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Teachers, teams and technology: Investigating a team approach for supporting teachers' uptake of ICT

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USE OF THESIS

The Use of Thesis statement is not included in this version of the thesis.

ABSTRACT

This study sought to explore the professional development of elementary school teachers who were keen to use Information and Communications (ICT) in their teaching and learning. The main object of the study was to investigate a model of professional development that would support teachers as they adopted ICT. At the same time a simple framework to help locate teachers on some typology of ICT uptake was desirable, on the grounds that such a typology could help teachers, professional development planners and schools in their use of and support for ICT and its associated professional development.

A review of the literature suggests two factors were of particular significance to teachers in Western Australia. The first was collaboration, and the second was an outcomes orientation. Collaboration is shorthand for the myriad ways that teachers worked together and an outcomes orientation embodies, in short, a student-centred approach to learning. Outcomes orientation is a current major initiative of the WA Department of Education and of keen relevance to educators in Western Australian schools.

The findings include a series of assertions about the interrelationship between collaboration, an outcomes orientation and ICT uptake, including the observation that the more sustained ICT usage was displayed by teachers with a greater level of outcomes orientation and was also associated with greater levels and types of collaboration. Further a typology of four divisions indicating levels of teacher ICT usage was derived and presented.

Overall this study illustrates the principle that ICT uptake can be seen as dependent upon both collaboration and outcomes orientation.

DECLARATION

I certify that, to the best of my knowledge and belief, this thesis does not:

(i) incorporate without acknowledgement any material previously submitted for a degree or diploma in any institution of higher education;

(ii) contain any material previously published or written by another person except where due reference is made in the text; or

(iii) contain any defamatory material.

Signature

Date

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Finally I am indebted to the many teachers in this project whose perseverance was inspiring. I was privileged to work with a wonderful group of dedicated educators and have gained many insights of life in the classroom.

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GLOSSARY

ACOT	Apple Classrooms of Tomorrow
DoE(WA)	Department of Education (Western Australia)
DOTT	Duties other than teaching
EdWA	Education Department of Western Australia *(an earlier acronym now apparently deprecated)*
ICT	**Information and communications technology**
Level 3	A recently introduced administrative classification designed to encourage good teachers to stay teaching, but allowing them some work release so that they can support others in their school
LT	Learning technology or technologies
THRASS	Teaching Handwriting, Reading And Spelling Skills
Quotations	Where possible quotations are referenced to indicate their source. The usual identifier is a set of numbers in brackets at the end of the quote, taking the form **(Interview number : line number)** where line number is the location in the NUDIST transcribed record.

Each of the glossary terms is underlined the first time it occurs in the text.

CHAPTER ONE

INTRODUCTION

This thesis sought to explore the professional development of elementary school teachers who were interested to sustain the use of ICT in their teaching and learning. The main object of the study was to investigate a model of professional development supporting teachers as they adopted ICT. At the same time a simple framework to help locate teachers on some typology of ICT uptake was sought, on the grounds that such a typology could help teachers, professional development planners and schools in their use and support for ICT, and the professional development that goes with it.

These twin objectives are embedded in the research propositions below and the research aims and research questions are detailed t the start of Chapter 3. A brief description of these aims is given in the next section and followed by an explanation of the background, significance and research approach before introducing the research propositions. The chapter closes with an overview of the thesis structure.

1.1 Aims

The aim of this research was to review the factors supporting good practice with professional development of teachers and to synthesise a potential model of teacher development capable of sustaining ICT uptake. With this background the research developed a framework describing that model and investigated the efficacy and utility of the model. This thesis reports the outcomes from the study and argues the place of such a model.

1.2 Background to the study

Like many journeys of exploration this PhD has a history. My experiences as a teacher using technology over twenty years suggested that it was increasingly being encouraged as an issue for schools to address. At the macroscopic level Governments were reflecting community pressures by making financial commitments and encouraging teacher development. At the micro level there was great variability in

usage among colleagues including those who had reservations about integrating ICT into their thinking, let alone into their teaching and learning structures.

It was obvious that there were many different reasons for their reserve, including some who were unconvinced, those who could not see ICT's relevance or felt it was seeking an unwarranted place in their children's world, others who felt some discomfort with ICT, and some who appeared to hold genuine fears about ICT. Some used words suggesting a measure of terror, like 'I am terrified of making it break', and although it was easier to laugh, placate them or be dismissive of such comments, it was clear to this researcher that these comments were representative of a much wider disengagement in the teaching community. The issue was not apparently about ICT itself but their willingness to use it.

The genesis for this research probably derives from the researcher's involvement in a four-year project with the staff in an elementary school where every student in their Years 5—7 classes had a small handheld computer (Clarkson, 1995; Clarkson & Dench, 1994). Two of us were responsible for implementing and executing the support program for these staff as they started to integrate ICT into their teaching and learning program. Of our many feelings and conclusions, one stands out. Despite their initial aloofness it seemed that any teacher could make progress with ICT if (a) they could see its relevance, and (b) they focussed on the learning they were after rather than the computer—which was only a vehicle or tool, as we have been reminded for over twenty years (Chessler, Rockman, & Walker, 1998; Schank, 1995; Taylor, 1980). We also felt that the process of collaborating had helped us build better support systems and that the teachers learned better this way. These perceptions have contributed to this research.

1.3 Significance of the study

Research consistently seems to indicate that the intentions of schools to make better use of ICT and the efforts of governments to improve teacher professional development are rarely more than incremental in effect (Centre for Educational Research and Innovation, 1998) and only locally successful (US Department of Education, 1999).

Reviews of teacher professional development programs regularly report that there is a need for effective development programs and that rather than identify a single solution, they need to be carefully tailored to meet local needs (Downes et al., 2002). The continued searching suggests that there is still a need to explore strategies for effective professional development approaches and is therefore supportive of the research undertaken by studies like this one.

At the same time a scale or typology which characterised teachers' ICT uptake was regarded as valuable, since the literature (as reviewed in Chapter 2) had very little descriptive developmental material relevant to teacher's ICT uptake.

This research could contribute to the 'community of understanding' about teachers and how they progress towards sustained usage of ICT in their classes and in their teaching. Specifically, it could contribute in the following ways. It could:

Inform the field of learning concerned with teacher ICT uptake;

Increase the understanding of the mechanisms that support and hinder teachers as they consider and undertake ICT activities in their own classrooms, and the support systems that they need around them to help sustain that development; and

and provide an extension to the theoretical rationale that addresses teachers' sustained adoption of ICT as a teaching and learning tool in their classrooms.

1.4 Approach

This study was interested in teachers' development with ICT adoption and instructional or pedagogical principles, and was embedded in a classic and realistic educational setting, the classroom and the school. It uses the principles of ethnographic case study design as a point of departure. Its orientation was descriptive, holistic and multi-disciplinary in approach.

The methods used were predominantly qualitative—and are described more fully in the discussion of methodology in Chapter 3—but a combination of qualitative and quantitative descriptive paradigms provided detailed in-depth descriptions and a range of perspectives on the two case schools involved. These labels help summarise methods but it should be pointed out that the study was driven by the research questions and not by the methods used.

Both case and cross-case analyses were utilised. Data were collected through interviews and questionnaires near the start and the end of the study period, as well as written and printed materials collected by the researcher within and about the case schools, emails to and from the participants and their reflective journals. The researcher as a participant observer also recorded extensive notes in a number of diaries, which were afterwards indexed to simplify their ease of access.

An important acknowledgement in any qualitative methodology revolves around the viewpoint of the writer, and the importance of attempting to share that with the reader in some useful but abbreviated way. Explaining all the lenses through which we perceive our world does not eradicate them but the very process of foregrounding them can be informative and even therapeutic. As a middle-aged, white, middle-class Australian with an education background there is a richly developed sense of fair play within me. Over time I have developed a deeper comprehension of and belief in the social nature of cognition, as theorised by Vygotsky and developed by neo-Vygotskian work, leading to predictable views about social constructivism and the importance of all learners talking about and reflecting on their knowledge and understandings of their world. These constructions are the only truths people know. The researcher's constructivist set of beliefs about knowing which underpin this study include:

learners construct their own meanings and explanations of their world and its 'knowledge';

learners are active participants to the learning process in which they actively create their own understandings, rather than absorbing knowledge from experts;

learning is an interactive process which supports and feeds on social interaction so that the learner can express understandings and receive feedback to clarify meaning and to reach group consensus.

Naturally all the presentation and interpretation in this work is filtered consciously or unconsciously by at least one person, namely this researcher/writer.

Limitations and assumptions of the study are referred to in more detail in the methods described in Chapter 3. Briefly, it was designed to gather depth rather than breadth of data, and intended to rely upon the credibility and sufficiency of rich forms of description and extended forms of data display for its believability. This

study does not attempt to make generalisations to all teachers involved in ICT uptake, but provides an in-depth study of the development of a group of teachers across two schools who made varying progress with their ICT adoption. The reader will be the person who ultimately determines the value of the data and the extent to which it can be applied more broadly. That decision may not be a generalised conclusion so much as a personal one (Patton, 1990). Qualitative research such as this is able to contribute to more analytic development around its existing theories according to Miles & Huberman (1994, p. 28). In this case the theorising could be interpreted as contributing to existing theoretical models of ICT uptake, and the conditions and factors affecting them. In this case demonstrating the veracity of a not-yet-developed model of teacher professional development was a desirable outcome.

