as the catalyst agent of change. Our plan was to work collaboratively with the schools to apply our tentative model for professional learning—the Seven Steps.

Schools were provided with an introductory workshop (approximately 2.5 hours) for their project teams, during which they were introduced to the theoretical notions emerging from the in-school observations made in an earlier project (Robertson et al. 2004). The particular focus was on three levels of consideration, which propose that in order for schools to successfully incorporate the use of ICT into class programs it is necessary for the use of ICT to be considered at three levels within the school, namely:

- School level: governance, infrastructure, people and applications
- Class level: students, teaching and learning, student outcomes
- Activities level: activities, knowledge, experience, products and insight.

In each project a team of three or four leading staff members (including the principal) engaged in developing and implementing an action plan with the following steps:

**1** Assess the current situation (general)—initial workshop and follow-up reflection.
**2** Choose a professional learning focus for action.
**3** Gather information about the present situation (focus).
**4** Implement initiatives.
**5** Study results.
**6** Act in response to findings.

The experiences demonstrated the flexibility of adopting the consensual model and adapting it to diverse situated contexts. Together we recognised the fundamental principles already outlined in the previous chapter. The following insights highlight the learning that took place for all concerned. They provide a set of principles for effective professional learning outcomes, outlined as follows.

**P1** In all four schools the professional learning process resulted in new and **improved professional practices**. The rationale for learning about ICT is that ICT may provide the practitioner with new ways to do old things easier and better. However, knowledge of ICT is not enough; professional learning is about situating the use of ICT professional practices.

**P2** Professional learning includes '**learning to manage**' better. The use of ICT requires managing resources and selecting ICT that can assist with management of resources and practices by making arrangements and getting organised, using the technology through applying technology in the class or office, and achieving purposes using known processes.

**P3** Purposes and processes should be **meaningful**. A key aspect of making arrangements is about ensuring that the purposes and processes used in the professional learning activities have meaning for the participants, and are likely to be endorsed, supported and encouraged by the school.

**P4** **Being informed** is essential. Information gathered from staff in the research project schools suggests that needs, interests, experience and capabilities in relation to ICT are not distributed in any consistent way. Hence, those making the arrangements for professional learning should be informed about who knows or wants to know, and what to know.

**P5** Build the outcomes in the school culture through **collaboration**. The arrangements help to ensure that outcomes of the professional learning become part of the school culture. They require working and learning with meaningful groups to develop communities of practice. Extending the collaboration to teaching, technical and other staff, beginning with staff induction, helps to expand the community of practice construct.

**P6** Start with **situated** samples and credible experiences. These provide meaning, not promises, and help to identify shared purposes and experiences.

**P7** **Keep timelines short** and the focus specific. The KIS (keep it simple) is a worthwhile motto to follow. Our action research findings indicate that shorter timelines 'work better'. Staff reported their appreciation of the shorter timeframe used in some of the projects. They found it easier to manage for one or more of the following reasons:

- Effort is more sustainable over the shorter period
- More people doing similar things (overlap of activities)
- Greater consciousness of what is happening
- Experience is shared informally
- Learning is more incidental
- More assistance with troubleshooting
- Greater intensity, with less distraction/disruption
- More attention, more awareness and more familiarity
- Greater confidence and comfort
- Sharing the load is easier.

**P8** Take ICT into the classroom with **modelling** and support. Knowledge of ICT is not enough. There is need to share and review the experiences within the learning group *and* share the experience and results beyond the learning group.

**P9** Apply, learn, share and **take it forward**. Learning continues beyond the trialling of a new practice in the learning environment. There are different things to learn each time ICT is used. As demonstrated in the projects, the progress of learning is enhanced by sharing within the learning group and into the wider staff and community.

To summarise, the **basic principles** for the design and delivery of professional learning are:

- Keep timelines short and the focus specific.
- Introduce the possibilities of ICT through:
  - meaningful products
  - examples of successful use
  - sharing credible experiences.
- Build collaboration with the learning group throughout the process.
- Promote co-learning (learning 'buddies').
- Arrange tutors for learners for how to use and manage specific ICT.
- Involve learners in planning and preparing for ICT use in the classroom.
- Arrange in-class support to maximise the chances of success.
- Apply and learn the professional uses of ICT in the classroom with success and achieve:
  - new ways to do old things better, and
  - new ways to do new things.
- Share and learn and take it forward (and revisit later).

## Findings

The findings lead to some initial conclusions regarding the benefits of our professional learning approach. Unlike the traditional approaches the outcomes were much more clearly defined. We define these as second-generation outcomes (see Table 10.1). In this sense, second-generation is designed to highlight the fact that the outcomes from this process can be part of an ongoing cycle or series of professional learning activities that expand the body of knowledge to other staff members. The primary aim of this kind of focus is organisation transformation of the whole culture.

***Table 10.1 Traditional and second-generation professional learning compared***

| PROFESSIONAL LEARNING | TRADITIONAL | SECOND GENERATION |
|---|---|---|
| **Cost-effectiveness** | Low (waste, rework ...) | High (practices, JIT, sustainable ...) |
| **Sustainability** | Variable (often low) | High (embedded in culture, aligned with school purposes and vision ...) |
| **Information base** | Variable (limited) | Explicit: participants and context |
| **Transfer of learning into practices** | Intended, optional, hoped for ... | Built into professional learning with direct or indirect support |
| **Requirements of the institution (school)** | Minimal | Sound governance, clear concept of ICT, endorsed purposes in using ICT ... |

The elements identified in Table 10.1 were consistently brought together in the action learning projects as a series of steps in what is emerging as a cycle of learning. At each step, the roles, responsibilities and tasks changed according to the intentions, opportunities and capacities of the group. Management of the cycle was shared and collaboration allowed for customisation to meet the needs of particular learners. Management as we observe is more a matter of leadership and facilitation rather than direction. The action research projects that enabled the uncovering of the above cycle also demonstrated the principles on which it is based.

## Towards a process model for professional learning

The following steps help to inform the leadership and management of professional learning activities. The steps are derived—at least in part—from each of the various case studies undertaken in our research. We summarise the steps as follows.

**1** Build **collaboration** between leaders and learners.

**2** Be **informed**—learners' hopes, experience and prior knowledge.

3 Choose a specific **focus** and involve the professional learners.
4 Design a short and specific **learning task**.
5 Make collaborative **arrangements**—scaffolding.
6 **Undertake** as a situated co-learning task, learn and apply.
7 Provide in-class tutors to support and mediate **progress**.
8 Check on learning, **share and review** (and share more widely).
9 **Transfer the learning** into new and/or improved practices in new or different situations.
10 Revisit and refresh from time to time as required.

### Professional learning and roles leading to cultural shift

Professional learning contributes to the development of several professional roles that may be undertaken by participants (see Table 10.2). The roles themselves are developmental; that is, this year's co-learner is next year's tutor. That is, over time:

- learners become more helpful co-learners (buddy)
- co-learners become tutors, as in 'learning how to'
- tutors becomes mentors—'what to do and why'.

These roles are situational depending on the context and purposes involved. Learning together means sharing knowledge, experiences and products from personal professional

*Table 10.2 Professional learning roles*

| ROLE | FOCUS | PROVIDES THE LEARNER |
|---|---|---|
| **Learner** (ongoing) | Self | Personal professional motivation—relevant knowledge and experience |
| **Co-learners** (shared) | Sharing learning and experience | Encouragement, understanding, shared perspectives, finding useful opportunities, little problems solved ... |
| **Tutors** (informal and workshops) | Doing | Operational knowledge of 'How to ...' |
| **Mentors** (ongoing) | Professional knowledge | What practices to use and why: guidance, backup, troubleshooting, access to support, resources… |
| **Supervisors** (as required) | Endorsement and clarification | Clarification of expectations and purposes, opportunities ...<br>Appreciation and validation of efforts and achievements |

activities. It provides a social and more 'natural' way to go. **Learning together makes change easier and safer**—'It is OK to have problems because …'

- experiences (good or bad) are validated by others
- problems can be solved by drawing on the knowledge and experience available
- shared achievement leads to shared celebrations of success
- everyone can be a contributor and a beneficiary.

The action research case studies have shown that there are a number of roles involved in the delivery of effective professional learning. Some of these roles are situational and informal, as in much of the tutoring situations. Other roles such as the principal and in-school mentor are more formal since they are official and involve the explicit placement of the professional learning activities in the context of the institution.

These roles 'overlap' in a developmental way, especially in a collaborative learning context:

- Co-learners are also learners.
- Tutors are also co-learners (with the person they are tutoring) and learners.
- Mentors also provide tutoring (often as a demonstration) and are co-learners.

Where there is an interest in the use of ICT, a culture that includes high levels of collaboration is likely to be much more successful in the use of ICT. The use of ICT appears to have little impact on the level of collaboration per se. However, the novelty of attempting to incorporate the use of ICT into teaching and learning practices may promote the development of higher levels of collaboration, especially where the technology is well managed and its application is clear—that is, there is sound governance.

If the changed practices are adopted as 'normal' practices, the result will be some cultural shift. Cultural shifts to new forms of practice can only be achieved together.

### Collaboration and standards

Collaboration in professional learning is likely to lead to the development and achievement of (professional) standards.

However, in collaborative professional learning situations the achievement of success is not the end of endeavour. The knowledge, experiences and products that result can be made available to support colleagues in their endeavours. Even when practices are not successful, collaboration with others increases the chances of gaining some insight into the cause, how to reduce the likelihood of the 'failure' repeating, and into improving practices, all of which can lead to genuine cost-effectiveness.

