

Reflecting on Change when Learning To Use Information And Communication Technology (ICT)

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This is a final draft of a chapter to contribute to the book:

Complexity and Systems Thinking for Educational Change: Generating a Professional Learning System

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Reflecting on Change when Learning to Use Information and Communication Technologies (ICT)

by Rob Clarke (Christchurch, New Zealand)

The function of reflective thought is, therefore, to transform a situation in which there is experienced obscurity, doubt, conflict, disturbance of some sort, into a situation that is clear, coherent, settled, harmonious.

(John Dewey, *How we think: A restatement of the relation of reflective thinking to the educative process*, 1933, pp. 100-101)

We do not learn from experience; we learn by thinking about our experience... The process of remembering, retelling, reliving and reflecting is the process of learning from experience.

(Shulman, LS, 1996)

Introduction

Education has been slow on the uptake of the use of Information and Communication Technologies (ICT¹) to enhance student learning in schools. One reason for this is the simplistic linear way in which technologies were first introduced into teachers. This often meant classrooms being delivered with new computers followed by several workshops on basic software for the teacher who was then left to their own devices. The assumption was that delivery of the machine meant integration into regular practices. Little thought was given to how the technologies should, or could, be used to improve learning for students or teachers.

¹ For a full definition of ICT, Information and Communication Technology, see “Interactive Education- A Strategy for Schools”, New Zealand Ministry of Education, October 1998, p5.

But as we know delivery does not equal implementation and many computers sit idle in classrooms or have been moved into a “lab” situation where classes of students use them on an irregular basis with a specialist teacher.

Integrating technology into regular classroom practices means restructuring pedagogy. A key to this restructuring involves changing the role of teachers and students in the learning process. Students in this new role become empowered as researchers with access to information from all over the world. The teacher is not the sole source of knowledge but instead is a facilitator to students. This new way of thinking about classroom learning requires technical support, continual training, new policies, new assessment procedures, school planning for networking and enough resources for class use. It introduces students to a real world inquiry approach rather than relying on textbooks and the teacher for information to learn. In short, effective use of technology within classes requires many changes in the classroom system and time to readjust many related issues.

Sadly though, professional learning in ICT for educators has rarely catered fully for their needs in a holistic way². Old professional learning paradigms of the expert computer-user being the fount of all knowledge and skill will do not necessarily work in education. These paradigms must be broken down and replaced with new mindset for teachers and administrators in order for professional learning in ICT for teachers to embrace effective, sustainable and long lasting change. Because of this, education can no longer sit back and ignore the enormous changes in technology that are increasingly affecting our lives. It is a reality now that is unavoidable- Negroponte, a world leading thinker in the area of technology and it’s influence on society, states, “Like air and drinking water, being digital will be noticed only by its absence, not its presence.”³ Only very recently has education begun to realize the importance of providing ICT in conjunction with integrated support

² See “The Software Trap” from: From Now On The Educational Technology Journal Vol 9, No 7, March, 2000 by Jamie McKenzie (www.fno.org)

³ from Wired online magazine, Issue 6.12, December 1998.

systems for sustained change (such as professional learning, infrastructure, technical, and emotional support). Professional learning is now of utmost importance, as are other aspects, that together, act as a system to support the effective integration of ICT. We need to re-educate educators in the why and the how, as well as the what- so they can use ICT to enhance student learning.

When we move from a linear “professional development program” approach to a nonlinear “professional learning system” approach, teachers need to understand how a system for change operates and how to study the patterns of change that result. Central to the design of any professional learning system is the notion of *reflection* to assist in this process. Reflection is a process that helps teachers to gain insights into the “big picture” on the patterns of change resulting from a complex, interactive learning system. Fullan (1999, 1993) argues that it is only through reflection at the personal, group and organisational level that teachers will begin to question their practice and think differently about teaching and learning. This notion of reflection originated in the writings of John Dewey (1933) as a way of thinking about a problematic situation that needs to be resolved. Schön, (1983, 1987) saw reflection not only as a way of thinking, but as a hallmark of being a professional. He contended that professionals need to recognize the “complexity, uncertainty, instability, uniqueness, and value-conflict” (1983, p. 39) of a work setting and frame the context in which a problem is situated. As such, the framing of a problematic situation is a catalyst for reflection and change:

To achieve change, teachers need to discover that their existing frame for understanding what happens in their classes is only one of several possible ones, and this, according to Schön, is likely to be achieved only when the teachers themselves reflect critically upon what they do and its results. (Barnes, 1992, p. 17)

An implication is that teachers and trainee teachers need to develop a better understanding of the nature of teaching and learning, not as a simplistic recipe-driven occupation, but as social, political and ethical work that is permeated with dilemmas and shaped by cultural and social influences (Hatton, 1998). This chapter will describe a long-term project to support teachers in using new tools of ICT in

four schools in Christchurch, New Zealand. A centrepiece of the project was the use of reflection which is one of the key principles of a professional learning system identified in Chapter 3.

Part 1—The Professional Learning System

Background

October 1998 was to be a turning point in the development and integration of ICT in New Zealand schools⁴. The Ministry of Education had just commissioned its Interactive Education Strategy for schools⁵. This strategy is designed to help schools integrate Information and Communication Technology (ICT) into the learning process, and improve schools' use of ICT for administrative purposes. There was a fervor of activity as school principals and IT specialists around the country gathered information, built alliances, and wrote proposals to be one of the 23 successful applicants for a lead school contract.

Fendalton School is one of the 23 lead schools that are contracted to deliver professional development to its cluster, or group, of four schools.

The Schools

The Christchurch ICT Cluster⁶ is a group of four schools who are committed to creating learning environments and school cultures that embrace the good use of ICT to support and enhance teaching and learning. Each school was invited to join the organization because the Principal and the staff had the potential to create real improvement in how they use, and understand the use of ICT. Within this group are represented low and high socioeconomic areas, rural and central city areas, various sizes of school, as well as a wide range of student and parent populations.

⁴ See "Goals for 2001- Implementing ICT in Schools", Nov 1998, p9.

⁵ See www.tki.org.nz for further information on the strategy and related documentation.

⁶ The Christchurch ICT Cluster are [Fendalton School](#), Ashley School, Richmond School and Roydvale School. Visit our web site at: www.christchurchict.org.nz

Together these four schools represent a diverse range of people working towards a common goal.

Fendalton School is an elementary school in Christchurch, New Zealand. It is an urban school with a roll of approximately 540 students from year 0 to year 6 at school (5- to 11 years old, or K-6). For the last few years Fendalton has been a leader in the area of information and communication technology and the support and professional learning it offers its staff. Late in 1998, Fendalton was successful in winning one of the 23 lead school contracts for the Ministry of Education. Fendalton is the lead school for the Christchurch ICT Cluster.

The other three schools are Roydvale School, Richmond School and Ashley School. Roydvale School is a school with approximately 220 students, aged from year 0 to year 6 (K-6). There are 8 teachers employed at this school, 2 of who are in a job sharing position. It is a middle class school located in urban Christchurch. Richmond School has approximately 220 students from year 0 to 6, it has 8 teaching staff. Richmond School draws its students from live in a lower socio-economic area in central Christchurch, which results in a more transient student population. Ashley School is a middle class country school situated 35km north of Christchurch with 6 teaching staff. It has approximately 140 students, aged from year 0 to year 8 (K-8). Ashley draws its students from a predominately rural area. The Christchurch ICT Cluster was founded on the belief that teachers are the dream makers and hold the key to improving education and how it embraces ICT. Making learning even more exciting and powerful through exemplary use of ICT is a major goal. The expectation is that teachers from the Christchurch ICT Cluster will become leaders in this area, and provide exemplary models for others in education in the future.