Not all the various forms of communications could have been recorded by the researcher, but those that were recorded or noted could probably be regarded as representative. They were certainly not a fair sample in terms of number but rather in significance. For example case teachers would sometimes begin a conversation with something like, 'I meant to tell you last time…', suggesting that *they* were doing the sampling and presenting material they regarded as significant.

There is a sense in which this research was planned to be interpretive. In other words that the breadth of rich description would be used 'to develop conceptual categories or to illustrate, support, or challenge theoretical assumptions held prior to the data gathering' (Merriam, 1988, pp. 27-28). This interpretation extended and derived new insights by extending the conceptual models to be presented in the body of this thesis, and will be summarised in the conclusions of Chapter 8.

Technology is a general term often used to describe computers, but covering also pencils and rockets. The acronym *ICT*, meaning *Information and Communications Technology*, refers to the range of electronic technologies used in educational settings like elementary schools which enhance or enable the processing, presentation and communication of information between people or groups of people, no matter how far apart. The intention of this label is to confirm that there is much more involved than just a computer with a screen for output or a keyboard for input. Many synonyms are or were used for ICT. These include the traditional *IT* (Information Technology) and *LT* (Learning Technologies). The latter is a phrase

favoured by the state Department of Education in Western Australia, who are also abbreviated in the rest of this thesis, as DoE (WA). ICT has been chosen as it is progressively more common and is now seen regularly in literature from the UK, Canada, Australia and increasingly the US. These and many other specialist words and phrases are used in this thesis.

1.5 Research propositions

The initial objectives of this research have changed and developed, in a way that is characteristic of qualitative research (Hoepfl, 1997). As it was originally proposed the research problem was implicit in the title of the proposal: *Teachers, teams and technology: investigating a collegial approach during teachers' uptake of Information Technology.* The research questions initially proposed were three:

Q.1: What happens in a school when teachers use collaborative teams as they adopt IT in their classrooms?

Q.2: In what ways does collaboration influence teachers' sustained IT development along a typology of Instructional Stages?

Q.3: What attributes of teachers' behaviours and activities best disclose the state of their IT development?

These questions did not specifically address the issue of a teacher's instructional development or changes in views about learning, which were only implied in Q.2 for example, and yet were regarded as important. The research problem developed along with the need to better express the intention of the study in its title, and hence the next iteration of the research aim was:

> To investigate a professional development model which integrated with current educational needs to address the ICT uptake of elementary school teachers.

The final research questions will be presented and elaborated in the methodology chapter.

1.6 Thesis overview

This chapter introduced the origins and purpose of the study, and has summarised the basic organization and methodology of the thesis. Subsequent chapters will address these in proper detail, and then present the data and their analyses, in the following order.

Chapter 2 reviews the range of literature that helped to frame the study. My inclination was to cover three distinct areas, notwithstanding overlaps, of *Technology and society; Teachers and learning;* and *the Change process*. These three topics are only a theoretical perspective over a topic, conceived as offering first a macro or macroscopic perspective—for example community views— and then a micro perspective—for example a classroom view—on the literature surrounding the research topic, followed by a review of more longitudinal or process issues, like the change process and ICT uptake. These areas proved to be satisfactory as a starting point. After the research began they were supplemented with further material from the adult learning literature.

Chapter 3 examines the methodological approaches, which provided the framework to collect and analyse the data for this research. It provides an operationalizing of the research problem into reality. Chapter 4 describes the settings and some background of the two case schools and then presents vignettes of all the teachers and leadership staff (Principals, Librarians or support staff) within them. This is intended to provide a detailed view of each participant with some explanation of the background that they bring to the study, that will provide much of the credibility and realism of the people whose stories as adopters of ICT are told in the subsequent chapters.

Chapters 5, 6 and 7 present and develop the data for the three developed research questions, as described in Chapter 3.

Finally Chapter 8 presents a discussion of the conclusions of this thesis as well as considering the joint issues of collaboration and outcomes orientation as overlapping supporters of ICT uptake. Finally the implications of this research are considered, as well as unanswered questions and suggestions for further research.

CHAPTER TWO

LITERATURE REVIEW

Introduction

This research began by assuming that a review of the literature that considered macro, micro and longitudinal discourses should be able to 'cover the ground' satisfactorily. It was an attempt to help categorise the wide range of literature rather than exclude topics which may become relevant on reflection. In this case the 'ground' is helpful professional development on the uptake process addressing computers and technology for elementary teachers in Western Australian schools. Readings in the area gradually suggested the triumvirate topics of the connection of ICT with the three factors of society, schools and change. These are represented as macro, micro and longitudinal or process perspectives and each became a separate section in this review. The logic is that the macro perspective addresses ICT and its general effect on schools, the micro perspective addresses ICT and its detailed connections with learning, and the process or longitudinal perspective considers the issue of ICT as change and development, and hence what appropriate professional development might look like. The chapter concludes with both a summary of desirable characteristics for a model of PD (professional development) which could theoretically assist teachers who participate in this planned research and the configuration of a professional development program which will be used.

Each of the three discourses will be addressed to show how the literature contributed to the philosophical design and methodological structure of this research. The first topic is to do with technology in general from a macro perspective, particularly the wide range of attitudes to information technology. It also addresses the characteristic of ICT as both a tool and as a vehicle for wholesale change in schools (for example Iacona & Kling, 1995; Koenig, 1997).

The second topic considers the micro issues of information technology—and particularly ICT—and schools. This includes its connection with the changing conception of teaching and learning, and the criticality of teachers in the introduction

and use of ICT. The value of collaboration was already evident in this context. For example collaboration has both a buffering role in the collegiality for teachers adapting to large scale change in a short time (Fullan, 1998), and a role in the symbiotic relationship that appears to exist between innovation and collaboration as change conditions (eg. Barth & Guest, 1990).

The third topic reviews the development issues of the change process—of which education is intimately a part—and identifies both local and systemic change conditions. This includes the fruitfulness of a humanist and multi-level perspective of teaching which considers forces on teachers, schools, systems and their communities (eg. Fullan, 1993a; Fullan & Hargreaves, 1996; Newmann & associates, 1996; Senge, 1990)

2.1 Macro perspective: Technology, society and schools

2.1.1 Introduction

The horseless carriage was a technology that was strongly resisted, but also welcomed, each time because of the changes it offered to the society that embraced it. There must have been times when it seemed, to use the old physicist's conundrum, like an irresistible force meeting an immoveable object—society. In hindsight perhaps there is a similar conundrum evident with ICT and schools, especially as unlike the car today there are many schools and teachers on whom ICT has apparently not made its mark. The stability of schools is reportedly well known (for example Cuban, 1993; Fullan, 1999). How will the stability of schools be resolved against the relentlessness of technological change?

Part I of the literature review considers this issue with a macroscopic view of technology and ICT, society and schools, as it seeks guidelines and suggestions for helping teachers as they attempt to increase their use of ICT in their classroom.

2.1.2 ICT and schools: just another transient perturbation?

Technology has been a popular add-on for schools for over a hundred years. Books and pens and paper were touted as ways to revolutionise school in the 19th Century; and radio, educational TV and films were going to change schools more recently (Cuban, 1986). However, these efforts have not always had the effect that their

promoters intended. For example, despite their educational advantages, not every teacher uses an overhead projector, and the introduction of educational film began with hubbub and hubris, but has settled back to a token part of schooling for most teachers. Cohen (1988) summarises our society's views neatly with the observation that 'new technology is really an old educational enchantment' (p. 122).

It seems that schools have proved stable in the face of technology. This 'immovable object' status at a time of significant societal change suggests that computing and information technologies also may cause no more than a peripheral change in schools. Nevertheless, governments and communities persevere. In fact there has been a significant increase in investment into Western schools in the last 15 years. By the end of the 1990s nations and states were making impressive commitments to ICT hardware in education. For example in the USA in 1998 President Clinton asked Congress to double one of Congresses six 'technology votes', the 1997 Technology Literacy Fund vote to $425 billion (Sartore, 1997). In the same year in Australia, two of the seven states, Victoria and Tasmania, announced that all their teachers would shortly have a laptop computer (Heller Report, 1998), and by 2000 three states (Victoria, Tasmania and Western Australia) were already issuing laptops to their teachers, usually at a significantly subsidised fee (School Education Initiatives, 2000). Early in 2002 the UK Education Secretary Ms Estelle Morris announced further plans to provide teachers in England with laptop computers:

> {The} £100m scheme … will provide laptops for about 100,000 teachers over the next two years…. Previous schemes have provided some 50,000 teachers with support towards purchasing their own machines. This time, they will not have to make any financial contribution. Instead, from this summer, education authorities will be able to buy laptops which will then be owned - and maintained - by their schools. (BBC News, 2002, p. 1)

In Western Australia large injections of public funds began in 1983 (Dench P.C., Personal communication. 7 May 1999). By 1998, the reaction by the W.A. Minister of Education to community demands was to offer $100 million over four years from 1998 to 2001. At the same time educators were arguing that school's technology was potentially a powerful new teaching and learning tool. For example, in technology-rich environments at least, expert teachers believed there were significant educational outcomes that are not as easily achieved without considerable access to the computers many schools now had (Newhouse, 2001).