## Other benefits of collaborative professional learning

### Collaboration adds value

Professional learning that takes place in a highly collaborative culture has the capacity to significantly increase the value of the professional learning. The community of practice

means that important knowledge and experience are well situated to support professional learning, that is, close to practices and learners. The close link between action and learning means that in a collaborative culture learning and action are both supported by members of the culture. Thus, learning that is matched to shared purposes is readily translated into new or improved shared practices. In addition, collaboration enhances the rapid and extended deployment of the improved or new practices (through action learning) into the life and work of the group. The learning therefore becomes part of the culture and is readily available to its members. Professional learning takes the time and the effort of the learners, the educational providers and those responsible for managing and administration. It can also influence others indirectly in a multitude of ways. These are several ways in which collaboration reduces waste in professional learning.

**Sustainability**

The acquisition of knowledge and skills is not an end in its own right because knowledge and skills are not effective in isolation. They are of value when they contribute to the effectiveness of professional practices; hence, the emphasis on the link between professional learning and the introduction of new or improved practices.

Most things are sustainable with enough power and/or resources. However, this is not practical for most educational endeavours; rather, the way to achieve sustainability of new or improved practices is to ensure that they become part of the culture. This is a useful definition of implementation: 'something has been implemented when it has become part of the culture' (authors).

**Part of the culture**

Where collaborative professional learning is part of the culture, value is added. Everyone can be a contributor and everyone can be a beneficiary. Individual members can initiate professional learning for themselves and for others. Knowledge of available resources is more widely shared. Finally, there is ongoing value adding from the professional experiences (action learning) in the field. In such situations collaboration is unlikely to be limited to professional learning; it also enhances school system development through:

- better-informed governance
- more extensive and well-focused and supported professional learning
- a better matching infrastructure
- astute application of the new and improved practices
- improved core practices and supporting activities.

**Learning into practice**

Perhaps the most important contribution of collaboration is that it reduces likelihood of failure to complete the transfer of learning into practice. Thus, there is:

- less waste—professional learning that does not result in new or improved practices is waste;
- less disruption—opportunities can be arranged as required between learner/helper;
- less unnecessary provision—provision is in response to actual needs of actual learners and the capacity of other participants to contribute;
- less *rework*—the successful transfer of learning into real practice and experience internalises the learning, matures the concepts involved and reduces the need to re-learn;
- less management required—collaboration includes more natural organisation by arrangement between learner and helper, and more self-managed learning.

**Collaboration in summary**

Collaboration clearly makes professional learning for integrating ICT more efficient and effective; sustainable; closer to JIT (time) delivery and improved (in process) follow up; closer to JIP (place) delivery, and faster: there are fewer hold-ups in the learning process since the required knowledge, experience and products are more readily available from co-learners, on-site tutors and mentors.

## RazzamaTas—THE PUBLIC CELEBRATION

The big celebration involved a two-day conference for each of the project teams referred to in the case studies outlined earlier joined other project representatives to showcase their achievements to the public. This was a telling time, during which the outside observers included the state Minister for Education, the media, members of University Council, representatives from many schools across two state borders and IT industry-based professionals. The following summary of each presentation captures the essence of the messages.

## School A

A rural primary school on the outskirts of a regional centre, School A serves a mixed demographic including low- and middle-income families. The initial audit process set the following targets:

- Provide staff with appropriate ICT tools, sources and professional learning.
- Get better value from the content management used by the Tasmanian Department of Education.
- Ensure that teachers are well informed.
- Encourage and support teachers to use the available ICT tools, for example, email, the Internet and newsletters.

- Aim to have teachers using ICT for their own purposes in an integrated way, including the use of digital cameras, email and the Internet.
- Use ICT effectively to support teaching and learning in classes.

**Preliminary findings reported anecdotally and observed by our researchers**

1. Some staff members are yet to achieve accreditation at any level.
2. All staff members indicated the need for more training—many in the use of programs such as FrontPage and PowerPoint, others in classroom management and use.
3. Teaching staff generally felt comfortable and knowledgeable to an average degree, while most ancillary staff were not so.
4. Half of the staff considered that three computers in their class were sufficient; others thought five would be preferable though space was an issue. One staff member considered twenty-five would be the ideal situation.
5. Every staff member indicated they had a computer at home, ranging from an eight-year-old Macintosh to very up-to-date models; most had access to the Internet, digital and video cameras and colour printers.
6. Further analysis of the data will allow the school to meet the needs of the school and its staff efficiently and effectively, thus achieving its goals.

The school has a commitment to supporting teachers' use of information to enhance their practice. To this end, the school is beginning to map the categories of information that staff members need to identify:

- Information about what is happening
- Information about students
- Information about professional matters (teaching, learning, institutional, etc.)
- Private information.

## School B

This small primary school located in a commuter town, near a large regional centre and airport, decided to investigate staff perceptions and authentic teaching strategies.

**Phase 1**

Using a simple open-ended teacher survey related to ICT in class, results included information about teacher self-confidence and concerns. They concluded that:

- low confidence results in a specific focus on learning about ICT in a highly controlled context with reliability a higher level of concern;
- high-confidence teachers generally use a more integrated approach and more inclusive view of the technology, focusing on pedagogy and the contribution that ICT might make to teaching and learning.

Staff concerns focused on four dimensions:

1. Technology
   - availability and reliability
   - expertise related to the technology
2. Teacher
   - knowledge of ICT
   - application of ICT (match to old or new purpose)
3. Student use of ICT
   - significant products
   - time use
4. Class operation
   - groupings
   - noise
   - time management.

**Phase 2**

The school project team decided to support a collaborative learning unit undertaken by two classes involving an investigation into a local issue of interest to the community. Interviews of older citizens had revealed a neglected local cemetery and this became the focus of the action learning project for the students. The steps included:

1. a site visit that led to discussions of issues with local council staff
2. ongoing collection, organisation and presentation of information and ideas
3. the beginning of improvements due to efforts by the students and council
4. fliers prepared by the students to promote community awareness
5. the students submitting their proposal for a community development grant, which was successful!

The use of ICT enabled the classes to:

- capture and share important information from the local environment
- organise, process and then present the information in a 'professional' form
- ensure that the local community took the students seriously
- ensure that everyone experienced the democratic process first hand.

## School C

This large metropolitan primary school involved key staff to develop a successful model for professional development that is convenient, relevant and useful to staff. Staff planned to use a buddy system for professional learning and trial an action period of capturing the learning through a shared electronic journal of experiences and issues.

The project team consisted of the school ICT mentors (two), the school's network manager (a new role emerging), the principal and four interested teaching staff. Their

focus for IT became the software program Inspiration, for various reasons: An initial staff survey related to Inspiration showed that most staff had engaged in professional development but had not used their knowledge with students; limited uses for Inspiration had been trialled in the classroom; staff had identified a wide range of uses for Inspiration; confidence with using Inspiration was low; staff identified time and opportunities as a barrier to expertise.

Eight teachers were selected to be involved in an Inspiration learning group. The team represented a varying range of ICT competence. They were motivated and optimistic and about half had already tried using Inspiration with their students. The outcomes of the process demonstrated the following:

- Effective transferral of professional learning into the classroom
- Stimulated interest in using Inspiration
- A 'community of practice'—the group helped each other to share ideas and troubleshoot problems
- The buddy system was highly motivating for learning group members, and expanded naturally during the course of the professional learning
- The timeline of an intense period of activity was very effective and welcomed by participants
- Promotion of an extensive range of alternative ways of looking at current classroom activities
- Participants achieved a high level of 'comfort' with software
- Many unexpected positive outcomes, such as leadership, insights, expanded knowledge of human resources
- Staff made their own arrangements for specific small-scale tutoring
- Adequate resources need to be provided
- Ongoing learning strengthened resolve to succeed
- Achievements of the students were publicly displayed in the corridors.

## School D

The small-town primary school has a proud history of professional leadership in the use of ICT in teaching and learning. However, efforts to maintain the previous level of expertise and practice have become more difficult with the loss of leading practitioners and reduced resources. The project aim for School D was to make better provision for ICT professional learning, leading to more consistent integration of ICT into actual teaching and learning in classes. The school project team devised an action plan with three steps:

**1** Find out where staff are 'at'.

**2** Select a meaningful starting point and provide appropriate training using 'buddies' where possible.

**3** Plan and make provision for the participating staff to take their learning into their classrooms.

After a short focused and simple workshop, KidPix 3 was chosen as their professional learning focus. School D worked from the premise of not seeking to overload people and to focus on one package for the whole PD session. They worked with the 'confident' teachers to present examples of ICT use, to show less confident teachers how it is used and managed as a package in their classes. Taking the learning into the class program, the project teams provided in-class support in the form of modelling sound practice incorporating the use of KidPix and co-teaching with the learner. Part of the process was to provide operational and troubleshooting back-up in an introductory lesson, followed up by negotiation.

The camaraderie within the school was observed to be abundant and inspirational. The mutual care helped to ensure the success of this project. Proudly displaying their class-based results at RazzamaTas, the staff enthused about their achievements. Their sense of community and enjoyment of the process had reinforced their self-perceptions of their skills and competence.