Elements of the Professional Learning System

This project rejected the conventional professional development program approach of introducing new technologies to teachers followed by workshops to support implementation. Instead, a professional learning system was designed to provide teachers with multiple sources for learning that interrelated to support the dynamic nature of change. There are four key underlying beliefs that guide this project:

- ICT can help students learn in new ways.
- Constant change is a characteristic of a technological world, which has implications for teaching and teachers.
- Teachers need to become ICT literate.
- Reflection in and on action is a key requisite in a changing environment.

Betts (1992) describes a system as; 'a set of elements that function as a whole to achieve a common purpose'. He refines this further:

'A *subsystem* is a component of a larger system; for example, the circulatory system is a subsystem of a human system... An *element* is a necessary but not self-sufficient component of a system. That is, the system cannot achieve its purpose without the element, and the element by itself cannot replicate the system's functions.

This project comprises five main subsystems, each of which interrelate to contribute to the complex and dynamic nature of the professional learning system. These five subsystems are: the Kids as Coaches subsystem, the Leading with ICT subsystem, Lead Teacher and Principal subsystem, Other Supports subsystem, and the Practicum subsystem. An overview of these subsystems is shown in Figure 1:

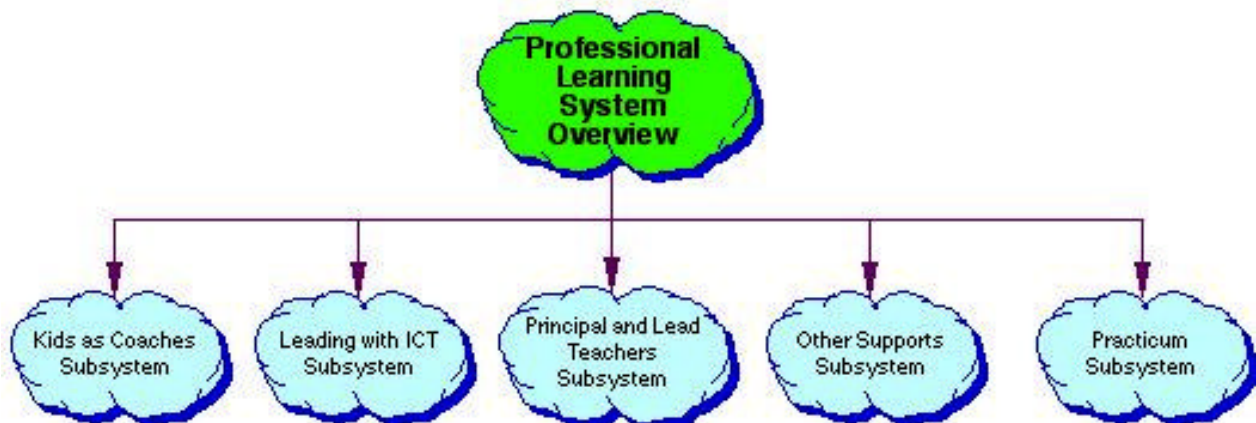


Figure 1: Professional Learning System Overview

Aspects, or elements as Betts (1992) describes, of these subsystems are negotiated with the people involved, and the role of reflection and team building contributes to the influence this has on learning for staff, Principals and students alike. The Kids as Coaches subsystem started in the second year of the project, the Leading with ICT subsystem started in the third year of the project, while the other three subsystems have been part of the project since its inception.

Kids as Coaches Subsystem

The Kids as Coaches programme is aimed at bringing together children from each of the four schools regularly, so they can develop their skills and look at how they can support other children and staff in each of the schools. This is a really exciting innovation, which has as its aims:

- To **explore** what kids can do when given powerful new tools.
- To allow kids **opportunities** to lead in their schools in ICT.
- To explore **learning** with ICT and develop skills that will be passed on in classrooms and in schools.

Leading with ICT Subsystem

The Leading with ICT subsystem was designed in response of the need to build the next layer down from the lead teachers, and to continue the development of staff who have stretched themselves as a result of the practicum. This will strengthen school ICT leadership density, and facilitate ongoing learning with ICT should any of the lead teachers move on. This subsystem focuses on the following:

- Increasing the depth and breadth of teacher's skills.
- Further exploration and research of learning models.
- Strengthening teacher's reflective practice.
- Establishing model classrooms.
- Strengthening teacher's leadership skills.
- Keeping up to date with new research/best practice.

Lead Teacher and Principal PD Subsystems

In addition to the subsystems to drive teacher learning, there are supports in place for Lead Teachers and school Principals. These subsystems are ongoing and change according to the needs of the participants. The Lead Teacher subsystem focuses on

building a teacher in each school towards becoming a leader in ICT and education, and helping them to support the process of change. The Principal subsystem focuses on wider issue relating to ICT and education, as well as personal skills. The key focus for Lead Teachers and Principals is leadership and school change. The key elements to these subsystems are shown in Figure 3:

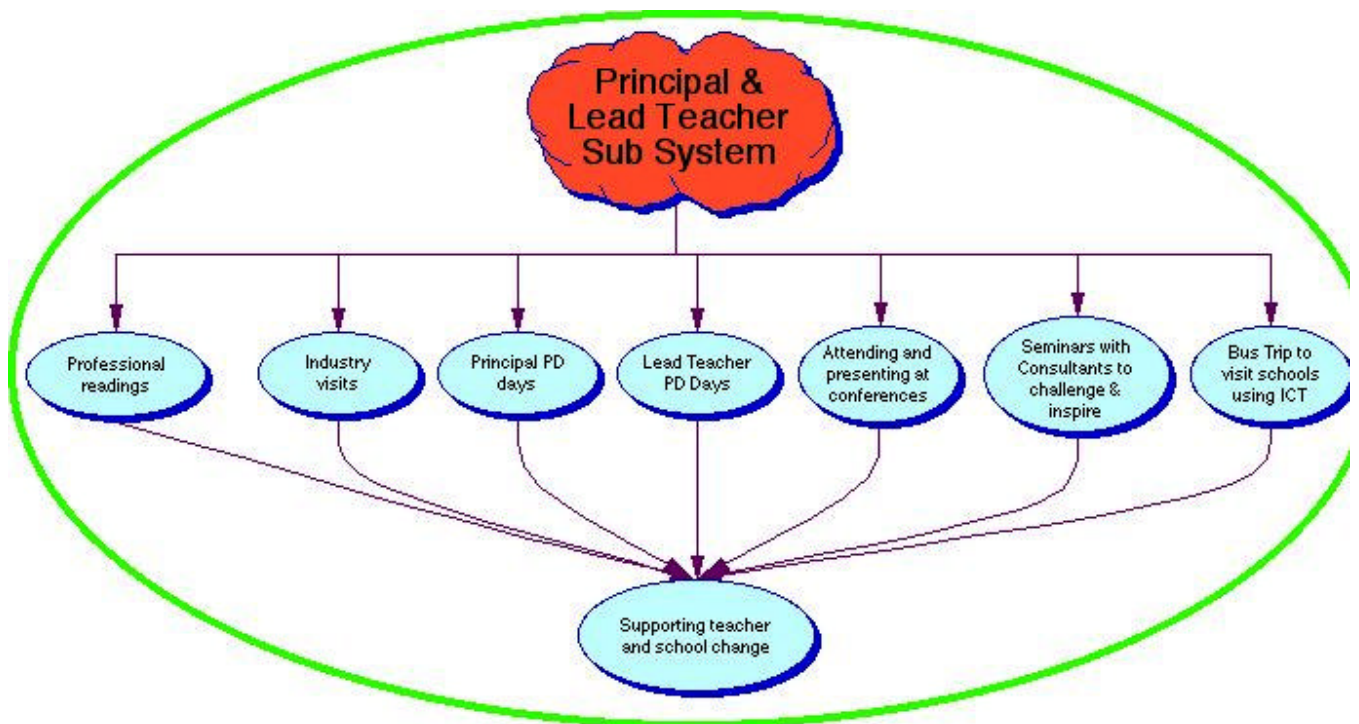


Figure 3: Principal and Lead Teacher Professional Learning Subsystem

The Lead Teacher's role is to:

- Support teachers as they work to make ICT an integral part of their classroom programmes.
- Help with the organisation and management of the contract in each school.
- To work toward the further development of their own personal teaching to integrate the ideas presented in the contract.