All this investment could presage great developments, but the cynics predicted another failure. One of the predicted reasons for failure was that significant educational innovations are rarely 'completed' for lack of planning, or antithetical political or social determinist agenda (Cuban, 1986). They argued that for a comparison one needed to consider only the implementation of educational TV into schools.

One of the challenges that the supporters of ICT in schools seem to have only recently identified is that of ICT's integration into the curriculum, rather than just into schools. We already know that this cannot be perceived as a technical issue alone (Moonen & Voogt, 1998), and such writers are blunt: '…technology integration into the curriculum is a complicated innovation' (p. 99). The American Council on Education, in calling for more support for teachers (A.C.E., 1999), argued that 'teachers are inadequately prepared to understand and apply technology to teaching' (p. 9). They pointed to recent surveys showing that even though there was now one instructional computer for every six students in US public schools, only a quarter of the teachers made substantial use of ICT in their classes, and 'only one in five said that he or she felt very well-prepared to integrate technology into teaching' (p. 9). There is no reason to believe that this statistic is unrepresentative of most Western countries, suggesting that teacher preparation and professional development have a long way to go.

Perhaps this is one reason why the protagonists argue there had still been little apparent progress (eg Kerr, 1996; Mathews, 2000; Oppenheimer, 1997) after more than ten years of information technology expenditure. Their arguments are not that ICT is inappropriate, but that its implementation has been a failure. The recent Australian report into teacher professional development around ICT integration (Downes et al., 2002) is one of the first to review the whole issue of professional development and ICT as a tool for the average class teacher, and concludes that improvement may now be more likely than ever before.

There have already been some signs of large scale effectiveness in schools (eg Sandholtz, Ringstaff, & Dwyer, 1997; Schank, 1997; Wenglinsky, 1998). In fact, all these commentators upon the 'technologizing' of schools often agreed on two things; it has had little effect so far; but it could be an important tool for revolutionary change.

2.1.3 The flexibility of ICT

Taylor (1997, p. 1) highlights an important facet of technology, namely its ability to cause change beyond its original use. It is easy to make the same observation about the first axe tools, and how they must have changed life so significantly for every man and woman of the species of early human Australopithecus; about the effects of horses (which were introduced by the Spanish in the 15th Century) on lifestyle and civilisation for the Native American and even about the questionnaires of researchers. The fact is that attempting to research a new process, the very use of which changes the environment in which it is part, raises additional challenges.

This 'two bites at the cherry' characteristic is elegantly documented by Lincoln & Guba (1985). In the case of technology, the distinction is the intertwined roles of technology as a classroom tool, and technology as a reform instrument. Such phenomena are harder to research, partly because of the non-linear and inter-related relationships they represent. Also traditional sequential analyses are more difficult because of the mutually interlocking decisions often involved.

In fact this change beyond its original intended use is one of the levers sought by the various school reform movements, which all add to the pressures on schools and teachers. The potential of technology to elicit some sort of reform in schools has been obvious for some time (for example David, 1991; Iacona & Kling, 1995; Means et al., 1993; Mehlinger, 1996). One concluded that 'support for the use of technology to promote fundamental school reform appears to be reaching a new high' (Means et al., 1993, p. 1). Many go further, in their efforts for significant school and teacher change for example Reynolds (1995), suggests ICT was also the tool for the various movements concerned with school improvement or school reform (or school renewal, reculturing, restructuring, school development, and so on). Although there is much disagreement on what is actually meant by reform, or what the technology is expected to actually do as a reform tool (Reeves, 1992), other writers (eg Schank & Cleary, 1995; Sheingold, 1991; Yocam, 2000) also acknowledge ICT's value as a seminal tool for the teacher in the re-constructed classroom. Perhaps the support of such groups will make ICT more of an unstoppable force than any previous technology.

A key value of ICT is its flexibility. This very flexibility can support others' inflexibility—if you want to use ICT to reinforce your traditional style of working,

you can do so. In addition, it could be argued that teachers resisting change may well see the opportunity to 'integrate' ICT into their workday with minimal change for themselves. This was one of Cohen's (1988) explanations for why this particular technology had not caused the changes predicted for it. A broader position is taken by Papert (1998) which points out that the narrow aims we traditionally set for technology, and the special, remarkably stable environment teachers work in, called 'school', means that the cyber-critics are usually right in their jibes—just as attempts to fit jet engine technology to a stage coach would be laughable.

2.1.4 Improving signs of adoption

The ratio of computers to students in schools is improving. In Australia, Tasmania's Department of Education, Community and Cultural Development had chosen a ratio of PCs per student of 1:5, and every teacher carrying a laptop by 2000 (Heller Report, 1998). In WA an old figure of 1:60 in elementary and 1:30 in secondary schools in 1988 (Dench P.C., Personal communication: 7 May 1999) has been superseded by the Education Minister's directive of 1:5 in DoE(WA) secondary schools and 1:10 in primary schools by 2002 [School Education Initiatives, 2000 #517].

Having a computer available to a teacher says nothing about whether it is switched on, or used well. Hence numbers are not as important as how they are actually used. Trotter (1997) suggests that up to one in five US teachers uses a computer regularly for teaching, but that does not necessarily indicate either exemplary use or even 'digital competence' (Clarke, 1998). On the other hand it suggests that four in five teachers do not have sufficient access or are under-utilising a potentially useful teaching and learning tool. Although not encouraging it is not failure either, and the trends continue to improve. The 1999 Australian report *Real Time* (Meredyth, Russell, Blackwood, Thomas, & Wise, 1999) pointed out that not only were there significant resourcing difficulties that teachers faced, but there were differing patterns across gender and age, For example, "women teachers, especially those over 50 and those in primary schools, are falling behind in both basic and advanced skills." Nevertheless improvements were evident:

> Many teachers have begun to use information technology with their classes within the past five or six years. Younger teachers are entering the profession with more advanced skills, while those with slightly more experience are acquiring them rapidly. (Meredyth et al., 1999, p. 29)

The outward signs of change in teachers may be improving—perhaps the irresistible force is at last starting to unseat the immovable object.

2.1.5 ICT's apologists

There is a surprising range of supporters for ICT in the education system. They range from the companies who sell computers to people who find them useful at work and expect them to be equally useful in school. For example Means (interviewed in Koenig, 1997) identifies some different motivations:

> Many members of the general public have a strong belief in technology's power to transform education either because of technology's 'mystique' or because they have experienced technology's power in other settings. (Koenig, 1997, p. 12)

Many different apologists for technology in schools can be identified from the literature, but different groups are attracted for different reasons. They vary in their belief systems, orientation to and perspective on the world and the reasons they support technology in schools. Four possible groups are synthesised here, taking nomenclature and material from Cuban (1990) , Green & Guinery (1994) and Iacona & Kling (1995), namely Artisans, Technophiles, Reformers and Colonisers.

The *artisans*–whom Cuban (1990) calls neo-progressives–from John Dewey on, argue for the educational benefits of a student-centric approach which technology seems to promise (eg. Sheingold, 1991). Their primary belief is in students as people, they are principled, post-modernist or developmental and support technology because of its potential student-centredness.

The *technophiles* (coined by Iacona & Kling, 1995) are technologically competent people who believe that their technology has a place in all aspects of everyone else's life, especially as a status object. Their perspective is self-centred and personal, and their support for technology is broadly because of their underlying enjoyment of its mystique. Iacona & Kling call it 'techno-lust'.

The *reformers* believe that schools are failing society and sense technology is the mechanism to help the re-arrangement and modernising of schools which have been waiting for so long for such a device (eg. Collins, 1991). Their view is political, self-interested and action oriented. Technology is justified because of its prospects for quick, short-term change and ability to improve employment preparation.

The *colonisers*, the makers and promulgators of these machines who simply seek product markets globally, represent the power and profit-motivated groups who may not even realise they are technological determinists, whether altruistic or not (Green & Guinery, 1994).

These four groups are shown in Table 2.1 below, along with aspects of their philosophies. To provide some elaboration of the table, the reader is encouraged to consider the metaphor each group might use for ICT**.** The Artisans see it as a tool, or a catalyst; they would agree it is a weapon in the cause for re-constructed classrooms and to change schools from the inside; the technophiles adore technology to the point that it serves as a status symbol; whereas the reformers see it as their weapon in the fight to change schools from the outside. The Colonisers regard it as a marketing tool to spread their colonising influences worldwide.

Table 2.1: Four apologists for ICT in schools (with material from Iacona (1995)

Philosophical aspects…	**Artisans**	**Technophiles**	**Reformers**	**Colonisers**
Belief system values	Students as people	Status and control tool	Politician view, self-interest	Global marketeers
Orientation	Principles	Status	Action	Markets
Perspective	Developmental, post-modernist	Personal enhancement	Eg. employment preparation	Technological determinist
Rationale for support	Student-centred learning	Techno-lust	Short-term change	Profit
Computer as...	Tool, catalyst	Status machine	Weapon	Coloniser

Each of these four groups has a different rationale to support ICT in schools. For those with an outsider's view (identified as the *Technophiles,* the *Reformers* and the *Colonisers*) it is a lever to a system-wide aim, for the more classroom-oriented *Artisans* it is the tool or catalyst for change. It appears to be the first time that so many pressure groups support the same innovation, and suggests that ICT is more than a minor perturbation, and indeed has a better chance in schools than any previous technology in their history.