## CONCLUSION

Confidence starts from being good at something. Our case studies illustrate the wisdom of this advice. The shrewd leader has the ability to atomise major change into small fragments that are palatable for staff to comprehend and make work. Once the process is started and has success, there is a sense of continuing need and wanting to join the team that can infuse a lagging culture with a renewed sense of hope and energy to get involved.

## SUMMARY

Step 6 of the process of integrating ICTs into organisational practice reflects the need we all have to emerge triumphant; to feel the sheer joy of completing something worthwhile and being able to share this with colleagues and others. This is the celebration time when colleagues quite rightly seek affirmation from outside sources regarding their achievements. There is a sense of the need to validate findings from the feedback of independent others, which can in turn affirm directions. However, this does not mean that all is over. Chapter 11 details the final step.

***Suggestions for further investigation***

1 Is there a document that succinctly describes the successful processes necessary for another organisation to implement similar new learning processes?

2 Are student voices describing the impact of the learning changes available for exhibition and celebration?
3 How far did the consequences of the project extend? Were they restricted to the individuals concerned, or were others also affected? What was the emotional response of all these people?

**Further information**

COLAT Linkage Project team 2004, *Children, on-line learning and authentic teaching skills in primary education: RazzamaTas 2 outcomes*, University of Tasmania.
Online at: http://www.educ.utas.edu.au/users/ilwebb/Research/razz_2_outcomes.htm

Department of Education and Training 2005, *Girls and ICT project*, Priority Schools Funding program, New South Wales.
Online at: http://www.psfp.nsw.edu.au/projects/Project%20Guidelines.pdf

Round Table conference 2005, *The vision for accessible information: celebrating achievement, seeking fulfilment*.
Online at: http://www.e-bility.com/roundtable/conf_proceedings05.php

# CHAPTER 11
# STEP 7: FUTURE PROJECTS AND TRANSFORMATIVE POTENTIAL

After the party comes a new dawn and a reflective process that looks back on this achievement in order to take on the next new challenge. In the previous step, the change-agents within the institution were feted and celebrated. But now their achievements need to be examined in the light of new developments and challenges facing the organisation. Perhaps other changes can be undertaken using a similar model in other parts of the community? A decision needs to be made about which area of concern should be tackled next, and what process to adopt.

## ONGOING CHALLENGES

The action research case studies revealed some powerful insights into the principles and processes of professional learning (see Table 11.1 on page 144). However, the studies also revealed some ongoing challenges that are consistent with observations made in the in-school observations as part of our larger research project work. These reported challenges include the following:

- Building collaboration across staff groups
- Accommodating staff changes: start with induction
- Providing the rationale for change: model ways and means
- Selecting and arranging the most appropriate technology
- Deciding when and how to upgrade (development is disruptive!)
- Creating opportunities for learning, belonging and leadership
- Arranging for the inclusion of all staff in professional learning; that is, providing equity of opportunity, for example, for part-time teaching staff

- Arranging release from fixed duties, for example, part-time hourly specialist staff (special needs aides)
- Building a 'community of practice'
- Performance management versus professional learning
- Individual performance management versus collaborative professional learning
- Accounting for individual professional learning in situated collaborative learning.

***Table 11.1 Revisioning professional learning***

| PROFESSIONAL LEARNING | TRADITIONAL | REDEFINED |
|---|---|---|
| Content | ICT knowledge and skills | Practices: tools, action and experiences |
| Educational focus | General; for example, how to use software | Specific: ICT device + use + practices |
| Initiation | Offer of pre-packaged training | Negotiated, co-planned, situated |
| Learning context | Institutional (push) | Community of practice (pull) |
| Intended outcomes | New ICT knowledge and skills | New or improved classroom practices |
| Participants | Individuals | Learning group (collaboration) |
| Participant roles | Largely formal and fixed | Situational and dynamic |
| | Novice and expert | Learner, co-learner, tutor, mentor ... |
| Timeline | Episodic | Ongoing and revisited |
| Learning cycle | Incomplete (event) | Complete, short and integrated into classroom/office practices |
| Cost-effectiveness | Low (waste, rework ...) | High (practices, JIT, sustainable ...) |
| Sustainability | Variable (often low) | High (embedded in culture, aligned with school purposes and vision ...) |
| Information base | Variable (limited) | Explicit: participants and context |
| Transfer of learning into practices | Intended, optional, hoped for ... | Built into professional learning with direct or indirect support |
| Requirements of the institution | Minimal | Sound governance, clear concept of ICT, endorsed purposes of using ICT ... |
| Knowledge task | Transfer knowledge of ICT | Knowledge management: situate knowledge of ICT in organisation |

Professional learning is a serious business with potentially significant costs and benefits, and is therefore worthy of informed decision making. Gathering information requires the trust and confidence of the providers of the information. In gathering information, some benchmark information will help develop understanding in a situated context. Questions answered should include:

- Where have we come from (history, culture)?
- Where are we now (what is the present situation—current strengths, weaknesses, needs, opportunities, interests ...)?
- How did we get here (more history and culture)?
- In what direction would we best proceed (an ideal but feasible future)?
- How will we get there (strategies)?
- What will be our next steps (what to do next)?

In gathering information from staff, some of the project schools acquired information relating to the impact of teachers' 'comfort with ICT', and the impact on the focus of their attention in their professional learning and practice. Significant discomfort might get a person's attention, but it also reduces the level at which their thinking can occur. The challenge of dealing with new possibilities should provide enough discomfort, to:

- be informed about people's level of discomfort with ICT (generally and specifically)
- build comfort through familiarity and success; initially familiarity and success will depend on being reliably informed and supported
- have confidence about possibilities and acceptance of the limitations (comfort).

In order to consider the available technology, the learner will need to:

- understand the concepts that are built into the ICT
- have some ideas of the knowledge and skills required—'there is always more to learn'
- be informed about the possibilities and limitations
- relate possibilities to actual needs and purposes.

It can be important to demonstrate that information will be used to help make the life and work of people easier and better. Share the information widely, especially with those who provided it! In Step 6 we recommended 'go easier first'; that is, make the tasks easier. This releases resources including time and energy directly. Also, re-work and stress will reduce because people want to do a great job and it will be easier to do so. The resources released can then be used to achieve other improvements.

Based on the available information, working groups can be identified; for example: arranging co-learners, tutors and mentors as a learning group. Working in learning groups has many benefits since it builds knowledge of available resources, enhances available professional learning resources and provides leadership opportunities. A challenge for the

designers and developers of professional learning groups will be: Who knows (or wants to know), and what? Who is using what? Who is doing what … and how?

There is considerable value in taking the evaluation beyond the group, including the factor that such a step integrates professional learning into the life and work of the school. To belong to a member of a profession is to be a life-long learner, to be willing to learn from one's colleagues and contribute to the development of the profession.

## The Seven Steps process as a spiral

Applying the Seven Steps in the school or workplace will achieve some improvement or transformation related to the use of ICT. This achievement can then be the starting point for using the Seven Steps to attend to other issues related to the use of ICT. An example might relate to a rethink on the teaching strategy for a unit of work (see Figure 11.1). In this sense, the ongoing use of the Seven Steps can be the basis of a spiral of improvement and/or transformation. In addition, a successful project will have enhanced the capacity of people to work together on future projects.

This project to improve learning may be over—but the opportunities do not stop! Having distilled advice to others from the exhibition of the previous stage, it is worthwhile contemplating what the next steps might be. If there were to be a successor project, what form would it take? The project team can plan out a future project, which may become reality if the context and climate are favourable. This does not have to be done in great detail, but sufficiently well that a funding application can be made for assistance if necessary. It may involve many people from the project just concluded, or it may inspire an

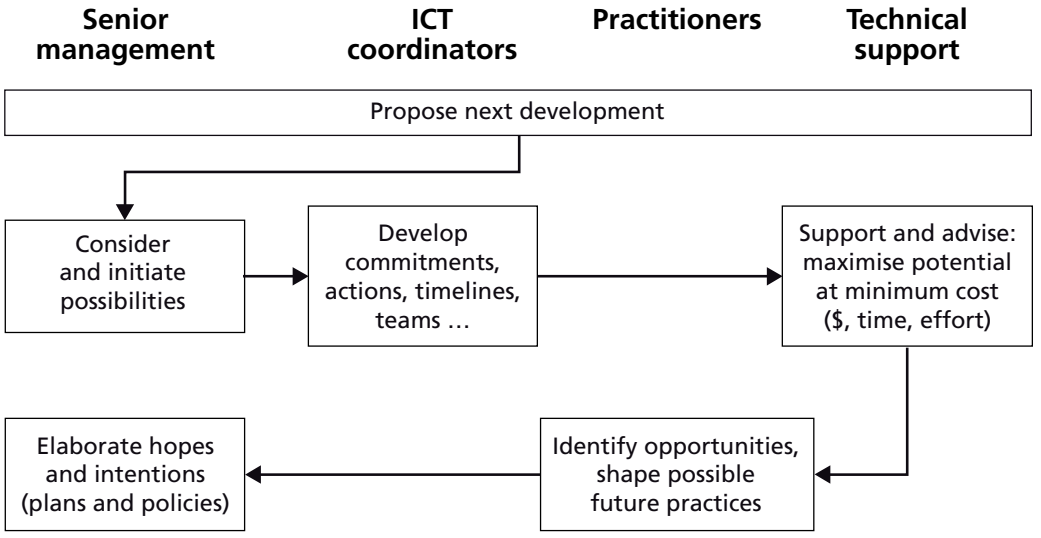


***Figure 11.1 Step 7: Future projects***

entirely new group. Plan the new direction(s) as if the latter were the case. Give clear direction about what is considered valuable and what to avoid.