Elements of the Lead Teachers subsystem include conference attendance, bus trips to see other schools who are using ICT, and a series of meetings each semester, to look at a range of aspects, for example:

- Higher end skills development.
- Looking at models that help develop our understanding of teacher professional learning.
- Looking at the nature of change.
- Discussing practicum staff progress and looking at how best to support them.
- Visiting industry sites to see ICT in other settings.
- Presenting to other educators at workshops and conferences.
- Sharing successes and challenges from their classrooms.
- Looking at systems that support change in their schools.

The Principal subsystem focuses on personal skill development of each Principal, as well as wider issues pertaining to ICT and education. Their role is to oversee the development of ICT in their schools and lead by example. The elements of their program include:

- Looking at research.
- Visiting industry sites to see ICT in other settings.
- Regular meetings to share, discuss and debate issues relating to ICT in their schools and in education.
- Conference attendance at certain times during the year.

These two subsystems complement the support provided for teachers and support the process of change.

Other Supports Subsystem

Throughout the time the Lead Teacher, Principal, Kids as Coaches, Leading with ICT, and Practicum subsystems are running, there are a range of opportunities made available to staff. These are conferences, weekly workshops, informal ‘just in time’ sessions and “techie brekkies”.

- Staff are encouraged to attend conferences that focus on thinking as well as ICT. These provide inspiration, challenge and a wide range of skill learning opportunities. The project subsidises attendance at these events.

Because different conferences provide different types of learning opportunities, this allows us to specifically target these to different groups of staff⁷.

Weekly workshops are made available to staff within the four schools, so staff can spend two hours learning new skills to raise their personal skill level. These workshops are open to anyone in the four schools, and are run by our business partner Infovision Technology⁸. Examples of skill learning opportunities include:

- basic skills (eg. basic desktop and file management, spreadsheets, database, graphics, multimedia, internet, email, digital image capture, etc.)
- high-end skills (eg. image editing and manipulation using Adobe PhotoShop, web site construction, collaboration software, networking, etc.).

Just in time support sessions are organised by the lead teacher at a school level. The advantage of these sessions is that they meet an immediate need for staff. This type of support is crucial because staff can have skills-based training as and when they need it, which emphasizes learning new things ‘just in time’, rather than ‘just in case’. A key element to this type of support is the use of “techie brekkies”, which are flexible sessions that may occur at different times, and could include breakfast, thus

⁷ Certain types of support have been found to be most appropriate to staff at different stages along the ACOT progression. See “Stages of Instructional Evolution”, p37. in “Teaching with Technology, Creating Student-Centered Classrooms” Sandholtz, Ringstaff, Dwyer 1997

⁸ Infovision Technology can be visited on the internet at www.infovision.co.nz

the name “techie brekkie”. This type of support may focus just on skills, while at other times it will focus on the integration of skills into the curriculum.

Practicum Subsystem

The practicum is our key strategy for creating change. The practicum is an intensive six month course, where 10 staff from the schools come together on nine occasions to work with the Facilitator. The program has as its focus the development of school cultures where staff develop a sense of community, and their need to use ICT to improve teaching and learning. During each practicum day staff work on a range of things:

- Sharing what they are doing in their classrooms.
- Learning new skills and looking at how these can be integrated into the classroom.
- Examining professional readings and looking at how these fit with ICT.
- Reflecting on their experiences and thinking.
- Visiting other classrooms where good teaching and learning with ICT is being modeled.

The practicum provides the structure and process for reflection on experience. During the 3-year period, every staff member in each school will go through the practicum. This gives continuity and builds a ‘critical mass’ of staff who become increasingly reflective in their practice, and hungry for further learning with ICT.

Figure 2 represents the various elements to this subsystem. These elements interact together to provide a comprehensive environment which supports teacher learning and school change:

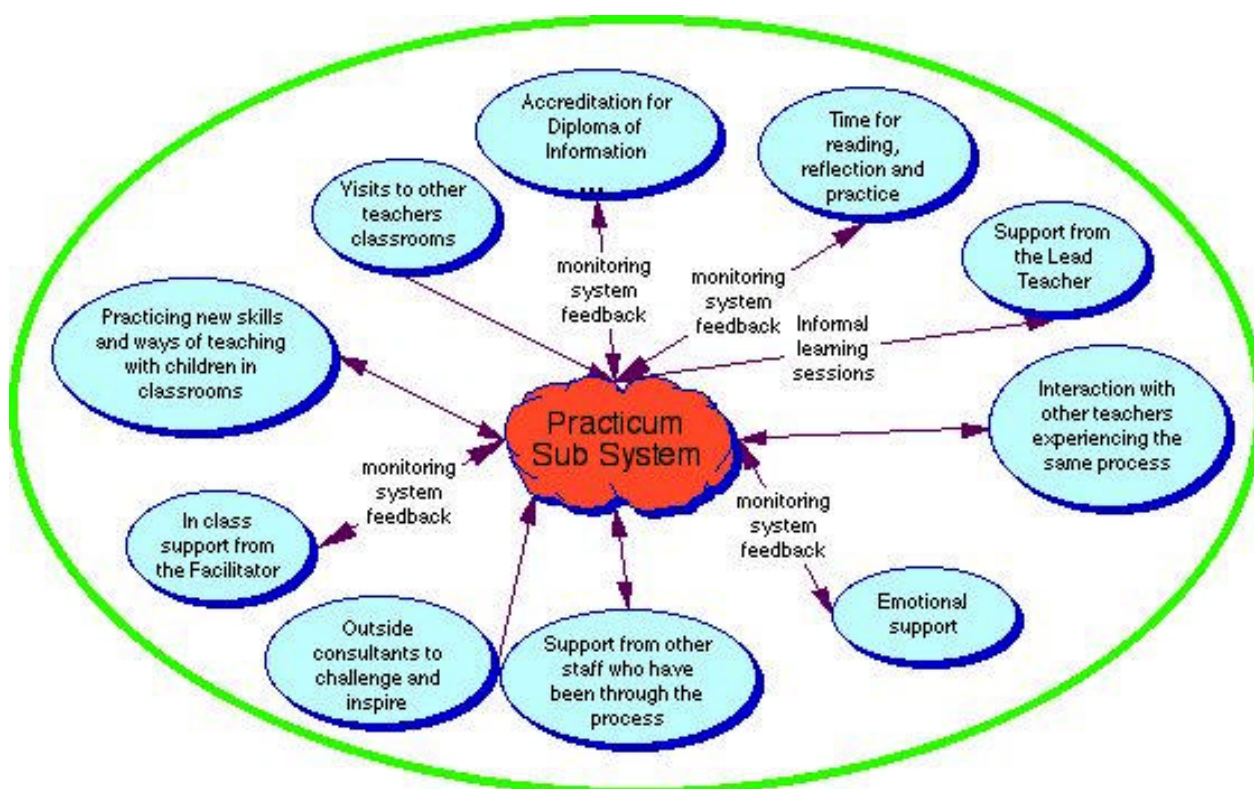


Figure 2: Elements of the Practicum Subsystem

As shown in Figure 2, there is a wide range of strategies employed that provide rich sources for teacher learning. They operate in a dynamic way and change to meet emerging needs of staff in the practicum. Central to this is the process for reflection, which encapsulates many of the elements of the model and underpins teacher learning. The structure of this reflective process matches the criteria for the practicum. The process for reflection and how it interacts within the professional learning system will be described in Part 3 of this chapter.