2.1.6 Summary: Technology, society and schools

Schools and their teachers are under significant pressure to change— at a personal level, teachers report varying attitudes to ICT, from supportive to negative, but increasingly there is acceptance that it cannot be avoided. It will also be important to consider all aspects of teacher beliefs, teacher resistance and the resistive discourses that many express towards technology. Many of these barriers may undermine any attempts to initiate some research to do with ICT uptake, and researchers should be aware of them, and be prepared to accommodate them.

A 1993 US Department of Education's report called *Using technology to support education reform* (Means et al., 1993) leaves no doubt that the powerful and increasingly insistent reform movements in the US have found an ally and even a vehicle for their plans. The report says that technology is seen as an important solution in supporting the 'revolutionary changes called for in these new reform efforts' (p. 1).

The US Congress report *The Power of the Internet for Learning* (Kerrey & Isakson, 2000), again calls for a technology-driven change to schools, and again makes many far-reaching recommendations. Although there is a codicil that 'the Internet is not a panacea for every problem in education', the recommendations belie this reality check, this time proposing 'an 'e-learning' agenda as the centrepiece of our nation's federal education policy.' The changes suggested in 1993 by Means and her committee (Means et al., 1993) are still largely unimplemented. A cynic may expect only slow, evolutionary progress this time as well.

While some teachers have significantly resisted ICT, others have embraced it, but overall it seems that most teachers feel under-prepared to utilise ICT as a curriculum tool. All the while, increasing pressure from parents, politicians and other forces external to the classroom have characterised the status of ICT in schools as increasingly important. Thus it is clear we are seeing increasing external pressures and increasing need for internal change. Perhaps there are signs here that the unstoppable force has arrived, and it will lead to some of the changes in schools that the apologists for ICT envisage.

2.2 Micro perspectives: ICT and schooling

2.2.1 Introduction

Non-educators and educators alike persevere with the view that technology has a profound place in schools, yet there is an apparent mismatch between the increasing numbers of computers in schools, and the continuing low rate at which teachers are using them. The dilemma is that different groups see diametrically opposed solutions to what they see as the problem. In essence what should be done with teachers? Should schools be seeking proofing against them or renewal with them? To some, making the classroom teacher-proof is the best solution, but to others, teacher renewal and a restoration of the basic moral purpose that keeps so many of them in the profession (Fullan & Hargreaves, 1996) is a better solution.

This section's discourse addresses teaching and learning at the school and personal level, and the value of the increasing use of more constructivist approaches to education. The low usage rate of ICT by teachers has already been documented at the 'macro' level, but warrants further 'micro' level coverage here, since there must be some profound, deeply rooted factors helping resist the introduction of ICT. Schrum (1995) flags the issue succinctly: 'Introducing information technologies to practising teachers is a non-trivial task' (p. 221). Equally there should be advice available to guide the design and implementation of school-based ICT activities, which was flagged in the research aim of Chapter 1.

2.2.2 The prospects for ICT in schools

Cuban (1986), reviewing patterns of educational technology since 1920 and noting the low usage of educational TV and film, predicted only motley usage of ICT across schools, with perhaps 5% system-wide usage on a regular basis. Teachers, who are on the receiving end of pressure to implement ICT, are still perceived to be moving only slowly to adopt technology as a classroom tool (Papert, 1998). A pessimist could argue that Cuban's prediction appeared not inaccurate after more than a decade. Teachers who show reserve towards technology perhaps imagine it like the Promethean gift of fire, supposedly a bad master but a good servant. Certainly the master and servant roles are evident simultaneously in ICT.

At the micro level, the prospects for ICT in schools depend on teachers having willingness and skills to use them. While reviewers like Bracewell (1998) and Laferrière (2001)argue relatively optimistic prospects for ICT in schools, there is no doubt that some educators find technology very stressful. ICT coordinators report palpable resistance by some teachers to learning about technology. 'People were really upset. They would cry and beg not to do it', reported a district coordinator during the introduction of ICT competency training (Zehr, 1997 p. 3). The remaining sections review specific aspects of the micro perspectives of ICT in schools.

2.2.3 Teacher proofing and the issue of standards

The application of various types of technology to education was often motivated by a desire to implement 'teacher proof' instruction. The programmed teaching machines of the 1950s and 1960s exemplified this philosophy. Such technology was a 'black box' that could be bestowed on schools and classrooms from above. Some regard this as an old-fashioned idea:

> An increasing body of literature on technology implementation efforts suggests that this goal was not only unrealistic but also fundamentally misguided. To be effective, technology and teachers must work together to provide challenging learning opportunities. (SRI International, 2000, p. 1)

Tinker (1997) argues that even a recent networking environment is not safe:

> Another misguided idea too often voiced is using the network to replace teachers. There is no 'teacher-proof' technology that can replace the thoughtful attention and educational guidance provided by an experienced teacher. (Tinker, 1997, p. 1)

It seems that the principle is still debated but the phrase is more usually being replaced by more politically correct language.

> For example, a textbook representative recently described to me the lessons in their teacher's guide by saying, 'And it's all scripted for the teacher, so that they know what questions to ask.' (Russell, 1997, p. 1)

Subscribers to this version of a school reform movement have a belief in teaching a curriculum —Latin for *little racetrack*—undoubtedly to ensure that school graduates can read and write once on the racetrack of Life. One of their strongest advocates is the writer E.D. Hirsch, a professor at the US University of Virginia, whose book *The Schools We Need: Why We Don't Have Them* (1996), argues for standards and for teaching a common curriculum content. Brown University's Theodore Sizer champions a second version. Sizer is chairman of a group called the Coalition of Essential Schools. He founded this coalition as a way to rethink schooling and

redefine school reform—a process he outlined in one of his books, *Horace's School: Redesigning the American High School* (1992).

For Hirsch, school reform lies in the singular focus on what children should know. He argues for what has come to be called the 'standards' movement, which calls for a common core curriculum of knowledge and skills that all students must learn. His focus is not on 'students learning' as much as 'students learning content', ie curriculum. The implication is that by setting standards everywhere, every teacher can be given the same tasks and checked for their efficiency against the same standards—regardless of their students' differences.

It would be almost mischievous to leave the topic of standards without acknowledging that the issue is more complex than this, as the reader will know. For example teacher expectations have been shown to have a significant effect on student achievement (eg. Havita & Lesgold, 1996), and setting high standards is just as important an issue for those who gather in Sizer's camp, as it is for those in Hirsch's camp.

Sizer takes a more sanguine view on the issue of 'basics'. Although he accepts that basics are very important, he goes further, arguing that students need to understand what makes them think, to become an educated participant of the world.

These two have been juxtaposed by Sevener & Spencer (1997) as examples of the choices facing American schools, and arguably many schools in the Western world too. Sizer has a more humanist perspective, according to Sevener:

> Of course such 'basics' are important and should be respected {says Sizer}. They can be measured and should be measured'. But just as surely, he says, schooling should go beyond knowledge of such basics to understanding and beyond understanding to the habits of mind that mark an educated person. (p. 2)

He contrasts the two in a way that suggests Sevener himself is a keen reformer too:

> Today, Sizer and E.D. Hirsch stand at the crossroads of the school reform debate. To their credit, both have looked inside classrooms. To our dismay, each points us in a different direction—Sizer to pedagogy, Hirsch to curriculum—to overcome the vexing inertia of school reform in America. To our continued frustration, both give us less a blueprint for change than lessons in why virtually none of the reforms has reached, on any widespread basis, inside the one place where change is most needed and most neglected: the classroom. No single venue is more central to improving schooling or more capable of thwarting meaningful reform. (p. 2)

2.2.4 Student-centred learning and personalised education

A review of the literature indicates that both the inherent stability of schools (eg. Cuban, 1990) and the nature of information technology are significant factors needing to be addressed by any study attempting to intervene in the natural, apparently very slow, adoption cycle (eg. Iacona & Kling, 1995; Sheingold & Hadley, 1990). The change process literature (eg. Rogers, 1983; Senge, 1990) suggests slow development is predictable, given the need for major revision of values and attitudes in the target groups involved. To seek sustainable change in this area is never easy. As Cousins and Leithwood (1993) explain 'individual members of the school organization must actively reconstruct the meaning they attribute to their work before lasting change will occur' (p. 305).

The distinction between *students learning* and *students learning content* is a significant one, as it also highlights the distinction between the traditional teaching approach, where students are 'taught', and the more contemporary teaching approaches which have a growing emphasis on the role and responsibility of learners in constructing and regulating their own learning (Tytler, Smith, Grover, & Brown, 1999). This style of learning is often described as constructivist (Fosnot, 1996; Jonassen, 1994), and includes collaboration, communication, inquiry and knowledge construction as its tenets (Yocam, 2000).