## Opportunities for future improvements

The Seven Steps always starts with a focus related to the use of ICT. Possibilities for future projects may include any of the following, and more:

- Access—for example, home computer involvement
- Achieving consensus across the school and its community re the role of ICT in teaching and learning (see Chapter 6, 'Governance')
- Audience for student-generated products
- Groupings and scheduling activities in class
- Use of ICT to contribute to rich tasks
- Spatial arrangements: placing ICT in classrooms
- Multi-tasking
- Enquiry-based learning
- Professional learning
- The nature of working knowledge
- ICT infrastructure homogeneity
- Insightful questioning (action learning)
- Reliability.

**Example: Access**

Access to ICT is multidimensional. In the early stages of our research we had the simplistic notion that 'computers at home' and 'home Internet connection' might be reasonable measures of computer access for students outside the classrooms. We were readily disabused of this notion by the students themselves. The following is a starting list of the factors that help determine the access to ICT in general (and online access in particular). Many of these dimensions are overlapping and complementary.

**1** Opportunity:

- the presence of the technology (time and place)
- configuration and connection
- acceptable performance of the technology
- permissions/authority (time, activities, programs)
- a match between technology and purposes
- ease of access

**2** Motivation:

- enjoyment
- satisfaction
- acceptable levels of frustration

- not outweighed by competing demands and opportunities
- perceived value (better, quicker, smarter, prettier, cheaper ways of working)
- culture (shared favourite games, websites)

**3** Confidence:

- functional knowledge (operational, content)
- access to additional knowledge as required ('expert' assistance from family and/or friends, manuals, cheat lists)
- modelling (others lead by example)
- expectation (benefits known)
- problem-solving ability
- skills (including ability to operate the interface)

**4** Need:

- primary purposes (tasks, efficiency, effectiveness, products)
- secondary purposes (activity, status, belonging).

Indeed access may be more a behavioural characteristic of the user than of simply an aspect of the user's circumstances. There are children without a computer at home who are able to achieve considerable access through workplaces, family, friends and school, while others who have great computers at home will 'only use a computer when I have to' (quotation from an eleven-year-old girl).

**EXAMPLE**

A Grade 3 boy has extended access to a late-model computer with an Internet (broadband) connection at home and is currently using it to visit the Lego Website (www.lego.com) most days after school, often when particular friends visit. The family policy is that the parent logs on to the ISP for the child. The computer has a monitoring software (www.netnanny.com) installed and is located in the living room. The child avoids using the computer for anything but games and dislikes using the computers in the classroom.

ICT enables learners to learn by doing real things. This leads to an issue about the identity of the audience for the products and knowledge that the learner produces. For example:

- ICT enables the presentation of information that can be useful for a wide range of 'others': publishing can realistically mean 'making public'.
- ICT can also enable the creation of specific 'tools' that can be used by others to acquire, process and/or present their own information.

Traditionally the 'products' of learning activities have been intended for the teacher-as-audience, with the purpose of enabling the teacher to verify (or otherwise) the learning

achieved. Notions of curriculum have been based largely on the teacher-as-audience in the first instance, with employer-as-audience some time in the future. The quality, portability and currency of information-based materials produced by young learners can now be such that it is necessary to rethink the audience.

The emerging curriculum can be 'reframed' to utilise the potential arising from the nature of the products of learning when ICT is involved. When learners are fully engaged in learning the teacher often becomes a 'third party'. Many young students are able to report on the numerous ways in which they have used their competence with ICT to help others, especially friends and members of their family. Indeed, teachers frequently utilise this 'assistance role' in delivering the class program. Our in-class observations indicate that few classroom activities involve the provision of as much support as those related to ICT. Working with ICT is resource hungry, and working with ICT also provides a context for collaboration.

## Curriculum → ICT → Action learning → Pedagogy

There are several possible new notions for consideration.

First, there are the notions of curriculum that will extend the audience for students' learning and products beyond the teacher. This means having a range of curriculum forms from which to select according to the needs, purposes and opportunities. In particular, a 'new' form included by Seaton (2002) [link to http://www.andrewseaton.com.au/reform.htm] places members of the 'community' as the audience for the learners' products.

Second, there is a parallel development in relation to the adoption of ICT in the class program. This means that the ways in which ICT is used in the class must complement the intended approach to the curriculum. Almost certainly the development of the curriculum and development of the ways in which ICT are used is best dealt with concurrently rather than as a 'chicken and egg' issue.

Both these developments are supported and complemented by a third component, namely action learning in which learners draw on their access to programmed knowledge and their insight into their own, local, messy but rich experiences and activities.

All of which leads to attention to the critical early stages of pedagogy, namely choosing the focus for learning and designing the learning task including consideration of purposes and products. Thus, using the above notions, pedagogy (the management of teaching and learning) can be undertaken in a way that includes the learners' real experiences and activities, meets the needs of the learners and others, and uses ICT for real purposes and in a collaborative context.

A number of specific issues are likely to intervene in this process.

### Space

Spatial issues arise in relation to many aspects of ICT through:

- increasing quantities of visual information and products in classrooms

- the size of computer-generated products such as projected presentation and poster-sized PowerPoint printouts
- increasingly visual workspaces (screens)
- the location of ICT devices within/near classrooms
- the orientation of activity that follows the location and orientation of the devices.

**Visual experience and learning preferences**

- The screen, keyboard and mouse mat are all spaces in which things have to be manipulated; that is, the multimedia 'workspace' provided for users is increasing space needs.
- The incorporation of ICT into class programs is changing the balance between visual and auditory information processing, almost certainly favouring visual learners who were once less favoured in the more text/language-based classrooms of the past.

**Location and orientation**

Technology is embedded in devices, and the devices need to be located where students can have access. Thus, the use of ICT relocates activities in order to use the devices; this relocation tends to be towards the periphery of the classroom (or beyond). Similarly, the orientation of the devices tends to 'take the users away' from the class and classroom. Locations and orientations have implications for learning environments in that:

- devices consume space that could be used for other purposes—an issue for larger classes in smaller rooms;
- devices are often located so that they can be related to the services they require (power supply, connections ...), forcing compromises in working arrangements;
- devices have their own orientation, which in turn may orient the users; for example, computers facing into a room orient the users to face away from the room, leading to potential benefits and difficulties. That is, there may be less distraction for the users but attention to the class is restricted, which can lead to uncertainty and communication difficulties. The relationship between the student (using a computer) and the class is often ambiguous. Teachers can monitor the computer use while working with the class. However, teachers are less able to monitor the class while providing assistance to students using the computer;
- computers in classrooms are often aligned (along a wall) because students using computers frequently need assistance that may well be provided by the student using the next machine. Alignment along a classroom wall (often because of services, or available space) may lead to difficulties with reflection from

windows in the opposite wall. Consider the following 'similar' arrangements of computers in the same classroom: alignment of adjacent screens and users' orientation facilitates collaboration but introduces problems with reflection, while lack of alignment of adjacent screens and users' orientation reduces the potential for collaboration but solves the reflection problem.

Many of the difficulties faced by teachers and their classes have their origins in decisions made in previous times, for other purposes.

## PROFESSIONAL LEARNING REDEFINED

Our project findings suggest the need to redefine what we mean by professional learning. Illustrated by our research case studies, this 'new' definition emphasises the following:

- principles for design and delivery of professional learning
- a 'pedagogy' for professional learning
- a professional learning cycle
- the importance of working from an informed basis for professional learning
- the central place of collaboration
- the cost-effectiveness of the approaches used.

### Generational change

In many ways the above redefinition of professional learning represents a move to what might well be a second generation of professional learning in relation to ICT. This raises the question of possible future generations of professional learning. It is not possible to be definitive because there are so many aspects that one cannot be certain. However, several years ago the *Apple classrooms of tomorrow* (ACOT 1995) studies identified several stages of development in the use of ICT in class programs. They are entry, adoption, adaptation, appropriation and invention. The focus of much (but not all) of this has been largely on students using ICT in the classroom and/or teachers working with students.

### Developmental opportunities

Other areas in which there is substantial opportunity for progress along similar developmental lines are in staff members and teams working collaboratively on their own/shared practices in the classroom and elsewhere. An obvious need is the development of systems of practice focusing on the ways in which practices complement each other. Activity Theory provides scope for such developments (see Chapter 4).

Many starting points for such developments are present in the everyday life of the work of schools. Technology is developed based on the creators' concepts of design and application. The mismatches between the creators' and users' concepts and understandings, and the numerous creative solutions to the limitations of the technology and the

failures of the devices, all provide opportunities for substantial gains, especially by combining technologies and people in novel ways. What might start out as problem solving can be a first step in significant developments—being hampered in achieving purposes can help individuals to clarify purposes.

## CONCLUSION

While celebrations are a healthy form of deriving personal satisfaction and confirming that our activities are valued by others, we face the unlikely future of very minor significance if we do not see this first set of steps as a beginning. The spiralling effect of professional learning is related to lifelong learning. That process is best approached in situ or in the situated workplace context. We live and work in social settings. Educational environments are socially controlled and contrived. Working collaboratively with people who share a similar vision of excellence will be rewarding and constructive. There is much to be gained from joining the conversation.