Practicum Requirements, Criteria & Content

There are four requirements for the practicum. These areas tie in directly with the process for reflection, and comprise the criteria staff strive for:

1. To reflect critically on each of the readings, using the 5 dimensions provided.
2. To produce examples of quality learning from the students in their class.

3. To increase personal skill levels and show evidence of this.
4. To continue this learning for a further six months.

The following professional readings comprise the core content of the practicum, and form the basis of the first part of the criteria:

Atkin, J. (1999). *Understanding How We Learn*. ICT Cluster Seminar notes, 12 April 1999.

Caine, R., Caine, G. (1997). *Education on the Edge of Possibility*. Alexandria, Va.: ASCD.

Thinking Strategies, de Bono, CoRT

Knapp, C. (19__). *Lasting Lessons- A Teachers Guide to Reflecting on Experience*.

Lazear, D. (1994). *Seven Ways of Teaching- The Artistry of Teaching with Multiple Intelligence's*. Australia: Hawker Brownlow Education.

McKenzie, J. (1997). *The Question is the Answer-Creating Research Programs for An Age of Information*. From Now On web site, Oct. 1997.
<http://emifyes.iserver.net/fromnow/oct97/question.html>

Tapscott, D. (1999). *Educating the Net Generation*. Educational Leadership, Feb. 1999, Vol. 56, No. 5, pp. 6-11.
<http://www.ascd.org/readingroom/edlead/abstracts/feb99.html>

Trybus, M. (1997). *When Quality Goes to School, What Do Leaders Do to Put it To Work?*

In addition to these core readings, a range of background material is provided. These are listed in the reference section of this chapter.

Part 2- The Role of Reflection in the Professional Learning System

Consistent with our underlying belief that reflection in and on action is a key requisite for success in a changing technological world, we have designed a comprehensive process for teachers to use when they reflect. This part will describe the reflective process and how it fits in the professional learning system. It will also illustrate how we have structured the process for reflection and feedback, which encourages reflection in and on action.

Caine and Caine (1997, 134) believe that reflection in and on action is a key to being able to change one's behaviour as a learner, where, in this case, the teacher is the learner. They state:

“One part of everyday self-reference is reflection on action. ...reflection on action means that after a person acts (whether an athlete or architect), feedback is supplied, usually by an external source, and can then be used by the person to self-monitor and improve.” (p134).

They describe reflection in action as the person's ability to observe their performance while it is going on, “...to assess what is happening, and to make changes midstream.” (p135.). Further, this is what Howard Gardner (1985) calls intrapersonal intelligence.

The Process for Reflection

Reflection is the key for success in this type of change. Donald Schon (1983, 1987) believes that people learn best when they actively reflect on a range of experiences. This is equally true for educators. Teachers in the practicum reflect on new knowledge, current thinking, new skills and new strategies for using ICT, they also record their reflections on what they are doing in the classroom and what they intend on doing next. They are reflecting in and on action. This helps teachers see themselves as learners, and helps them to become what Robert Diltz terms as

increasingly 'open to doubt'⁹. Becoming open to doubt helps teachers critically and honestly analyze what they are doing and what they are thinking at any particular time during this practicum. This is a process that takes time, and is challenging and presents difficulties for staff at different times. How the system responds to these challenges and difficulties is crucial. Feedback is a key element to the systems' ability to support change.

Figure 3 shows how reflection supports the professional learning system. It demonstrates how these multiple sources of learning act collectively to create sustained change. Through this process teachers monitor their own progress and become aware of the overall patterns of change.

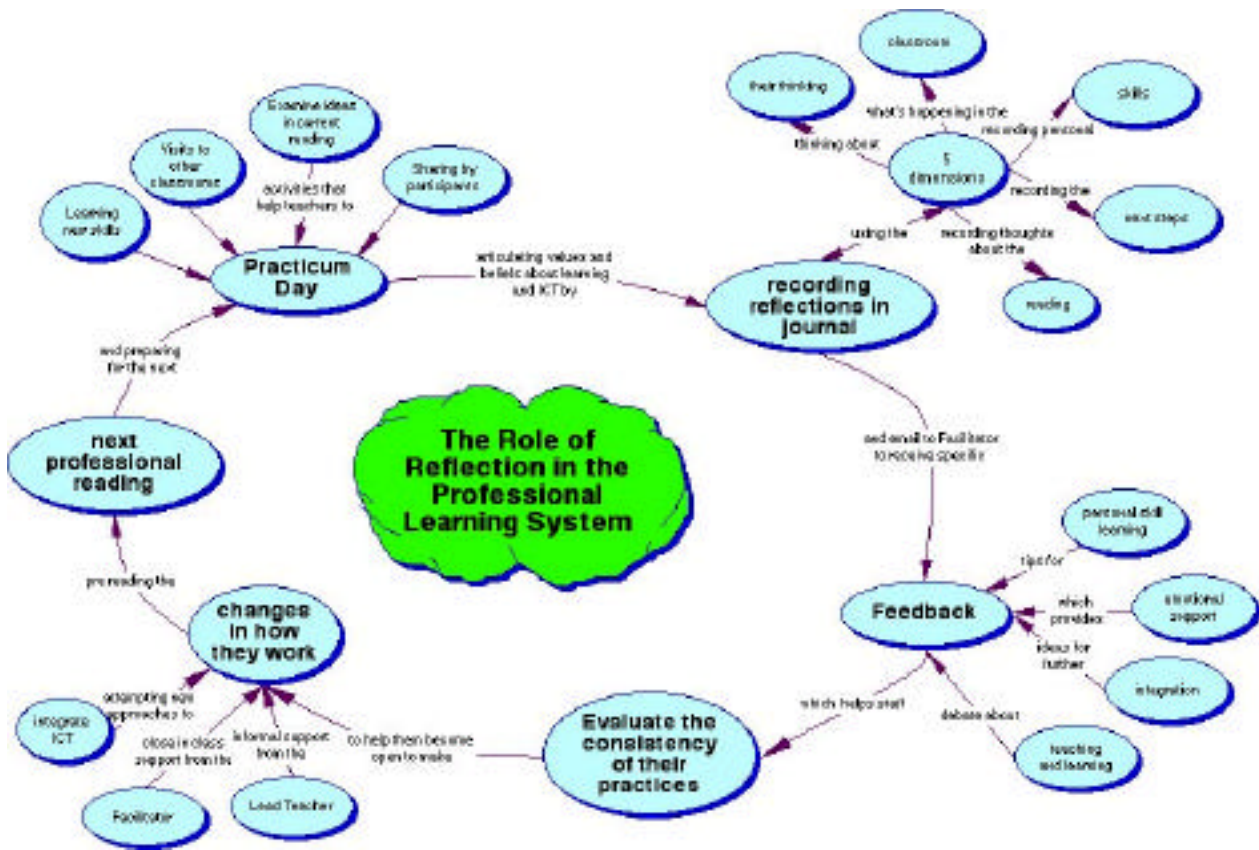


Figure 3: The Role of Reflection in the Professional Learning System

⁹ For further information see The Belief Change Cycle, Robert Diltz <http://www.scruz.net/~rdiltz/archive.htm>