The origins of modern constructivism are early in the 20th century and derive according to Knowles, Holton, & Swanson (1998) from the writings of John Dewey (eg. Dewey, 1915), and draw on the philosophies of writers like Allport (1955), and clinical psychologist and therapist Carl Rogers (1969). Rogers constructed a student-centred approach to education based on five 'hypotheses' (reported in Knowles et al., 1998, p. 51):

We cannot teach another person directly, we can only facilitate his learning

A person learns significantly only those things which he perceives as being involved in the maintenance of, or enhancement of, the structure of self

Experience which, if assimilated would involve a change in the organisation of self, tends to be resisted through denial or distortion of symbolisation

The structure and organisation of self appear to become more rigid under threat and to relax its boundaries when completely free from threat. Experience which is

perceived as inconsistent with the self can only be assimilated if the current organisation of self is relaxed and expanded to include it

The educational situation which most effectively promotes significant learning is one in which (a) threat to the self of the learner is reduced to a minimum, and (b) differentiated perception of the field is facilitated.

All these principles were summarised in a brief statement by Rogers:

> I should like to point out one final characteristic of these individuals as they strive to discover and become themselves. It is that the individual seems to be more content to be a process than a product. (Rogers, 1961, p. 122).

These principles should also provide some guidance for the design of professional development activities for teachers, where constructivist principles are appropriate. After all, both students and teachers are cast as active learners in this new educational environment. In fact, contemporary learning methods—like collaborative learning, working in teams, authentic, longer term assessment and meta-learning (Wiburg, 1996b)—are just as relevant for teachers improving their skills, confidence and understandings with ICT as for students (Tytler et al., 1999). It would be important that any project helping teachers to become adept with technology in their classes in a contemporary environment should be true to these principles.

Learning without recipes

Further support for the utility of this more active role for teachers came from a summary of the ACOT (Apple Classrooms of Tomorrow) professional development model, where they eventually felt that their 'extended conversations were the best professional development':

> What we knew was that when we introduced technology to ACOT teachers, the old ways of doing staff development didn't work well. When we thought about what did work, it always seemed to involve the teachers in conversations about change and reflection on their practice. Sometimes these conversations took place at meetings or workshops. They weren't episodic; they were ongoing. A conversation might start at a workshop, but would continue during site visits, over e-mail, by phone, and even during real-time, online group meetings.
>
> It seemed these conversations had greater impact on teachers actually changing what went on in their classrooms than the traditional staff development approaches we had tried. Over time, a common terminology about change and technology emerged that would engage the teachers in talking about standards, assessment, tasks, situations, interactions and tools. (Yocam, 2000, p. 6)

These 'conversations' ranged over topics from both local and specific classroom practice to general and pedagogical issues. Also valuable was the principle that students and teachers were working together and even changing roles occasionally:

> One of the high school teachers described students and teachers as becoming a 'community of learners.' Emerging was a view of ACOT classrooms as places where both teachers and students were learning, places where expertise was distributed among the learners, where teachers and students actually changed roles when technology was involved. (Yocam, 2000, p. 6)

An important point was that there were no prescribed lists to follow:

> We felt that a 'recipe' did not really work well in describing our methodology. We were practicing a constructivist approach to staff development and wanted to capture the process. We knew that the significant changes resulting from our conversations with ACOT teachers were made because they were personal and meaningful. (Yocam, 2000, p. 6)

Increasingly such approaches are being undertaken by teachers. For example, a focus on more authentic activities has meant that the researcher has seen newspaper or magazine headlines like these in recent years:

Primary students win national award for a web site on aboriginal language

Elementary students publish their own school newspaper

Secondary students learn about teamwork and management in *SimCity*□ simulation

These are examples of a technological sea change from the whole classroom approach assumed to be used by the traditional teacher. They have been well described in other places (eg. Wiburg, 1996a). More importantly, the ACOT project observed that technology-using teachers gradually shifted their views towards knowledge construction principles (Apple Computer Corporation, 1995). Table 2.2 illustrates this transition over eight different Attributes of Learning. The left hand column suggests that the following attributes vary under the two conceptions: the activities are different and the teacher and student roles are different, as is the learning emphasis, the underlying concept of knowledge and its acquisition, how they demonstrate their mastery of work and how they use the technology.

Table 2.2: Shift observed as the ACOT teachers extended their traditional views of learning from instruction to knowledge construction (Apple, 1995, p. 2)

ATTRIBUTES OF LEARNING	Traditional (instruction)	Extended (knowledge construction)
Activity	teacher-centred and didactic	learner-centred and interactive
Teacher role	fact teller and expert	collaborator and sometimes learner
Student role	listener and learner	collaborator and sometimes expert
Learning emphasis	facts and recitation	relationships and enquiry
Concept of knowledge	accumulation	transformation
Demonstration of success	quantity	quality
Assessment	norm-referenced and multiple guess	criterion-referenced and performance portfolios
Technology use	seat work	communication, collaboration, information access and expression

There was also support from psychologists who agreed that higher order skills were acquired through the ability of learners to interact with the material in their own way, not through the transmission of facts (Means et al., 1993, p. 2). This relatively constructivist perspective of learning called for more realistic tasks, more authentic assessments and, by assisting students through collaboration and expert support, to achieve intellectual progress that they could not achieve on their own (David, 1991). These are part of the changes that teachers adopting ICT are participating in.

Constructivism and teachers renewal with ICT

Although the uptake of ICT may be slow, nevertheless two positive facets could be deduced. Firstly, confident ICT-using teachers seemed to have a qualitatively different teaching style; and secondly the need for a low-pressure, collaborative environment was indicated as more likely to support successful change. In short, teachers seem to be able to change, and there was a range of supportive evidence from many writers and researchers.

For example David (1991), reported that confident ICT users tended to teach in ways which were often classified as constructivist; for example they sought outcomes that were less absolute and more relativistic (p.8). This was only associative evidence, and it could have been that teachers who were confident ICT-users were already different in some way. This is the point made by Becker & Ravitz (1999) when they

questioned whether ICT is a catalyst or simply appealed to those already disposed towards constructivist approaches. But there was confirmation that teachers who found themselves *without specific choice* in technologically rich environments also tended to change the way they taught, using less teacher-directed activities than before (eg. Clarkson, 1995; Cuban, 1990; Newhouse, 1998).

Further support for the supposition that ICT is gradually being used better in schools is embedded in the fact that the proportion of ICT-using teachers slowly continues to rise. For example in the US in 1994 Becker (1994) estimated this was 3% of all teachers and in 1998 Trotter estimated it was 10%. It seemed reasonable to conclude that more teachers could become confident ICT users under the right circumstances and furthermore, it may be reasonable to expect them to change their teaching and learning strategies even more, because of the increase in job satisfaction for those who did.

Of particular interest in this context was the opportunity for teacher renewal through curricular innovation. Naturally teachers do not have to use ICT to change their teaching style, it can happen in multiple ways. Prestine (1994) reported one teacher involved in school renewal, saying, 'I have never been more excited about my profession than I am now' (p. 15). There were conditions, for example explicit learner–centred activities were required. Alexander, Taggart, & Thorpe (1997), describing Physical Education teachers, reported

> Our research findings have led us to a position that when curriculum innovation moves beyond surface change … teachers will renew both their pedagogies and their programs. (p. 1).

From Physical Education teachers to whole schools, involvement in curricular reform seemed to have a flow-on effect, as long as the focus was clear, and centred on learning. Whether teachers used ICT to effect pedagogical change or not, the increase in satisfaction was still evident.

2.2.5 Reasons for resistance to ICT uptake

Teacher resistance to ICT has a variety of causes, which are worth investigating. Any person involved in the delivery of professional development for teachers should be aware of the possible problems and challenges, and teacher resistance to ICT is a crucial facet.

Hodas (1993) pointed out that technologies are not simply neutral objects, and the low rate of technology adoption is not addressed by simply blaming the teacher or administrator, or presuming their temperamental inadequacies.

> Such a construction is predicated on the frequently tacit assumption that the refused technology is value-free and its implementation therefore not a field of struggle…(p. 3)

Instead, Hodas proposes that

> No technology is ever neutral that its values and practices must always either support or subvert those of the organization into which it is placed, and that the failures of technology to alter the look-and-feel of schools frequently result from a mismatch between the values of school organization and those values that are embedded within the contested technology itself. (p. 3)

In fact Hodas' discourse is part of a broader perspective which seeks to explain the slow adoption of ICT in schools through a post-modernist narrative. This constructs the argument that those who resist the technology are resisting the values 'embodied' in the technology, rather than the technology itself.

There are other equally profound reasons for teachers to resist the advent of ICT in their classes. The teaching profession has become more and more the butt of social and political assault, and as more negative publicity results, confidence in our teachers has evaporated, argues Rosenholtz (1991). In fact harsher demands for accountability and minimum competencies movements seem to embody not only an obsession with measurement, but even a wish to create different classrooms, ones without teaching professionals in charge.

> Many of the recently passed reforms try to regulate both the content and process of education in the hopes that teacherproof instruction will increase the quality...(Rosenholtz, 1991, p.214)

Understandable resistance occurs because many attempts at reform are misconceived. They simply fail to address the core principles of teaching and learning, instead making changes in a piecemeal or *ad hoc* fashion. As Fullan (1993a) describes, 'they actually make matters worse by discouraging all teachers, but especially those with a greater sense of commitment' (p. 58).