## SUMMARY

The last of the Seven Steps draws attention to the debriefing period when reflection on the processes involved in the preceding six steps has been completed. The message is that while celebration is good, there is no room for complacency. The learning spiral needs to continue. However, this time the learning can be built on situated knowledge with much greater opportunity for success. The community of learners is a dynamic group of people all dedicated to the improvement of learning opportunities for the world of the future.

***Suggestions for further investigation***

1 What new processes and products would be featured in the successor project(s)?
2 Which individuals would be involved?
3 What should definitely NOT be included?

**Further information**

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# PART C
# CASE STUDIES FROM RESEARCH FINDINGS



In this section, we seek to illustrate some of the principles discussed in Parts A and B. Three projects are summarised, each referring to aspects of developing teaching and learning authenticity with ICTs in different learning settings. As researchers and teachers we see the situated aspect of each of these illustrations as illuminating. Different issues are highlighted and all contribute to the emerging understandings demonstrated in our descriptions of the Seven Steps.

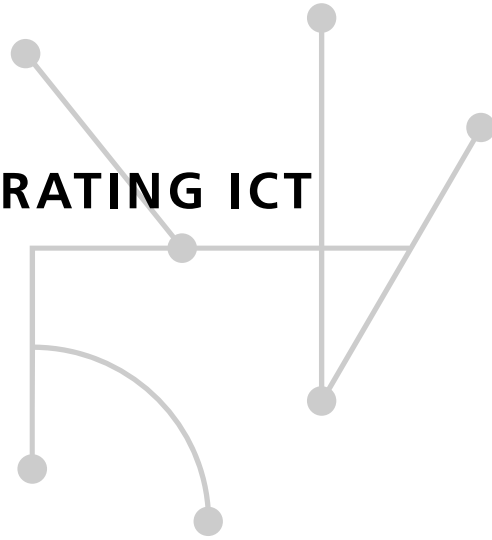
The first relates to teaching and learning observations in classrooms that were involved in our Australian research study involving Tasmanian schools during the 2002–04 period. This project was aimed at identifying 'authentic online teaching and learning pedagogies for primary schools'. Teachers, students and school leaders were interviewed as part of the study. Open-ended responses add to the evidence we have gathered regarding key success factors in the integration of ICT into learning environments.

The second case study refers to a post-compulsory technical and further education apprenticeship program (TAFE Australia). This study is of particular interest in the context of the claims made in Chapter 9 that relate to rethinking the value of the apprenticeship model for the purposes of professional learning of teachers. The collaborative nature of the model, whereby the expert works with the novice in an authentic workplace setting, is offered as

a genuine possibility for expanding further into the ways we think about professional learning.

Finally, we move into the community where some of the more innovative activities are taking place in the daily working life of government agencies and business. The big take-up at the moment is the use of global positioning systems (GPS). The use of GPS and associated digital software equipment is revolutionising public access to spatial data. Google Earth may be a beginning in mainstream society. Our prediction is that the automobiles of the next ten years are all likely to have GPS units installed as part of the sales package and include downloadable updates. That expectation raises the bar for all teaching and learning contexts. The possibilities are endless as a motivational tool and for integrating widely available information into the curriculum that links reality with learning. The wonderful part about this exciting prospect is that, in our experience, local government agencies are only too willing to share their expertise with learners. As part of that global community in which we all participate, such partnerships help us to mentor young citizens with genuine knowledge of multiple ways of seeing the world and interpreting the knowledge around us.

# CHAPTER 12
# CASE STUDIES—INTEGRATING ICT IN PRACTICE



## EXAMPLE A: SCHOOL-BASED INTERVIEWS

### Introduction

As part of a large Australian Research Council funded grant, class-based observations were conducted into fifty Australian primary school classrooms during the period 2002–04. This excerpt from the study focuses on interviews conducted during week-long visits to schools.

### The sample and method

Interviews were conducted in twenty-four Tasmanian primary schools. Of these schools, six were from the Catholic sector and eighteen were Department of Education schools. On the basis of their location, eleven were classified as being urban, eight as rural, and five as rural/urban (while on the basis of student enrolment four were categorised as being large, nineteen as medium and one as small). Within these schools, sixty-four interviews were audio recorded and later transcribed. These interviews were with a total of sixty-five people (with one interview involving two people) distributed as follows: nineteen principals, two assistant principals, thirty-five teachers; eight ICT coordinators, and one technician. The interviews, generally, lasted about one hour and followed a semi-structured format. Prospective interview questions were distributed to interviewees in advance.

### Results

Close reading of the interview transcripts led to the identification of fifteen 'themes'. These themes provided the framework for data analysis. The results of the analysis are provided

below in roughly the order of frequency; each theme was mentioned at least once by the interviewees. The data associated with each theme were tested for differences on the basis of four sets of criteria. These criteria were:

1. Whether the school is of the Catholic sector or the Department of Education
2. Geographic location of the school (rural, urban or rural-urban)
3. Size of the school in terms of student enrolment (small, medium or large)
4. Role of interviewee (principal/assistant principal, teacher, ICT coordinator, technician)

Given the relatively small size of the sample, two non-parametric tests were employed. These were the Mann-Whitney U Test for the Catholic/DoE test (two independent samples) and the Kruskal-Wallace Test for the other three sets of criteria (more than two independent samples).

## Themes identified in the data

**Theme 1: The use of ICTs involves partnerships between people**

Interviewees talked frequently about various types of partnerships between people in regard to ICT. These partnerships, in order of occurrence, were seen to be between students and students (34 per cent of interviewees mentioned such partnerships), between teachers and teachers (28 per cent), between students and their teachers (25 per cent), between teachers and other school personnel such as technicians, aides and cleaners (20 per cent), between school personnel and parents (17 per cent), and between students and their parents (9 per cent). Other partnerships, such as between members of extended families, were mentioned on several occasions. No statistically significant differences were noted in regard to the four sets of criteria outlined above.

**Theme 2: ICTs are perceived to be an empowering device**

ICTs were regarded by 30 per cent of interviewees as having the capacity to enable students to learn more effectively and efficiently, and to communicate their learning to fellow class members, parents and others. Similarly, 25 per cent of interviewees mentioned that ICTs have the power to enable teachers to amend their teaching/learning strategies to make them more child-centred, enquiry-based and/or problem-solving oriented (19 per cent), while 17 per cent regarded ICTs to have the capacity to assist children and others to function adequately in the twenty-first century. No statistically significant differences were noted in regard to the four sets of criteria.

**Theme 3: ICTs are more or less integrated into the classroom curriculum and are more or less entwined in the various pedagogies employed by teachers**

Thirty per cent of interviewees thought that ICTs were integrated and entwined in their classroom and/or their school in a substantial way, 16 per cent thought this occurred in a moderate fashion, while 20 per cent thought they happened in a limited way. Principals

showed statistically significant (p=0.04) more agreement than the other role groups that ICTs were integrated and entwined in classroom matters moderately or significantly.

**Theme 4: Professional development in the use of ICTs is an important consideration for many interviewees**

Professional development of various sorts for teachers, technicians and aides was seen to be integral to their school's functioning in regard to ICTs by 23 per cent of interviewees. On the other hand, 14 per cent thought such PD was an 'add-on' at best. Generally, by a margin of about three to one, where PD was discussed by interviewees, they thought it was pitched at the collective rather than the individual needs of staff. No statistically significant differences were noted in regard to the four sets of criteria.

**Theme 5: Reliability of ICT hardware and/or software is a consideration**

Some 28 per cent of interviewees indicated that their experience caused them to regard reliability of ICT hardware and/or software to be either of considerable or moderate concern. However, another 20 per cent indicated such reliability was of limited concern. No statistically significant differences were noted in regard to the four sets of criteria.

**Theme 6: Access to a sufficient stock and quality of ICT hardware is often limited**

Thirty-four per cent of interviewees thought they had inadequate access to enough good quality hardware. On the other hand, almost 10 per cent of them had no real concerns in this regard. Personnel in urban schools indicated significantly more concern (p=0.02) about the stock/quality of the school's hardware than the other two geographic groups.

**Theme 7: Attitudes towards early adopters of ICTs and resisters to them vary**

As with all significant innovations, the sample of schools revealed there are early adopters of ICTs, while at the same time there are those who resist their implementation. The interview transcripts show that such early adopters and persistent resisters occur among both the staff and the student bodies. There is nothing surprising in this. On the other hand, the data indicate interviewees' attitudes towards such early adopters and persistent resisters are evenly split, in that 19 per cent of those who commented on this aspect indicated a high degree of tolerance for persistent resisters, while another 19 per cent demonstrated a far less tolerant attitude and indicated they put in place various strategies to 'convert' persistent resisters into adopters of ICT. No statistically significant differences were noted concerning the four sets of criteria.

**Theme 8: ICTs are generally seen to be tools that facilitate empowerment**

While there is some evidence in the data that ICTs are seen to be 'integral' in some way to any form of empowerment that emanates from their mastery, 33 per cent of interviewees revealed they considered ICTs to be tools that enable students to become more empowered learners and/or teachers to become more empowered servants of their students and/or people generally to become more empowered members of society in the twenty-first century. No statistically significant differences were noted in regard to the four sets of criteria.

**Theme 9: There may be a lack of time, lack of space, an overfull curriculum, a lack of resource management, a too-busy routine that impinge on the implementation of ICTs**

Almost one in every three interviewees pointed to the existence of barriers to implementation of ICTs such as these. No statistically significant differences were noted in regard to the four sets of criteria.