As can be seen in Figure 3, teachers record their reflections using five dimensions. These dimensions were chosen to provide a holistic approach to reflection. Teachers need to reflect on what they are thinking, what they are doing and new knowledge as it comes to light. Each of the five dimensions for reflection interact to provide what I will describe as a ‘*reflective cycle*’ which helps teachers to inquire into their process for change and continuous improvement. This reflective cycle is consistent with the ideas presented in Chapter 7 “Getting in the Loop”. This cycle of reflection paints a comprehensive picture of change over time. These dimensions are summarised in Table 1:

<i>Dimension for reflection:</i>	<i>How it fits into the cycle for reflection:</i>
What teachers think about the reading.	<i>New knowledge aspect which provides a stimulus for thinking about new things as well as current knowledge.</i>
What teachers think about how their thinking is changing.	<i>Meta-cognitive aspect which provides self evaluation and emotional support information.</i>
What teachers are doing in the classroom that relates to this and ICT.	<i>Link to the classroom aspect which gives a grounding in practice.</i>
What teachers are learning in terms of their personal skills at the time.	<i>Personal skill learning aspect which gives information about the skills teachers are learning.</i>
What teachers are intending on doing next.	<i>Goal setting aspect which gives a link to action and what teachers intend on doing next.</i>

Table 1: The Five Dimensions for Reflection and how they Fit into the Cycle for Reflection

Each of these elements interrelate to provide a very clear picture of a teacher's journey as they learn to integrate ICT into their classroom, and the patterns of challenge and success along the way. These five dimensions will be described in turn, showing how they interact to provide a platform for inquiry into ones' thinking and teaching behavior.

Reflecting on New Knowledge

Through the use of a series of professional readings, teachers are taken through a process of relating what they currently know to a range of theories about teaching and learning. Some of the ideas in these readings may be new to some staff, while others may be familiar. First, staff examine the content in each reading in a general sense, then they relate this to the use of ICT. These readings range from specific classroom strategies, such as good questioning technique, through to examining global issues such as quality in education. This provides a range of ideas which act as a stimulus that helps ease staff into the idea of the value of ongoing professional reading and dialogue about this.

Reflecting on Your Current Thinking

This provides the meta-cognitive aspect to reflection that teachers encourage within their classrooms. ICT can be a challenge for teachers who are either hesitant, or may have little or no experience in this area. Because of this, it is important that teachers are given a means to express how they are feeling. Emotional support has been found to be vital in the area of professional learning for teachers in ICT¹⁰. This aspect to the reflective journal is extremely important.

¹⁰ see ACOT <http://www.apple.com/education/k12/leadership/acot/library.html> for further information relating to emotional support, and the various other strategies to support teachers in the area of PD for teachers in ICT.

Information shared allows the facilitator and lead teachers to adapt how they support individual staff. This might mean a 'shoulder to cry on', or for someone to pop in and ask how it is going. Emotional support is dependent on the relationships between individual staff, a lead teacher in each school, and the facilitator. Information shared gives the facilitator useful information about attitude, and how comfortable teachers are within the process of change.

Reflecting on What is Happening in the Classroom

Without a link to what teachers are doing in their classroom at each point in time, we have found that teachers don't always naturally jump in and try new things. It is more likely that a teacher will try to change something if they are thinking about it in relation to what they are reading and thinking about at the time. The focus on one particular reading or theory of learning at different times helps teachers to focus in on specific aspects of their class program. The underpinning belief here is that any professional learning must be set within a practical context for it to be authentic and long lasting. This element to the reflective process encourages ownership and accountability within staff, and builds the need within a supportive climate.

Reflecting on Personal Skill Learning

We strive to always encourage staff to learn new skills when those skills will be useful to them- personally or in the classroom. In this way, teachers are learning new things just in time, as opposed to just in case¹¹. If teachers are learning new skills as they need them, and attempt to integrate them into their class programs, they are naturally becoming facilitators of learning- as they don't always know the answers and are having to learn alongside their students. As time progresses, staff develop their hunger for new skills.

¹¹ Learning new skills just in time is better than learning new skills just in case as it means new skills will be learnt and practiced in authentic contexts, which, in this case, is the classroom.

This is a natural way to help teachers change their role within the classroom. This invariably causes challenge and sometimes stress for the teacher, as they are no longer 'in control', which ties in with the emotional support component to the reflection and feedback process. We call this teacher 'ICT literacy development'. Teacher ICT literacy development creates increased need within schools as staff become excited about their new discoveries as the world of possibilities opens up for them.

Reflecting on Goal Setting and Next Steps

Teachers are constantly having to 'look into the future', and think about what they are going to do next, by recording what they plan on doing next. This creates a link to action for what staff do in their classrooms. This type of goal setting builds ownership for staff as they have to be continually upskilling themselves, while thinking about how they will integrate these skills into their classrooms. We strive for the creation of true ownership of personal learning and the attitude of discovery, exploration and continual skill development.

Each of these five elements, when brought together as an interrelated system, provide a thorough process for reflection in and on action, therefore providing an excellent platform for inquiry, challenge, change and improvement. It also creates long term attitude for the value of a strong reflective process, and ownership within individuals for their learning.

The Importance of Feedback in the Reflective Cycle

as the ability to "Feedback is a vital element to this reflective process, and a database system has been designed that helps the Facilitator to monitor the reflective journal of each staff member. This database provides comprehensive feedback for teachers while they are on the practicum. The process for reflection involves each practicum staff member emailing the Facilitator their reflections, the Facilitator recording these in the database, the Facilitator recording his feedback and then emailing this back to the teacher. The next section will provide a case study of one teacher's reflective journal to illustrate how reflection facilitates the process of change, and ties in with the professional learning system.

Part 3 Outcomes for Teachers and Students

This part will discuss a case study of one teacher's journey, how we know we are making a difference to learning and our challenges and plans for the future.

The goal of any good professional learning program should be an improvement in teacher philosophy and also how they put that philosophy into practice. This means improved learning outcomes for students. We believe that without improvement in how teachers work and learn, we cannot hope for improved learning outcomes for students. Because our ultimate goal is to enhance student learning using ICT; the specific strategies, challenges and discoveries that happen during the time of the professional learning are our pointers and guides to improving future professional learning in this area. We have started to make some of these discoveries about what makes quality learning using reflection as our tool, and ICT as the catalyst.

We have observed changes in how teachers teach, how they see and think about the use of ICT, and there are strong changes in teachers' attitudes towards their own professional learning. We have seen how ICT can enhance traditional teaching and learning, as well as modern innovative approaches. Some teachers show increased skill levels only. There are two common challenges that we have found for all teachers learning to integrate ICT, these are:

- How ICT challenges teachers' flexibility in how they operate in the classroom.
- How the ICT challenges the role of the teacher from being the one who knows the next step or the knowledge, to a guide who helps students find things out for themselves.

The following excerpts illustrate the journey of one teacher during the practicum. Using the five dimensions for reflection, we illustrate the close relationship between what is happening in the teacher's classroom, what they are reading, what they are learning and the importance of feedback to this process. This demonstrates the interrelated nature of reflection in and on action and how this develops over time.