It is understandable that under these conditions, teachers have tended to react less than enthusiastically. For example Huberman (1992), when reviewing Swiss research on teachers' professional life-cycles over 35 – 40 years, discusses how little long-term professional satisfaction teachers gain from their work:

> One of the clearest findings of the study—and its replication in other countries—was that teachers progressively 'focussed' their work and their energies at classroom

> level, and disengaged from participation in multiple-classroom changes or more 'systemic' changes at building or district levels. Like Voltaire's Candide, after his misadventures, the older teachers 'cultivated their gardens' figuratively speaking, and built protective walls around them. (p. 5)

For some the reasons for their concern about ICT are based around more palpable feelings, like personal frustrations and fears. Compared with an overhead projector with a single switch, some teachers could find a computer a more frightening prospect. Some of the teachers' reservations perhaps centre on the obvious complexity; and some around the obvious flexibility—the ability to be shaped in numerous ways and fit many educational needs (eg. Bennett & King, 1991; Sartore, 1997). This flexibility may make it seem like a moving target for a nervous teacher trying to learn how to use ICT.

A range of reasons for teachers' resistance were identified, and in Carl Rogers' (1994) conception, the resistance to new ideas and practices was predictable. One irony of which Fullan (1993a) reminds us is that we will do anything to avoid having change imposed on us, but often are more than willing to impose it on others. This is a prompt that there are conditions and approaches which provide encouragement for teachers prepared to look at their teaching and even the performance of their whole school.

2.2.6 Conditions and facilitators of change

It is clear that there are multiple pressures on teachers to change, and reasons making it difficult. There are also positive reasons to change. These include local factors as well as generic ones. In Western Australian schools there were two important local initiatives going on at the time this research was starting. The first was a recent state government injection of $100 million to get more computers into schools (setting threshold targets of 1 computer to 10 students in primary and 1 to 8 in secondary schools (School Education Initiatives, 2000). The second was the *Curriculum Framework* (Western Australia Curriculum Council, 1998a),a ten year initiative first introduced around 1995 to change the approach to teaching from inputs-driven to outcomes-driven. The Outcomes initiative was already making headway in schools but only slowly—for example the deadline for its final implementation was extended during the research from 2004 to 2006 (Western Australian Curriculum Council, 2000). The transition towards an outcomes orientation for teachers was a decision which has taken a number of years, and is being addressed or considered by

educational systems all over the world (Hannan & Ashenden, 1996; Hughes, 1999). If it were appropriate that either or both of these initiatives could be integrated into any professional development program then there would be predictable fruitful spin-offs.

More generic factors supporting teacher change include the increased satisfaction from a more collegial work setting and a more interesting teaching and learning environment. Fullan (1993a) argues that one of the major stimuli for teachers is the moral purpose they feel in the role. It seems unlikely that teachers would choose the more didactic and teacher-centred style over the more constructivist approaches, after experiencing the two options. Unfortunately, the resistances to change mean that many teachers have not yet experienced the alternative.

An important part of the use of ICT in schools is that it seems to be associated with some changes in teaching style; that some teachers seem to become a little more constructivist as they use ICT more and more. For example Walker, Rockman, & Chessler (Walker, Rockman, & Chessler, 2000), investigating a large laptop program in covering 27 teachers across multiple schools indicated that more than 4 out of 5 teachers who made a change in their teaching practices, indicated that their computer played a role. Also, it seems that collaboration and sharing are effective strategies for teachers to help reduce the negatives and improve the positives. The success of these factors is critical to the research questions, and will therefore be explored further.

The value of social and reflective skills

Despite being an isolated profession—teachers are expected to perform their major function without adult company for long periods each day—Rosenholtz (1991) has established beyond doubt the criticality of social factors. A central lesson which Rosenholtz's research clarified was that the social organization of schools gave meaning to the nature of teaching. Equally significant was the literature on teachers' belief systems—'ignoring teachers' beliefs in implementing change could lead to disappointing results' (Anders & Richardson, 1994, p. 6). Richardson (1994) showed quite a strong relationship between predictions made from beliefs and observed practices (p. 97); and work on how teachers and professionals thought in action can help explain how teachers' implicit theories might affect their behaviours (Anders & Richardson, 1994, p. 7)

It has been shown that altering teachers' perceptions of their work was difficult (eg. Goodlad, 1983) and with their values of self-reliance (eg. Ashton & Webb, 1986) some teachers may not discard lightly their classroom independence in return for collaborative relations. But Rosenholtz (1991) describes high consensus schools, where,

> clumped together in a critical mass, like fuel rods in a reactor, teachers generated new technical knowledge… Principals often orchestrated collaborative relations between more and less successful teachers, explicitly acknowledging that improvement was possible, necessary and expected. (p.209)

Further, Rosenholtz (1991) points out the value of focussing and reflecting on appropriate assessment is an important part of schools where professionalism is important:

> Our own research strongly suggests that the successful school is a place where teaching professionals are asked to make reflection and its requisites the master of action and its requisites.' (p. 214).

The value of reflection at times of change should not be underestimated (Heppell, 1995). As well as writers confirming its value (eg. Joyce & Showers, 1995) there are also practical activities to encourage it with both teachers and students (eg. Pollard & Tann, 1993). A number of these references strongly recommend formal tools like a reflective journal as a way to provide such opportunities, although it is not clear whether they suit more reflective teachers more than others.

Learning communities and achieving learning outcomes

Previous analyses tend to have focussed on the technology or the change process, rather than the people in the middle. A humanist focus, exemplified by Newmann & Wehlage (1995), suggests first that acknowledging and then addressing the wide range of resistance is important; and that building professional learning communities—also known as communities of practice—can be a key factor in successful school restructuring.

> Organisational capacity is enhanced when schools are shaped into professional communities. Just as authentic achievement provides a vision to inspire student learning of high intellectual quality, an image of a school as a professional community can help cultivate organisational capacity. (Newmann & Weylage, 1995, p. 8)

Wenger (1998) points out that professional communities exist in many professions, but in schools she defined professional learning communities by three general features:

Teachers pursue a clear shared purpose for all student learning.

Teachers engage in collaborative activity to achieve the purpose.

Teachers take collective responsibility for student learning.

These characteristics further reinforced the value of working with a school 'group', and the need to ensure collaborative sharing and a student focus. It would seem that these things could be encouraged by arranging and supporting conversations about learning. By their nature such conversations would tend to allow the participants to reflect on their own assumptions, and understandings. By encouraging conversations about students and their learning, then the focus for those teachers would be more likely to embrace these criteria important for a successful learning community.

Professional learning communities are an example of a way to help teachers achieve support for each other when they have a learning goal they wish to achieve. When whole schools used professional learning communities their efforts were effective, according to Newmann & Weylage (1995). With a five year government research grant, they searched for 'what works' in schools—or under what conditions will a school produce high quality student achievement. Their main project, the School Restructuring Study, searched for public schools that had adopted unconventional structures—eg. site-based management, shared decision making, teacher teaming, sustained student advisory groups, coordination of social services, school choice—and investigated their students' 'authentic achievement'. The results were mixed, but in summary they report that restructuring which produced good student achievement required

Sustained schoolwide concentration on the intellectual quality of student learning, and

Schoolwide professional community among the staff.

This led to a model described in Fullan (1998) and reproduced as Figure 2-1, describing three characteristics which he described as critical to the reculturing process of school improvement namely *Pedagogy, Professional learning communities* and *Student assessment*.

This model has some appeal as a simple model for change in schools, and although it does not consider ICT as part of the change process, this does not mean it cannot be

used as the basis for a model of change more oriented towards ICT and still considering the school culture.

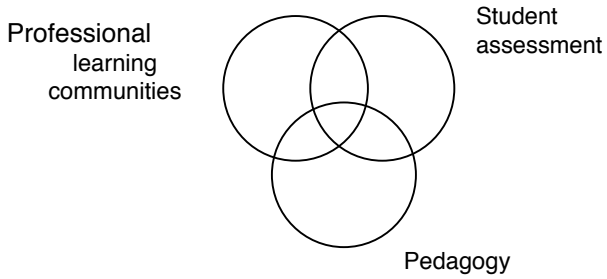


Figure 2-1: School factors for successful school reculturing (Fullan, 1998, p. 9)

School change in an ICT-rich setting

Those concerned for schools and their students' learning consider that ICT will be a boon as schools adapt to an ICT-rich environment. An example of such an adaption was the Apple Classrooms of Tomorrow (ACOT) project. ACOT began over a decade ago with the assumption that computers might change classrooms. Their conception of ICT access changed over that time:

> the model changed from computer 'saturation,' which most often resulted in a didactic approach to learning, to the current emphasis on 'routine access,' where technologies are used to support collaboration, communication, inquiry and knowledge construction. (Yocam, 2000, p. 1)

Although the ACOT research was groundbreaking, it may prove to be unlike the final versions of schools that will eventually evolve out of these pressures. Seymour Papert, a researcher at the Media Lab of MIT, has been an inveterate supporter of the use of ICT in schools. He advocates a school where students are active participants in their own learning, but he believes that any of the technologies that are gradually changing schools have a long way to go, because of factors like the traditional curriculum:

> When the movie camera was invented, its first use was pretty close to putting the camera in front of a stage on which actors performed as they always had. It took a long time for camera-aided theaters to turn into what we now know as cinema and television. The use of technology in education is mostly at the first stage, in which technology is used to enhance what people did before without it. In the next two decades, we will begin to see change in how people think about learning as deep as the changes technology has brought to how we see entertainment. This will be much, much more than putting a lot of computers in otherwise unchanged schools teaching an otherwise unchanged curriculum. (Interview with Papert in Koenig, 1997)

The literature reviewed so far has provided guidelines for conditions of teacher change and teacher development, but under limited conditions. As well as trying to minimise the barriers to change which many teachers feel—and this is not to be trivialised—the prospects for success seem to rely upon a number of factors. These have included arranging supportive and collegial sharing arrangements. Probably school-based rather than withdrawal training was the preferred mode since it can increase the level of teacher interactions and hence the conversations. When teachers were willing to engage in more discussions of a pedagogical nature, Hargreaves called this 'turning up the heat in the staffroom' (in Hargreaves & Fullan, 1998, p. 5). This willingness made it easier for them to genuinely reflect upon their pedagogies as well as their practices. There was support for teachers addressing their school's substantive aims about learning and the outcomes they sought, as well as a multi-faceted approach which considered both personal or local issues and wider or systemic ones simultaneously. Little argued that it might be that the resulting approach to professional development was more sophisticated, complex and therefore 'messy' compared with traditional 'one-shot PD' (professional development), but it is also likely to be far more relevant, challenging and effective (Little, 1995). The twin issues of are investigated further in the next two sections.

2.2.7 The value of collaboration in this study

Schrage (1990) points out that collaboration has not been a critical element of Western intellectual thought, nor part of the tradition of learning:

> You don't find collaboration as a part of Aristotelian or Platonic thought (which is ironic given the role of dialogue in creating enlightenment). Nor is collaboration a part of the Judeo-Christian ethic of community. Adam Smith talked about *the division of labour*, not collaboration, Marx heralded *the labour theory of value* yet left the collective processes that yield this value virtually unexamined. (p. 44)

Towards a definition of collaboration

What exactly is meant by the term collaboration? The Oxford English Dictionary (Simpson, Weiner, & Oxford University Press., 1989) defines it as:

> United labour, co-operation; esp. in literary, artistic, or scientific work.

Schrage adds some specificity that seems more relevant to an educational setting:

> Collaboration is the process of shared creation: two or more individuals with complementary skills interacting to create a shared understanding that none had previously processed or could have come to on their own. (Schrage, 1990, p. 40)

Schrage then elaborates his conception of collaboration with examples of collaborative acts and collaborative relationships from Art, Science, History and Literature. He addresses for example the limited connection with friendship, the need for candour and trust, and the fact that collaborations 'aren't designed to last forever' (p. 43). The purpose, he explains, is that there is a natural desire and a natural ability to collaborate amongst people in our culture and that it can be a powerful support that leads to joint development and growth of the people involved, as well as their joint ideas. They can involve disagreements, and they can be intense, but they always involve some level of professional and personal development:

> There's an alchemical, almost mystical quality to the best of these collaborations; a sense of creation that transcends individual talent and skill. You can hear it in a Rodgers and Hart musical or a Lennon and McCartney song. Yet there's nothing inherently fragile about the process: some of the most productive collaborations occur at the top of the participants' lungs.

At the other extreme he points out an ordinary chat at the water cooler can become the basis of some collaborative act. Whether big or small acts, the collaboration can have an effect on the development or support between both parties.

This role of collaboration as a support mechanism is one way of presenting collaboration as a useful tool for those involved in ICT uptake. A critical point about these relationships, for this thesis, is his observation that there are successful collaborations of peers just as there are involving mentors and protégés. As an example he quotes Robert Kanigel's *Apprentice to Genius*, 'which details four generations of mentor-protégé relationships in the field of neurochemistry' (p. 46).

The literature in teacher development increasingly portrays collaboration as an important concept for teachers changing and reforming their classroom practices (eg. Cousins, Ross, & Maynes, 1994; Fishbaugh, 1997; Fullan, 1999; Lewis, 1998; McLoughlin & Oliver, 1998; Raywid, 1993; Trimble & Peterson, 1999; Wagner, 1998; Yocam, 2000). The literature is sometimes less distinct about differences between commonly used words like cooperation, collegiality, joint work and sharing. In fact Lewis distinguishes clearly between collaboration and cooperation, arguing that one is more like going in the same direction, whereas the other is more like working together to get there:

> The words cooperation and collaboration are often used rather loosely to describe people acting together in some way. When thinking about tools and environments to support joint actions, it is useful to be clear about the distinction. Some clarity emerges if the notions of Activity Theory, which has its origins in Russian socio-

> psychological culture, are invoked. A key dimension in this theory is the concept of 'intention of action'.
>
> *Cooperation* depends upon a supportive community of actors who agree to help one another in activities aimed at attaining the goals of each person involved. *Collaboration*, on the other hand, depends on the establishment of a common meaning and language in the task which leads to the community setting a common goal. (p. 4)

One resolution to the need to define these terms is to suggest that most of the words used as synonyms for collaboration could be regarded as on a continuum with collaboration at one end and cooperation at the other. As long as the support that helps a person or persons' development (in this case with ICT uptake) is evident then the various activities, for which these words are used as descriptors, are acceptable in this research.

Becker (1994) noted that exemplary computer-using teachers seem to clump together. He noted that the likelihood of finding an exemplary computer-using teacher in any school increases unfairly with the number of computer-using teachers at that school. Therefore, he concludes, the more teachers using computers, the more likely there will be *multiple* exemplary ones, and he ascribes this to collegiality.

In Becker's research it is not possible to ascertain whether collaboration encouraged existing collaborative teachers to congregate or whether it also encouraged new ones to 'grow' in this supportive environment. Nevertheless Becker concludes that collegiality is a major factor in determining exemplary teachers. Thus being able to establish a collegial, team-oriented environment may be a supportive characteristic which helps generate even more exemplary ICT-using teachers. It is predictable that collaboration is equally important for all teachers, and hence it may be a key factor in successfully supporting novice ICT users, whether or not they are yet exemplary.

Collaborative activity can also enhance teachers' technical competence (Fullan, 1998).

> … as the curriculum begins to demand more intellectual rigour, teachers require information, technical expertise and socio-emotional support far beyond the resources they can muster as individuals working alone. .. they participate in reflective dialogue, to learn more about professional issues; they observe and react to one another's teaching, curriculum and assessment practices; and they engage in joint planning and curriculum development. By enriching teachers' technical and social resources, collaboration can make teaching more effective. (p. 8)

A branch of the same literature introduces collaborative learning as another aspect of collaboration. For example Scheid (1993) has a chapter on the process of

'Developing strategic learning capabilities through the application of collaborative learning methods'. Although it might look like collaborative learning is being offered as a catch-all for a range of modern and postmodern theories, it can be represented more simply. Gerlach (1994) describes collaborative learning as …

> based on the idea that learning is a naturally social act in which the participants talk among themselves. It is through the talk that learning occurs. (p. 8)

Hamilton, in the final chapter of a book called *Collaborative Learning: Underlying Processes and Effective Techniques* (1994), describes three models of collaborative learning, namely post industrialist, social constructionist and popular democratic models. However she suggests that the models may be interpreted as developmental, and then introduces a tentative model of five stages of expertise with collaborative learning. The idea that all collaboration is developmental sits easily with the definitions above, and supports the conception of collaboration sought in this research.

Snodgrass & Bevevino (2000) distinguish collaborative learning from cooperative learning from a student perspective. It is true that the two approaches have much in common, they argue:

- They involve a task or activity suited to group investigation
- They utilize small groups
- They involve cooperative behaviour
- An element of productive independence exists
- Individual students are held accountable and responsible. (p. 3)

However collaborative strategies differ from cooperative learning through a social dimension. Collaborative activities assume that the students have sufficient social skills to work in peer groups. They conclude that these have value in a relatively constructivist learning environment:

> Collaborative learning strategies are effective as instructional tools that encourage all students to participate actively in making meaning of information that is to be learned. (p. 3)

Their regular interchange of the phrases collaborative strategies, collaborative learning and collaborative learning strategies in their discussion of the topic suggests that collaboration is the underlying tool they wish to describe, and that collaborative learning is not as far from collaboration as was first thought.

It is evident already that the topic of collaboration appeals to many authors and practitioners. It seems arguable that writers like Hamilton (1994) are adding a level of complexity not necessary in research on ICT uptake, namely its value in recognizing the value of shared and intentional talk in joint learning and development. Perhaps the obvious overlap is implied by the constructivist interpretation introduced by Gerlach (1994) above, namely that talk and learning—when they are intentional, Lewis (1998) reminds us—are intimately related. So conversations with peers and conversations with those in a leadership position are able to contribute to learning. This inter-relationship could be regarded as the process of collaboration, in various forms. The key point seems to be that the personal and professional development that grow from most types of collaboration are able to contribute to the learning of the participants, regardless of whether they are peers or in a mentoring relationship.