**Theme 10: Students need to acquire ICT-related skills**

The interview transcripts point regularly to the need for students to be skilled in using ICTs, with approximately 30 per cent of interviewees mentioning this specifically. There is little agreement, though, concerning the manner in which these skills are to be acquired. Many larger schools have established a laboratory where half to full classes are scheduled on a rotational basis to learn specific skills—even though on several occasions personnel expressed reservations about the rationale for such laboratories. At the other end of the spectrum, students are encouraged to experiment and engage in 'peer tutoring' to develop relevant skills. No statistically significant differences were noted with regard to the four sets of criteria.

**Theme 11: ICT environments in schools/classrooms are more or less rich in their diversity**

Slightly more than 25 per cent of interviewees described the nature of their ICT environments at school. While about one-quarter of these people indicated such environments were 'impoverished' or only moderately fulsome (with several computers of doubtful ancestry and little more), the others talked of environments containing a range of modern computers, scanners, digital cameras and video recorders, data projectors, printers and so on. Furthermore, 25 per cent of interviewees described something of the breadth of ICT use throughout their school, and of these, more than 80 per cent (that is a total of sixteen interviewees) pointed to ICTs being involved in a wide range of school functions—teaching, learning, communications, administration and so on. Principals among the sample tended to see their environment richer ($p=0.04$) than other role incumbents.

**Theme 12: Implementation of ICTs in schools coincides with more or less change in school structures, processes and pedagogies**

Approximately 22 per cent of interviewees spoke of institutional change occurring along with attempts to implement ICTs in their schools, and the majority of these indicated that some degree of 'reinvention' or 'renewal' was occurring/had occurred. The principals tended to perceive more 'reinvention' or 'renewal' ($p=0.01$) occurring in their schools than did those in other roles.

**Theme 13: ICTs may have the capacity to actively drive teaching and learning rather than be servants/enablers to them**

Slightly more than 20 per cent of interviewees spoke about aspects of this theme, with the vast majority (all but one or two) depicting an image of ICTs being servants/enablers

rather than active drivers of educative functions. No statistically significant differences were noted in regard to the four sets of criteria.

**Theme 14: Implementation of ICTs in schools occurs with or without parent/community support, endorsement and/or active promotion of them**

Twenty per cent of interviewees spoke about the role of parents and/or other people from the community. None of these indicated that this matter was unimportant, with approximately three-quarters of them indicating such support, endorsement or active promotion was very important as the school attempted to move towards a richer ICT environment. Principals tended to perceive the importance of such support/endorsement/promotion as being somewhat more important ($p=0.03$) than other role players.

**Theme 15: ICT 'champions' or 'heroes' are recognised more or less in schools**

Some 15 per cent of interviewees spoke with great enthusiasm (indeed sometimes with considerable passion) about one or more school personnel (the ICT coordinator, a teacher, an aide, a technician, the principal and so on) who were valued highly for their expertise and leadership in the implementation of ICTs in the school. The data indicate that ICT coordinators perceive such recognition less so ($p=0.04$) than other role incumbents.

## Relationships between the themes

The non-parametric test for correlations between variables, the Spearman rank correlation coefficient (or Spearman's rho), was applied to the data to determine whether or not there were any statistically significant positive or negative relationships between the responses of interviewees regarding the various themes. A number of such relationships were identified, and these are displayed in Figure 12.1 on page 162.

Figure 12.1 indicates:

- that where interviewees responded positively about the extent to which ICTs were integrated into the curriculum and entwined in pedagogies (Theme 3), they also looked positively on the existence of partnerships in the school/classroom (Theme 1), on the need to ensure students acquire sufficient skills in using ICTs (Theme 10), and on the extent to which ICT 'champions' and 'heroes' were recognised in the school (Theme 15);
- that where interviewees spoke positively about the provision of professional development opportunities (Theme 4), they also tended to talk positively about early adopters of ICTs (Theme 7) and about the extent of perceived parent/community support, endorsement and/or active promotion of them (Theme 14);
- that where interviewees indicated that reliability of hardware and/or software was of little concern (Theme 5), they also endorsed the need to ensure students acquire sufficient skills in using ICTs (Theme 10);

| Theme | 1 | 3 | 4 | 5 | 7 | 8 | 10 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | 0.46** | | | | | | | | | |
| 3 | 0.46** | | | | | | 0.56* | | | | 1.00** |
| 4 | | | | | 0.65** | | | | | 0.76** | |
| 5 | | | | | | | 0.92** | | | | |
| 7 | | | 0.65* | | | | | | | | |
| 8 | | | | | | | | | 1.00** | | |
| 10 | | 0.56* | | 0.92** | | | | | | | |
| 12 | | | | | | | | | | 1.00** | 1.00** |
| 13 | | | | | | 1.00** | | | | | |
| 14 | | | 0.76** | | | | | 1.00** | | | |
| 15 | | 1.00** | | | | | | 1.00** | | | |

* significant at the 0.05 level, 2-tailed

** significant at the 0.01 level, 2-tailed

***Figure 12.1 Statistical analyses of interview responses based on identified themes and roles of interviewees***

- that strong relationships between implementation of ICTs in schools coincide with considerable change in school structures, processes and pedagogies (Theme 12), on the one hand, and perceived parent/community support, endorsement and/or active promotion of them (Theme 14) and the recognition of ICT 'champions' or 'heroes' (Theme 15), on the other;
- that where interviewees reported ICTs are seen to be tools that facilitate empowerment (Theme 8), they also regarded ICTs as being servants/enablers (Theme 13).

## Conclusion

The analyses of interview data gathered during our research formed part of the theory building that underpins the Seven Steps. The statistical analyses helped confirm different perspectives and how these may influence behaviours. This outcome reinforces the view that collaborative approaches work best where all strategic personnel are involved. Principals need to hear the views of teachers and vice versa. One major shortcoming of this brief report is that the views of students are not included. However, we include the students' voices in many other parts of the book.

## EXAMPLE B: ICT INTEGRATION IN FURTHER EDUCATION

### TAFE Tasmania—implementing web-based teaching approaches

The Institute of TAFE Tasmania—Automotive (Launceston) provides a case study that demonstrates the interaction between practices that use ICT and the 'success factors' as identified from the in-school observations made in this project. Although the educational context is very different from that of primary classrooms, it would appear that the same factors are involved in the success of the endeavour. In 2002, TAFE Tasmania—Automotive (Launceston) adopted an Intranet-based approach to teaching and learning with the intention to move the learners' focus from being taught specific automotive knowledge and skills to managing their own ongoing (life-long) learning to acquire the required knowledge, skills and understanding of principles now and in the future (potentially life-long).

The rationale of this approach is that teaching staff realised the need for changes in their traditional teaching, to encourage students to a greater degree of participation in class and to improve the students' learning overall. At the same time, senior management realised that not adapting to new approaches in teaching and learning would have business (enrolment) implications. In other words, modern teaching methods were required to maintain the number of student enrolments and to keep students motivated in their learning. Having realised these needs, management and teaching staff formed a group of three staff members who developed a computer-based tool to support students' learning.

In order to gradually implement new teaching approaches, staff experimented with a web-based e-learning software system for educational institutions (WebCT—www.webct.com). This software is widely utilised in tertiary education in Australia to support the flexible delivery of teaching material (such as teaching notes, assignments, chat rooms, notice boards, etc.). After experimenting with WebCT's standard features, it became evident that this software in its default set-up did not prove to be suitable for the teaching requirements at TAFE. The TAFE staff therefore decided to customise the software to their teaching and learning needs. The use of ICT (WebCT random selection self tests—formative assessment) enables the following activities:

- Students monitor their learning, especially their understanding of principles of teaching material.
- Test items prompt the students to action (if required) to further their understanding of the matter being 'tested'.
- Staff can monitor and analyse student capabilities as well as progress, and hence, course efficiency and effectiveness.
- Staff and students collaborate on a shared, informed basis about the students' knowledge and skills.
- Students and staff are able to use the system as and when convenient (synchronous and asynchronous).

Some of the key elements for successful implementation of new approaches to teaching were identified as:

- identification of a need for change in teaching style and improvement of learning among staff and management;
- being prepared to take risks to develop material that is different from traditional teaching methods;
- attempting to change the culture of the workplace to accept new ideas; and
- being prepared to invest a significant amount of time to develop new strategies. This raised the question of available time for such endeavours given that all staff involved are also actively teaching. All three staff members involved in this process emphasised that it was worthwhile to invest in these new approaches to make both their teaching and the students' learning more enjoyable.

Staff also identified high start-up costs for test development and medium ongoing development costs (adding and refining test items), as well as:

- ongoing savings
- focused, informed engagement with students
- continuous improvement of the course
- flexibility and deployment (other places and other systems)
- improved student performance
- long-term value to students: current knowledge and skills related to current and ongoing learning/problem solving (rather than specific low-level, limited-life knowledge and skills.

Student feedback has been very positive so far and fine-tuning of the software design is an ongoing process to improve the learning process at TAFE Automotive. Information exchange and interaction between students are encouraged, with the result that students become increasingly active and participating learners rather than passive listeners.