Case Study of One Teacher's Journey

Glen is a teacher who works with a class of year 2 (or 6/7 year old) students. She has been teaching for approximately 20 years and is the Assistant Principal of one of the schools. Prior to joining the practicum Glen hasn't used ICT in her classroom much at all. Most uses were for word processing and drawing pictures, and playing 'educational' CD ROM's such as "Millies Maths House". The structure of this journal is each aspect of the teacher's reflection, with feedback from the Facilitator where appropriate. Reflections and feedback are indented. After each reflection and accompanying feedback, a brief discussion illustrates how this fits into the professional learning system.

Glen 2/8/2000

* * * INTERACTIVE LEARNING/TEACHING- EDUCATING THE NET
GENERATION * * *

I agree with many of the statements e.g. " ...the most potent force for change is the students themselves..."

However there are many statements, mainly in the Eight Shifts of Interactive Learning, that do not apply only to learning through technology. Learner centred education begins with an evaluation of abilities, learning values, social contexts and other important factors that affect the student (a class description?). "From teacher as transmitter to the teacher as facilitator"

OK ICT may help these teaching strategies along, but aren't they what we have been talking about and using (in part or whole) for years? The last paragraph about the challenges financially and personally has long been a stumbling block, or excuse for keeping the status quo. Hopefully the cluster will help us to be part of the change.

Feedback 13/8/2000 What you think about the reading...

I agree with you partly in that I think YES we have been talking about these sorts of things you quote, I wonder if we really practice them however? How do you see ICT fitting into this? Can it inhibit or help these things? What are the things that influence this?

I too hope the cluster may be able to help us deal to the financial realities we face. We do have very limited access, but the flip side of that is that we have very innovative teachers who can make the most of what they have got- I think you are one of these!

This first part of Glen's first reflection demonstrates that her notions of the role of the teacher are being challenged, through statements such as: "OK ICT may help these teaching strategies along, but aren't they what we have been talking about and using (in part or whole) for years". This reading invariably does this for teachers, which, as Diltz terms, 'opens them up to doubt'. This is an important aspect to the process of change. She mentions the financial realities of lack of equipment as well as the fact that this is an excuse for not making progress for many. This is a pointer to how open she is to the practicum and to her own professional learning. Note the emotionally supportive statement in the last paragraph of the facilitator's feedback,

which turns a negative into a positive- this is important as it will help Glen continue to open up further during the process.

DEVELOPMENT IN THINKING...

Working with young children for so long, the "Chew and Spew" method has never been part of my teaching strategies. Children need to relate the new information to their previous knowledge, use it and make some sort of meaning out of it that fits into their schema. I do often model an activity, but expect the children to be using that model in their activities to help them construct meaning. Interaction is a key feature of learning – between the child and teacher and between child and child. My aim is to get children thinking and acting with autonomy. My most frequently asked question must be, "What do you think it might be?" Their guess is often right and to have that confirmed is more powerful than for me just to tell them an answer. Of course I need to know the children's abilities and needs, to plan and prepare activities appropriate to their level and according to the National Curriculum.

My thinking about ICT... It is part of the children's future and should be part of their present. I can see huge value in programs like Kidpix developing problem solving and thinking skills. Most of my children are not good enough readers to use the Net. I can guide this and model it as shared reading – I haven't yet! I don't need to be convinced to use ICT, I need some strategies for making it easy to use in the classroom.

Feedback 13/8/00 Changes in your thinking...

You have touched on something that Stephen Heppell mentioned a couple of times in his keynote at the conference- the need for a mentor of some sort.

Your idea of using the net as a shared reading experience is best, that will also give you opportunities to help them develop a reading conscience when they move to more independent work using the web. It's great that you don't need convincing of the need/value of ICT- your journey will be much more easy in this case!!!! Strategies- let's have a look at your planning and also do some planning next practicum day to help this.

Have you seen www.sunshine.co.nz?

This shows that the teacher is relating the ideas in the reading to those she holds already, that of 'schema'. This also is important for creating a change paradigm, as we believe that teachers need to relate their current knowledge to new knowledge to aide the process for reflection. In the second paragraph Glen notes that she could use an existing teaching strategy, that of shared reading, to teach her class how to use ICT. This is the first indicator of a coming change in her teaching. Notice the clue in the facilitator's feedback for examining her planning, so as to help her find useful strategies for integrating ICT into the classroom. The facilitator has also suggested a web site for her class, which has age appropriate reading material on it.

WHERE I AM AT WITH MY TEACHING...

Not very organised. Other things seem to take over even when I have planned and made charts to follow. The children have all written stories and had a go at Kid Pix. Otherwise it is Maths programs at Maths time and Language programs at Reading time we have used the digital camera (teacher dominated!) and video camera – the kids did get a go. I have been waiting to be on the practicum to really get a good program going.

Feedback 13/8/00 Where you are at with your teaching...

Being 'not very organised' is OK. Integrating ICT will actually create a bit of 'disorganisation' at first, then you will figure out systems with the class that make life easier for all. This takes time so my advice is 'jump in and get wet'. The more exploration you do the better placed you will be to think through systems, procedures and little strategies that help you. Your flexibility in time-tabling will be challenged by this, which will be fun.

Again you can see the emotional support element to the process for reflection coming into play here, where the teacher is feeling disorganised, and the facilitator is validating this as a natural part of the process of change. Notice that the use of ICT at this stage is teacher dominated, and in 'subject specific' areas where the teacher is most comfortable. You can see that the teacher has already made some changes in how she works with ICT, as she is creating charts to provide support, of scaffolding, for independent work by children.

MY PERSONAL SKILL DEVELOPMENT...

Following up from the Computer Conference workshops – practising making KidPix slide shows and using the Mac at school to word process on, instead of doing it at home on my PC. I've had a look at Guru Net, which gives hints and shortcuts for the Internet.

Feedback 13/8/00 Where you are at with your personal skills...

Good for you- that's great to hear. What is the URL for GURUNET?

WHAT I AM GOING TO DO NEXT...

Write a cooperative story with the children and get children to make a page each of the continuing story. Take photos of children and put them onto a desktop picture when they are class leader. Use topic pictures for the other computer desktop. (Can I make a photo a screen saver?)

Keep up the good work. Rob =)

Here Glen is taking on board some of the ideas from the practicum day, where one of the activities was to write a continuing story with other teachers. This is coming through in her reflections. Although most ICT use at this stage is teacher dominated, and in 'subject specific' areas where she is most comfortable, she is starting to explore a wider variety of ICT activities. She is also starting to ask

questions about how to do things that she doesn't know, which is another sign of the change process having an effect on the teacher and how she operates.

Glen 5/8/2000

* * * QUESTIONING * * *

I would not necessarily use all these kinds of questions in my planning or teaching, but I can see that knowing of them and their place in learning could be of benefit to the quality of my teaching. The three types I see most useful are Essential, Subsidiary and Hypothetical. Of value – Which questions matter? WHY? HOW? WHICH? A questioning toolkit that each school develops for itself would be useful. It could give guidance and expectations throughout the school's levels.

"From Now On" was one of McKenzie's references and I found some straightforward sense in this that I believe in and find useful. The three sections – Framing Essential Questions, Identifying Subsidiary Questions and Stating Suppositions – Hypothesizing and Predicting are succinct and have information relevant to my level of teaching.

"Before they proceed..... students list suppositions, pose hypothesis and make predictions.....This thought process helps provide a basis for construction of meaning. Suppositions... What do you suppose? How do you suppose? Why do you suppose?"

Feedback 28/8/2000 What you think about the reading...

Could you perhaps think of other 'labels' for these types of questions, so you could use them with children of the age that you work with.

Glen has acknowledged her agreement with some of the ideas in the reading. She has identified the ideas that are most useful to her.

DEVELOPMENT IN THINKING...

The questioning toolkit has expanded my knowledge of kinds of questions and how to use them.

WHERE I AM AT WITH MY TEACHING...

My responsibilities are getting in the way of what I want to do. I am only at school for one and a half days this week and during that time I have to do two classroom appraisal observations. I have four different courses to go to!! However, what I hope my student and reliever can do is run the programs based on questioning that I have organised.

1. Contract about The Sea – Each child asks a big question, two little questions related to it, makes a prediction and decides where to go for information, who to get to help and how to present it.

2. Learning centre type activities about the sea using Bloom's Taxonomy for questions. There will be must do and can do activities.

Feedback 28/8/2000 Where you are at with your teaching...

Yes it will feel like this. Try to think of ways to do your job using ICT, so that it makes it more efficient or easier for you. A database on appraisals might really help you to collect information to feed back to staff.

Again notice the changes the teacher is trying to make in their classroom. She is exploring the use of different types of questioning with their class (although she is struggling with the amount of time she is out of the classroom!). The facilitator has

suggested another way to make her life easier through using IC T to help her with her administration. This is important, as integration of ICT can sometimes be easier if teacher administration is focussed on first. In this case, the teacher is keen to try things in the classroom.

*MY PERSONAL SKILL DEVELOPMENT...
Devising the contract and the activities*

Feedback 28/8/2000 Where you are at with your personal skills...

What are you doing specifically to up skill yourself Glen? Could any of these skills help make life easier for you?

Here the facilitator is guiding the process for reflection, to ensure that the teacher records specifically what they are learning at that particular time. This is important information for the facilitator and the teacher, as it may give clues to what they could focus on during the next practicum day. Or it may give information so the Facilitator could recommend a weekly workshop or a 'just in time' session for the teacher to attend.

WHAT I AM GOING TO DO NEXT...

Revise how I was using Kidpix in a cooperative story situation. It was an add-on story, but I think it needs to be more planned and structured, with better modeling and instructions. I would like the reliever to monitor this as well, but it depends how much I can get set up on Monday

Feedback 28/8/2000 Where to from here...

Good, keep practicing your skills and modeling to and with the class.

Keep up the great work! Rob =)

Here Glen states that she needs to restructure how she sets up the situation when using ICT. She wants it to be more integrated and natural, through better modeling and clearer instructions on her part.

Glen 12/9/2000

** * * HOW THE BRAIN/MIND WORKS * * **

I tried to look at each of the 12 findings presented by Caine and Caine and relate them to my experiences.

1. The brain is a complex adaptive system

This seems to be an all-encompassing principle about how the entire human system interacts with the environment when learning.

Reflecting on Change when Learning to Use Information and Communication Technologies (ICT)

2. *The brain is a social brain.*

To me this reinforces the importance of the relationship between the teacher and learner, and between and among learners.

3. *The search for meaning is innate.*

We are always on the lookout for novel stimuli, something new to learn. Children respond well to anything new – a natural instinct.

4. *The search for meaning occurs through patterning*

The brain organises and categorises information, interprets and creates meaning.

Meaningless patterns are not registered or retained. The new information needs to fit into or onto prior learning.

5. *Emotions are critical for learning*

How one feels about one's self, others, the situation and the subject affects the learning.

Emotion helps to store and retrieve information.

6. *The brain processes and creates parts and wholes simultaneously.*

One part of the brain reduces the information into parts and the other perceives it as a whole.

Global ideas should be given from the beginning – I agree with this very much. I get so frustrated when someone tries to teach me in steps, before knowing the whole picture.

7. *Learning involves both focused attention and peripheral perception*

Peripheral stimuli can influence the lesson because the brain responds to the entire sensory experience.

8. *Learning always involves conscious and unconscious processes.*

Reflection activities help learning because much learning takes place after teaching

9. *We have at least two different ways of organizing memory: a spatial memory system and a set of systems for rote learning.*

Meaningful learning occurs through a combination of both approaches to memory.

10. *Learning is developmental*

The hard wiring comes from experiences. There is no limit to the capability to learn more. As long as children can follow the teaching and construct their own meaning out of it, we cannot teach them too much.

11. *Complex learning is enhanced by challenge and inhibited by threat*

Children are wary of making guesses and trying to confirm those guesses if they think their efforts may be criticised or rejected. It is those thought processes that construct meaning for them.

12. *Each brain is uniquely organised*

And the brain becomes more unique as it develops. The more you know, the more you can learn.

Feedback 20/9/2000 What you think about the reading...

Thanks for your thoughts Glen, I guess right now you are enjoying the Olympics! I'm interested in your thoughts about '*Global ideas should be given from the beginning – I agree with this very much. I get so frustrated when someone tries to teach me in steps, before knowing the whole picture*'- How do you apply this knowledge of how you like to learn to situations when you are learning new things to do with ICT?

The facilitator has encouraged Glen to look at herself as a learner in relation to one of the principles described in the reading, as a way to help her become more cognisant of her learning. The principle in question is introducing global ideas to learners first, rather than the steps involved. This is something that doesn't happen much in teacher professional development in ICT- people tend to focus just on the small steps involved.

DEVELOPMENT IN THINKING...

The Caine and Caine reading made me reflect on my ideas about learning. Their theories fit into my thinking. Some ideas expanded on my thoughts and others voiced them. I still keep in mind, how does ICT enhance children's learning (for the extra time, expense and hassles, it has to be doing a lot.)? I have highlighted the headings above where I think that ICT would have more effect on learning.

Multiple intelligence's – The ideas from "Seven Ways at Once" are great – thanks.

Quality - my Quality World workbook looks interesting – I'd still need to know more to use it.

Feedback 20/9/2000 Changes in your thinking...

Yes the headings you have highlighted are not really focussed on enough in teacher PD in ICT. This reminds me of a conversation I had with Geoffrey and Renate Caine, where we were talking about 'humanizing the ICT/PD experience for educators', and how if we get this right then our model will be awesome.

WHERE I AM AT WITH MY TEACHING...

In a muddle – I seem to have tried a bit of this and a bit of that and have not done anything thoroughly. I want to try everything! I don't seem to be producing examples of quality learning. Management needs some fine-tuning.

Half the class took a digital photo of a friend – one photo is on the desktop. I'd like to get all the class' mug-shots on file. A few children have been involved in making graphs. Whole class graphs, with all the names, are too big to read easily off the screen. We'll try group graphs and stating a preference from a short list (eg cat, dog, horse, mouse, bird – pets). I videoed some dancing with Rooms 4 and 5, but got completely carried away with Art on Friday and forgot to get the camera out. Haven't got to the editing yet.

Feedback 20/9/2000 Where you are at with your teaching...

It's OK to be in a muddle sometimes- remind me to get you a really good quote about muddling. It talks about how we should muddle, muddle and muddle some more in order to learn effectively. I guess the key is to not 'stress out' to easily- esp. with ICT!!!!

This type of ongoing dialogue builds a strong relationship between the facilitator and the participants. Here the teacher is concerned that they are trying many things at once, and not completing things- or at least not feeling like they are completing things. This is yet another challenge that attempting to integrate ICT in a classroom presents. The change that this teacher is starting to make in her classroom is the use of ICT in a variety of ways, which is, initially, causing her frustration.