## EXAMPLE C: WORKING WITH LOCAL GOVERNMENT

### The Launceston City Council experience with ICT and GIS

The Launceston City Council (LCC) in northern Tasmania has used Geographic Information Systems (GIS) since the early 1990s to manage their spatial data assets in a computerised environment. A GIS can be defined as software or tools to capture, analyse and present spatial data. This case study involved an interview with ICT/GIS personnel at LCC who shared their experiences and insights in this challenging and ongoing project. Our hope is that by including our observations, educators may become excited about this dimension of learning in practical and applied classroom activities.

The key success factor to implementing this technology was identified as being able to present a successful initial ICT/GIS project to receive support from senior management

for any future project. Much preparatory work went into this initial project. Data were prepared for implementation of the GIS during 1990 and 1991 with the aim to have a series of datasets ready for GIS implantation at the time of GIS software purchase in 1991. The initial GIS project was used to demonstrate the usefulness of the new system by means of examples, such as:

- showing the precise location of water mains and electricity cables in relation to other infrastructure;
- identification and location of existing industrial/residential properties (including their values) in relation to fifty-year, 100-year and 200-year flood zones to allow the quick calculation of the spatial extent as well as financial damage that a flood could cause;
- showing the extent and distribution of development and building applications within the council area.

The success of this first project opened a path for the funding of more projects as well as an increasing usage of GIS in various council sections. GIS is now almost fully integrated with day-to-day activities and LCC holds approximately 130 different layers of spatial information. Being able to use GIS database query functions to call up information stored in the attribute tables of those data layers and displaying the query results, helped to improve the productivity of council staff. Spatial information is now disseminated by means of simple computer interfaces, digital or paper (printed) maps.

Given that not every council staff member is fully trained in the use of GIS software, GIS is used at different levels of sophistication among council staff, depending on the level of everyday use of the technology. The council differentiates between 'power users' and 'casual users'. Power users are fully trained in GIS (typically staff in the surveying section), develop customised user interfaces and provide GIS support, while casual users operate the software and undertake simple tasks such as performing simple database queries, overlaying data layers and producing maps. Power users typically share their experience and skills with casual users by means of project presentations and explanation of the ICT/GIS methods used to achieve these goals.

Some of the council's future projects include the conversion of all existing paper maps to a series of digital data layers. These include, for example, historical maps that are used for displaying and modelling the historical and future growth of the city. Combination of such information with infrastructure, population growth and hazard information (such as flooding and landslides) allows planners to identify areas most suitable for urban development and those areas at greatest risk from natural disasters. Another project aims for the provision of digital spatial data for staff working in the field, using a handheld GIS device with an integrated global positioning system (GPS) unit. Using that technology allows field staff to enter or update information immediately into a computerised system, rather than using field books and having to transfer that information into the computer upon return to the office.

## Involving students

Council staff summarised at the end of the interview that it was vitally important for them to have a clear idea about an initial project and a successful case study to gain the support of team leaders and other decision makers.

One of the key messages of this interview is that teachers should not be afraid to let students explore the scope of a project and the tools (or software) employed. Rather, they should encourage students to work together to explore the new technologies, even if they find that students are ahead of the teacher in using the technology within short time frames. Working together with students, however, provides an opportunity for successful project work.

In the context of a school example, a teacher from a school in north-western Tasmania convinced the school's principal to purchase five handheld GPS units. With the support of the local council, the teacher initiated a student project to map the distribution of native plants and weeds in the vicinity of the school. Upon presentation of a GIS-based map of the project outcomes in the school's corridor, the teacher commented that not only an increasing number of students, but also fellow teachers were keen to borrow the GPSs because they could now identify the usefulness of GPS in their respective teaching disciplines.

A limitation that is commonly identified by teachers is the availability of spatial data. This issue has been addressed for example by software vendors who provide a set of national or global data sets bundled with the GIS software. Other sources of spatial information are local, state or federal government agencies, the World Bank, the UN and other organisations.

For a school project, it might be useful to approach the local government authority for a digital base map or aerial photograph of the area of interest. Such baseline maps may then be utilised to start collecting and presenting other data (similar to the example above), which would ultimately allow development of a local spatial information system.

## Support for 'GIS in school' activities from software vendors

GIS software vendors have become more aware of the fact that schools are increasingly using spatial technology in their teaching and development of spatial literacy. At present, at least one GIS software vendor has developed programs to introduce 'GIS in Schools' (www.esri.com), including student exercise workbooks with complimentary one-year software licences. These books have been developed at a level that allows new users to familiarise themselves quite easily with this technology.

Spatial technology has experienced significant improvements with the advent of Windows-based interfaces as well as the Internet in the 1990s. Sharing and exchanging data has become a much easier task than it has been in the past. Also, developments in related technologies, such as global positioning systems (GPS) or remote sensing (RS),

have boosted the uptake of GIS. Examples for the everyday use of GPS are handheld devices being used for such activities as recreational boating or bushwalking to navigate to a destination (see for example: www.garmin.com).

An increasingly known example of the combined use of GPS and GIS technology is the use of car navigation systems, which has gained popularity in recent years. A navigation system is essentially a combination of a GPS and a GIS. GPS technology is utilised to pinpoint the present location of the car and to navigate along a pre-defined route (shortest, fastest) to a destination, calling upon the spatial (street) information stored in the GIS database. The route is then displayed on a digital (GIS-based) screen.

Another trend in car navigation is the introduction of local/regional information systems. These systems link location (via GPS) with regional information that is broadcast (usually from a CD/DVD) as soon as a car approaches the region.

In the context of GPS/GIS use at school, a few examples of the combined use of GPS and GIS include mapping of:

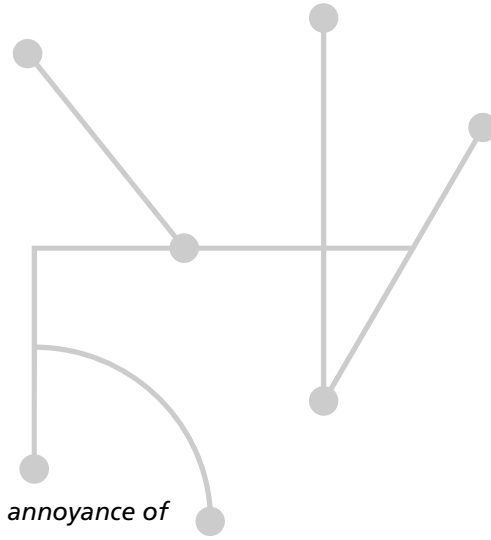
- native vegetation and weeds (mapping change over time)
- native animals and feral animals (mapping of decline of native animals)
- a cross-country track
- features (for example, garbage bins) on the school grounds.

Similarly, remotely sensed spatial information has become more available in recent years. A well-known example is the launch of Google Earth (www.earth.google.com) in 2005. Google Earth combines a number of high-resolution (up to 0.6 m on-ground resolution) imagery of large parts of the world that are visible on the Internet free of charge. Such high-resolution remotely sensed information can also be combined with other data layers in a GIS. For example, remotely sensed data are used to monitor the growth of crops in rural areas where farmers receive financial incentives to grow particular types of crops. Authorities in charge use the high-resolution remotely sensed data in combination with land parcel information to monitor the farmers' activities without having to visit the area.

## SUMMARY

The purpose of this chapter has been to provide a taste of the many interesting ways in which ICTs can be applied. For the researcher, the use of statistical analyses using powerful software tools has revolutionalised data gathering and analysis powers. Results are known much more quickly and trends detected because of the ease of handling large databases. Likewise in industry, electronics are used for diagnostic purposes and increase the efficiencies of identifying problems and solutions. Encouraging young learners in apprenticeship training to use the learning tools of the technologies complements this one-on-one approach to work and study. As the final example, in this small sample of possible activities with ICTs we strive to show some leadership for future directions that may lead to interesting and very rewarding situated partnerships with local government.

# CHAPTER 13
# CONCLUSIONS



*Few things are harder to put up with than the annoyance of a good example.*

*Pudd'nhead Wilson*, Mark Twain, 1894

The voice of Mark Twain from former times offers considerable wisdom. Having built a career on solid principles we can find it very annoying and disheartening to suddenly arrive at the realisation that all is not as it seemed. Recognising these symptoms in our responses can be difficult and cause considerable anguish and downright anger. Such emotions are healthy and normal. What is not healthy is letting such concerns interfere with personal self-worth for doing that which may have been done very successfully for many years. The advent of this fast-moving information society is likely to have woken within many of us varying degrees of these feelings. The calm suddenly becomes turbulent with all kinds of externally driven changes that are upsetting the normal run of daily life. There are, however, choices for all of us and we hope our book has provided some new ways of thinking about life in the twenty-first-century fast lane. Working with the agile minds of young people is perhaps one of the greatest privileges we can have in the educational world. Failure to prepare them adequately for the world of tomorrow is not an option. Phobias regarding the integration of ICTs into everyday educational learning environments have to be overcome. There is nothing wrong with starting from the ideas and advice of those who may have had time to stand outside the engine room of teaching and learning and reflect on practical strategies for making teaching with technologies a pleasure.

At the personal level, much of what we advocate is about internal conversations; that is, encouraging professional learning that starts with where people are currently focused in their thinking. Archer (2003) describes this as mediation between structure and agency, or recognising concerns, developing projects and practices through 'internal

conversations' (p. 133). Change agents can do this for themselves. The next step is to share these deliberations in collectives that enable interpersonal scrutiny. The conclusion is that: 'Methodologically, efficient causation will always be lacking, whilst ever the subjective powers of agents are excluded from research designs' (p. 133). Hence our advocacy of professional learning communities built around ongoing shared but purposeful conversations.

Underpinning our Seven Steps approach to the integration of ICTs in the educational environment are strong beliefs that situated decision making and practical and attainable goals are part of the recipe for success. All the key players in the localised school of learning context need to be involved, including the managers, practitioners and support personnel. All conversations need to be heard and acted upon. This builds confidence and compassion within the learning community for moving forwards. The collaborative nature of this culture-building process advocated in the Seven Steps will ensure the ongoing commitment to the projects currently being developed, and will contribute to enhance capacity for future projects.

As Sergiovanni (2005b) explains, there needs to be a balance between the lifeworld and the systems world. Organisations are built around people of mixed faith and beliefs. If the systems world is too dogmatic and intrusive upon people's working lives, then the inherent survival tactics within are likely to lead to internal conversations that are counterproductive for healthy working lives. Putting the people in the organisation centre-stage is commonsense for building lasting resilience and sustainable outcomes. In the long term, all our systems worlds are designed to better organise interactions between people and information, from small rural communities to the multinational giants. Their sheer size in numbers is their power, and this is not easy to push back without conviction and shared passions with like-minded others.

In recent times, educational commentators have lamented the lack of educational voices in the decision making of educational change. Change is part of the evolutionary nature of society. Our survival depends on recognising this reality. No response is not an option and never has been. Educational institutions have the responsibility to fight back with informed advice on how best to achieve sustainable education outcomes. As social structures are made up of people from diverse backgrounds and internal belief systems, our assets lie within our own midst. From diverse views and internal conversations, creative and imaginative outcomes that may well push back the systems world to a more balanced location are possible. Winston Churchill once said: 'The empires of the future are the empires of the mind' (speech at Harvard, 1943). We possess the power within all of us to develop our competence, but we need to apply the power wisely.

The old adage of 'act locally' and 'think globally' remains valid. The information society is based on electronic, digital technologies and free time-space availability—as a global reality, we need skills as individuals to be part of this world. Acquiring these in

our places of learning will always rely on independent endeavours to some degree. The application of these skills and competencies relies on others within the social context of technology. ICTs are tools for information sharing and organising better and more efficient communications with each other. Like letter writing with a pen, the object may be similar in some ways, but we need new skills and working knowledge to use the tools. How we use the tools is another matter and therein lies the need to collaborate with other users in social settings such as learning environments. The sheer joy of being part of a change process that involves agile thinking and enthusiastic young learners building understandings together with their teachers, is powerful affirmation of the community-based professional learning approaches.

We hope the Seven Steps approach for ICT integration provides a set of guiding principles for implementing changes in professional settings. Our vision for professional learning is about 'strengthening the heartbeat', as Sergiovanni (2005b) describes so well. More than that, as authors of the book we hope you derive some sense of our feelings of exhilaration for the world around us, and are able to connect with our ideas for continuing 'internal' and 'interpersonal' conversations—any time and anywhere. The last word goes to Robert Burns (1786):

*Gie me ae spark o' Nature's fire,*
*That's a the learning I desire.*

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# Index

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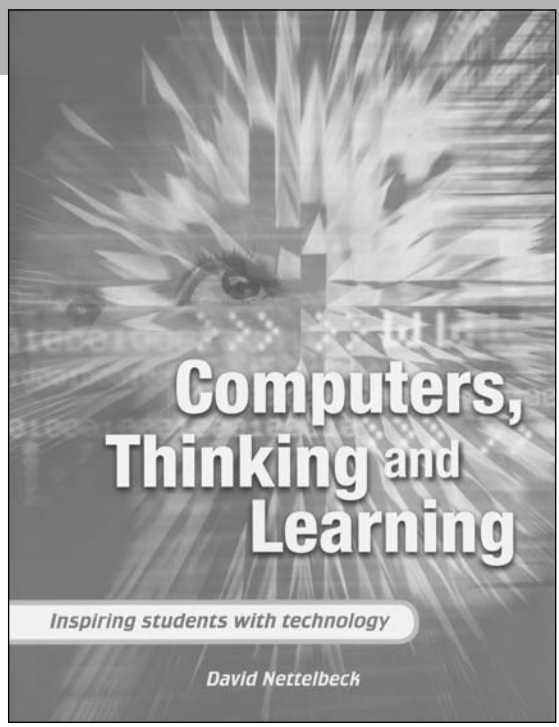


## Computers, Thinking and Learning

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David Nettelbeck
ACER Press 2005

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**About the Author**

David Nettelbeck has held senior teaching and administrative positions at a number of schools in Australia and Tanzania, and conducts professional development workshops for teachers in all states of Australia. David believes that computers offer an ideal means for educators to engage their students, using a resource that is familiar to them. He also believes that technology offers teachers like himself a fresh, exciting way to think about their approach to teaching and how students learn.

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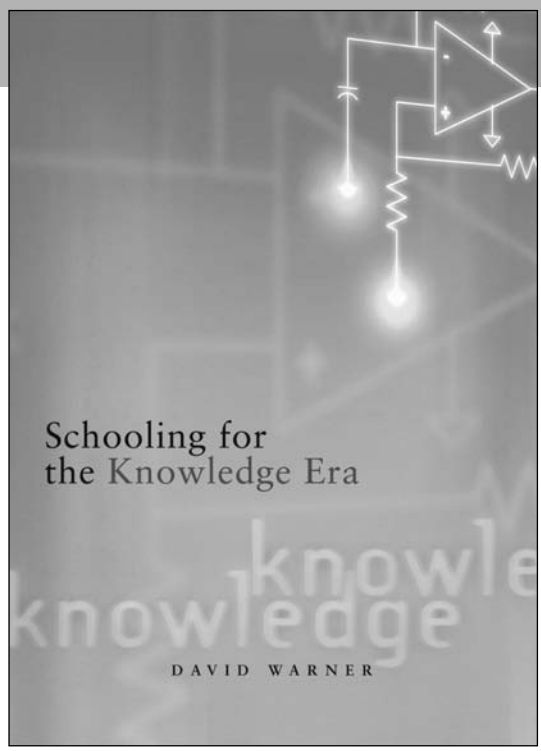
## Schooling for the Knowledge Era

David Warner
ACER Press 2006




***Schooling for the Knowledge Era*** describes the rapidly developing global knowledge economy and how schooling can be made more relevant to a world that rewards independent, self-directed and entrepreneurial knowledge workers capable of thriving in a changing environment.

This book challenges people to re-think what 21st century schooling needs to be. It defines the 'knowledge era schooling' learning approach and demonstrates the importance of revolutionising school culture beyond industrial era thinking and influence that remains prevalent in Australian schools today.

David Warner draws on his experience as a teacher, principal, and labour market analyst to show how schools can transform, creating a learning environment connected with the world that young people will inherit. Told with remarkable clarity based on first-hand knowledge of the change process, the author delivers a powerful and authoritative vision for a new culture that can be fostered in any Australian school.

***Schooling for the Knowledge Era*** shows it is time to break the mould and adopt new schooling practices that best meet the needs of young people. The author outlines five main criteria that should operate within a knowledge era school. These principles are discussed across five chapters, followed by discussion on the changing role of the teacher, the key knowledge era skill of self directed learning, a chapter long case study on ELTHAM College of Education, and a conclusion on the role of parents and policy makers.

***Schooling for the Knowledge Era*** takes a whole school approach to transformation, from teaching methodology to change management. This book is a must-read for policy makers, principals, senior educators, teachers and parents.

**Features**

- David Warner writes from experience as a Principal/CEO who has transformed over the past four years the school he currently leads
- grounded in numerous examples from a variety of schools in Australia, the UK, and the US that are practising new and innovative forms of learning
- cutting edge ideas that challenge readers to re-think the role of the school, the school organisation, and the way teaching is practised
- highly readable style
- foreword by Professor Brian Caldwell.

*'[T]his book makes an important contribution to the educational challenges of post-industrial society in terms of appropriate teaching and learning approaches used in schools … This book is a must read for all teachers – whether they are publicly or privately funded.'*

Ken Peak
Senior Manager, Department of Education and Training

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## Designing a Thinking Curriculum

Edited by Dr Susan Wilks
ACER Press 2005

***Designing a Thinking Curriculum*** responds to the challenge of disengagement in the middle years of schooling by providing teachers and administrators with ideas for the implementation of a thinking curriculum in their schools.

Teachers, teacher educators and curriculum consultants describe how they have been influenced by theorists, their use of appropriate cognitive theories, and strategies they have developed that will assist students to develop higher order thinking skills. Ways of accommodating a variety of learning styles and establishing supportive school structures are also presented.

Teachers in this book show how they have:

- modelled their curricula around ideas and issues generated by students
- linked substantive, real problems to curriculum content
- ensured that students achieve deep knowledge and understanding
- fostered higher order thinking through the use of technology, creative thinking, the visual arts and mathematical and scientific ideas.

***Designing a Thinking Curriculum*** will inspire, inform and motivate teachers looking to implement a thinking curriculum in the middle years of schooling. It is a practical first-hand account of the experiences of teaching colleagues based on sound pedagogy.


### About the Editor and Contributors

Dr Susan Wilks is a Senior Fellow in the Faculty of Education, The University of Melbourne and Director of the TeeCh Project (Thinking and Enquiry - Educating for Creative Habits.).

The contributors include teachers, teacher educators and curriculum consultants who discuss how they developed innovative curriculum content in response to the challenges of educating adolescents.

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