MY PERSONAL SKILL DEVELOPMENT...

With guidance, I got a photo on desktop. With practice and help from Rob and Thomas I have got to grips with spreadsheets and graphs – well enough to take the class through it. I put the practicum members' email addresses into my address book at home – there doesn't seem to be a connection for our classroom to be on the Internet and it is too cold and lonely to be playing on the school (crappy) computer in my "spare" time.

I am doing more hunting around and discovering, rather than having to ask for help so much.

Feedback 20/9/2000 Where you are at with your personal skills...

Great you did it. One of the wonderful things about ICT is it's ability to use visual images- that is why I set one of the practicum prerequisites as being able to bring digital photos into the computer. There are many other things you can do with images once they are in the computer however. Permit me to ask you a question: "Is it important to take the whole class through something?" Why or why not? When?

Good for you, your ability to solve your own problems with ICT is improving. This is REALLY important, as you need to be as self-sufficient as possible. Plus it feels really good to be able to solve problems for oneself!

Here you can see that Glen's skills are starting to transfer to other situations, such as at home. Her confidence is increasing as is her ability to figure out problems for herself. Something that isn't obvious from this reflection is that she is using children in her class to help her solve ICT problems, which is something that wasn't happening prior the practicum. The aspect of the teacher role that is being challenged by the facilitator here is the notion of teaching the same thing to the whole class all at once.

WHAT I AM GOING TO DO NEXT...

Strategies to make life easier with ICT – study this and use it

Clocking in – Helen's work with the fizzy drink impressed me and I think my kids would love to do it.

Feedback 20/9/2000 Where to from here...

Great, these have been developed from many teachers. They will help you. Some might seem quite obvious, but are worth exploring! Yes, Helen's work with the drawing strategy is really working in her classroom. She is making loads of progress because her kids are developing many basic skills as a result of this simple, easy to manage strategy. Keep up the great work! Rob =)

Finding easy to use ideas that work in the classroom is possibly one of the biggest challenges for teachers who are learning to integrate ICT. Here you can see the uptake of an idea from one of the other practicum teachers.

As these excerpts show, change in how a teacher works in the classroom is a process that takes time. It is thwart with challenges and barriers to overcome. How the system supports this type of change, in a non-threatening and process-oriented way, is vital to facilitating ongoing change. The following list summarises the challenges recorded in this period of two or so months:

- The teacher examining their role.
- Relating new knowledge to existing knowledge.
- Looking at integrating ICT into curriculum areas where the teacher sees a 'fit'.
- The teacher using existing strategies to teach with ICT (ie. Making connections).
- Attempting many new things at once, and feeling disorganised and muddled as a result.
- The teacher having to be more flexible with time and how they allow students to use it.

Further on in the process, the teacher writes:

Glen 6/11/2000

** * * THINKING TOOLS/STRATEGIES- CORT & DATT * * **

I have used de Bono thinking skills for over twenty years. I found that I have only been using CoRT 1. ...PMI is a marvelously useful strategy for all ages. I used it extensively earlier this year in a Social Studies topic about people's jobs. We had lots of guest speakers and asked them

the PMI s of their jobs. This served as a model for the individual contract the children did in interviewing someone at home about their job and writing it up as a PMI. I have some cards that suggest possible lesson topics for the thinking skills, but I think they are most effective when used in conjunction with a current topic in the classroom.

DEVELOPMENT IN THINKING...

The round the table discussion about teaching and learning theories we had at Ashley School consolidated my thinking and I have developed a more global idea of the ideas in the readings. I was a little confused about their similarities, but of course they are all from the general constructivist school of thought. I felt positive about the discussion.

WHERE I AM AT WITH MY TEACHING...

The Space topic lends itself very well to using ICT and I had heaps of ideas, but I have not used them all and some have backfired.

Ideas used:

Inspiration for brainstorming "what we know about Space" and for recording thinking skills ideas from buzz groups on topics such as "questions to ask an astronaut in an interview" and "what if the Earth had no gravity?" My first attempt was a disaster and I ended up writing it and putting it on Inspiration after school – but never say die, I tried it again the next day and it worked well.

The Inspiration experts have been gradually tutoring others - topic "What I like to do" Hyperstudio for drawing a planet and making a moon or spacecraft move around it CDs for information

Ideas yet to be used include: use of the internet for information and to download pictures for slideshows, using a database for space contract questions

We are using Email and are currently corresponding with a class in Ohio.

MY PERSONAL SKILL DEVELOPMENT...

HyperStudio– workshop with Nicky and Justin, and Rob in the classroom

Using Hyperlinks to get on to the internet

I am getting better, faster and more confident with lots of things – I can multi-task when doing computer things, instead of giving it my undivided attention.

WHAT I AM GOING TO DO NEXT...

Carry on further with HyperStudio

Revisit Kidpix

Use photos more – I keep forgetting to snap at those great moments

Internet in the classroom / use askjeeves.com

More Email – eg children sending messages home and to friends

Long term plan and weekly plans templates

Database for next year's class

As can be seen from this reflection, Glen is using ICT routinely and naturally in her class program. The children are using it to gather information, to communicate and to create. Children are coaching each other, rather than the teacher being responsible for the coaching. The teacher is seeing opportunities for using ICT in the current theme, and, more importantly, she is seeing herself as a learner with the students.

How do we know we are making a difference for staff and children's' learning?

A child approached me at Richmond School the other day to ask if I could show him how to connect and set up a hub for his teacher, who happens to be the lead teacher of this school. His reasons for asking me were:

“I’m not doing this because I have to, but because I think it might be useful. My teacher is a bit busy at the moment ... she isn’t quite sure how to set the hub up- so I thought it might help her”.

Jack, 10 year old learner

I then proceeded to show Jack how a hub works. It needs to be plugged into the power, the ethernet cables must be plugged in, and two of the holes (or ports) may be the ones that connect to the rest of the network.

Jack left me with a ‘so-what’ expression on his face, confident in this new knowledge that he could problem solve to help his teacher get the hub set up. How do we measure the outcomes for learning from a project of this sort?

Challenges for the Future- Where are we heading?

The future of the Christchurch ICT Cluster is uncertain. We are currently faced with 3 challenges:

- Further developing the four schools as a learning community.
- Ensuring sustainability of the cluster.
- Researching our effectiveness and our impact on teacher and student learning.

How we manage to respond to these challenges will determine whether the cluster of four schools will continue beyond the funding from the Ministry of Education.

Conclusion- Teachers Are Learners Too

*One can be an effective teacher only when one is himself or herself a perpetual learner; learning “with” her or his charges in a genuinely naive, sharing fashion.
-Carl Rogers*

Teachers themselves must be perpetual learners. Teachers need to be able to match and reference their espoused theories with what they are doing in the classroom, analyse these and make subsequent changes to what they are doing, and how they do it. If we are to get long lasting change in how teachers think about teaching and learning with ICT, and what they actually do in the classroom- then we need to have a strong platform for reflection in place.

Using multiple sources for reflection is our key to encouraging this type of learning. The use of reflection in and on action is vital to the success of this project. Our five identified characteristics for reflection enable this process. This is most effective when it is embedded within the various aspects of the professional learning system, and builds on and reinforces them. This type of reflection, sharing and challenge creates what Caine and Caine (1997) refer to as an environment of 'high challenge-low threat'. Thus, openly supportive relationships are essential to this process of change and continuous improvement.

This dynamic system has multiple influences on teacher learning, which will have a long lasting impact on teaching and learning. This system must constantly evolve and adapt to meet the needs of the learners it exists for, the teachers.

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