Collaboration in ICT environments

Sandholtz et al. (1997, p. 105) describes a series of collegial sharing strategies that ACOT teachers used (reproduced as Table 2.4 below). They are *Emotional support* (eg. sharing frustration and success, providing encouragement); *Technical assistance* (eg. managing software and hardware, technical problems); *Instructional sharing* (eg. observing and sharing ideas, strategies); and *Team teaching* (eg. joint class or curriculum planning, interdisciplinary teaching). It pointed out that as teachers moved along the taxonomy of instructional stages, so they tended to use more of the collegial sharing strategies listed.

Table 2.4: Relationship instructional evolution, sharing (Sandholtz et al. 1997, p. 115)

Instructional stage	Emotional support	Technical assistance	Instructional sharing	Team teaching
Entry	✓			
Adoption	✓	✓		
Adaptation	✓	✓	✓	
Appropriation Invention	✓	✓	✓	✓

The table indicates that the ways teachers collaborated gradually changed form as the ACOT project progressed. These strategies are also hierarchical in that teachers were

noticed over time to make use of more of the categories, when they began using only the earlier ones.

Hence collaboration can be regarded as supportive as well as helpful as a learning tool. Collaborative techniques can reduce their feelings of discomfort, and increase their enjoyment of the activity by the simple process of sharing the same problems, and finding that other people have similar feelings (Fullan, 1993b). On the other hand simply forming a team may not be a supportive and collegial experience at all—Morgan's (1995) study of students using 'teams' which simply perpetrated bullying and teasing by failing to ensure an appropriate collegial environment, is an example. Hargreaves (1994) warns of mandating collaboration, which risks creating 'contrived collegiality', and risks overriding rather than supporting professional teacher relations.

Although collaboration is a useful concept, it is not without its difficulties. For example Raywid (1993) points out that finding time for collaboration has become one of the crucial issues for teachers. With care though, it is obvious that it has a place in the repertoire of appropriate professional development for ICT-adopting teachers.

Identifying the range of collaboration

One way to help identify the different types of collaboration is to locate a categorisation of ways of collaborating and use the categorisations in this study. Such a categorisation could be instructive, so it could be useful to have a model which can provide such a distinction.

There are many categorisations in the literature, some specific to situations and some more general. Little (1982) described four types of collaborative activities between teachers in successful schools namely talking, observing, sharing or disseminating with colleagues, and joint planning. Although these were a relevant set, they were deprecated by Cousins et al (1994) who found this framework 'rather limiting for describing the sorts of joint work the respondents in our study described'. Another specific example is provided by Jackson (1999) who describes four types of collaboration that can occur in field-based teacher education programs.

More general classes of collaboration are presented by Fishbaugh (1997). Her book describes three types of collaboration, namely Consulting, Coaching and Teaming

collaboration, and shows how they apply in educational and semi-educational settings. The particular field addressed by the book was that of special education staff and their student trainees who were learning to support the integration of people with disabilities into workplaces and their communities across the United States. It seemed reasonable to assume that these roles would be equally identifiable in the standard elementary education setting as well, while teachers were learning to integrate ICT into their classes and particular educational contexts.

Consulting models of collaboration are typified by 'an expert giving advice to a novice' (Fishbaugh, 1997, p.64). Fishbaugh defines a dyadic relationship but there seems no reason why it could not involve two groups rather than just two people as long as a relationship with a reciprocity of action or a sharing nature is still discernible, and one of the group(s) is showing more leadership.

Coaching models, on the other hand, are characterised by parity in the relationship—suggesting a shared or joint coaching arrangement rather than the more common sporting 'coach and player' model that the reader might expect. Finally *Teaming* models are an even more interactive version characterised by active and shared ownership of their roles and outcomes (Fishbaugh, 1997, p. 86). The common factor in the latter two types of collaboration is the equality in the interrelationships involved. The distinction between the latter two classes of collaboration is reminiscent of Lewis' distinction between cooperation and collaboration mentioned earlier (Lewis, 1998). These three classes of collaboration are shown in Table 2.5.

Table 2.5: Forms of collaboration identified by Fishbaugh (1997)

Class of collaboration	**Characteristics of Fishbaugh's types**
Consulting	an unequal relationship but not necessarily dyadic; possibly with a reciprocal or sharing nature;. She identified a range of types from loose advising to mentoring
Coaching	A sharing between people, characterised by parity in the relationship
Teaming	even more interactive version characterised by active and shared ownership of their roles and outcomes

Summary: collaboration and its value for this study

Constructivist conceptions of learning such as collaborative groups and professional learning communities may provide opportunities for teachers to revise their resistances and engender support and strengthen social ties. These approaches seem to embody the type of environment that would be appropriate in a school, because of their emphasis on collaboration. They must be formed with due diligence to ensure that they are genuinely socially and intellectually supportive. Although professional learning communities are normally self-managing and self-sustaining (Wenger, 1998) and therefore unlikely to suffer any of the problems identified earlier, these could be some of the reasons that individual groups or teams failed to coalesce satisfactorily.

2.2.8 Value of an outcomes orientation

An outcomes orientation embodies the idea that the method is not as important as the end result. In a classroom this could mean that the effort the teacher puts in is not as important as the final efforts recorded for the student, because it is the student who ultimately is being measured. In the same way teachers who are frustrated or dispirited about ICT may be able to let go of the frustration and get on with the substantive task of implementing an activity, even if the exact details of the activity are less than perfectly formed, knowing that it is not their efforts being measured. This change allows, for the ICT-adopting teachers, a focus on their students and their students' accomplishments. It is also seen as a powerful focus for teachers for two other reasons, namely the potential for stress-reduction and the potential for extended professional development.

It was hypothesised that focussing on the educational outcomes of an activity using ICT, rather than the ICT itself, could reduce the stresses that were often associated with the need to learn how to use some ICT at the same time as teaching about it. The principle is not simply to distract teachers from the stresses they felt, which are real enough and should not be demeaned. Rather the principle is to remind them, as educators, of the goals that they would want for any similar activity, even when one happens to use ICT as a means to reach that goal.

Hughes (1999), researching the impact of outcomes-driven curriculum reform on teacher perspectives of professional practice in Queensland schools, notes four broad

themes. Firstly, that teachers lost both confidence and faith when the conceptual material was perceived as too technical or too removed from their own experiences. Secondly, this loss of confidence was exacerbated when they were confronted with curriculum material that they had previously skirted around either because of lack of understanding or appreciation. An important corollary was that the outcomes focus encouraged greater syllabus fidelity when frameworks were closely aligned. Thirdly teachers appreciated the greater opportunities for collaboration within and between schools that an outcomes focus encouraged. Fourthly, in banding together at the school level to resist aspects of implementation, some teachers showed growing awareness of a collective authority capable of being exercised in response to top-down reform.

These consequences for teachers working with outcomes are potentially relevant to this research, especially as any adverse teacher reaction to the complexity of the Student Outcomes Initiative in WA schools could jeopardize the proposed approach. On the other hand the local teachers will be already pressured with the existing Student Outcomes Initiative and this research will be able to encourage overlaps and, through collaboration, could provide a supportive environment to dilute some of the difficulties, as well as diminish the feelings of top-down imposition. Given Hughes' observation that an outcomes orientation can 'prove an effective means of high-fidelity syllabus implementation' (p. i), then this further supports its use in a study like this one.

In fact the identification of outcomes-oriented activities for teachers could be simplified by reference to already sanctioned Student Outcomes Initiative materials for teachers in Western Australian schools.

Identifying an outcomes orientation

Costa & Garmston (1998) represent the concept of an outcomes orientation in a way that appears relevant to this research. They present five layers of outcomes, where they distinguish content-based outcomes from process-based outcomes (see the left column of Table 2.6). There is an overlap between Costa & Garmston's (1998) work on layered educational outcomes and the interest in students' outcomes encouraged by writers like Newmann & Weylage (1995) , and mentioned earlier.

Costa & Garmston's (1998) principle is that there are at least five layers or nested levels of outcomes that can be identified, 'each one broader and more encompassing than the level within and each representing greater authenticity' (p. 2). They illustrate the key distinction that they apply to all the outcomes, namely that as they become more general, they begin to consider less product-oriented facets and address more process-oriented facets of a task. As an overly simplistic example consider two teachers using e-mail in a class activity. They may appear to be teaching a similar lesson, but they may have different intentions and as a result students may derive completely different value (outcomes) from that lesson. One may be teaching students how to send an e-mail for the second time, and be praying that the e-mail server doesn't stop again. The other may be expecting improved language outcomes, since it is their second time, as students write to another class in another country.

The value of this table is that a teacher's level of outcomes orientation could be determined, in their model, by determining the types of questions they asked of themselves as they designed and implemented a lesson. Each outcome level has different questions associated with it (see Table 2.6 for example questions) because each level of outcomes orientation has different transformational intent.

Table 2.6: Five nested levels of educational outcomes identified by Costa & Garmston

Outcome	Typical questions
Outcomes As Activities	What do I want to accomplish in this lesson? What will I do to make it happen?
Outcomes As Content	What concepts or understandings do I want my students to know as a result of this activity? What will I do to help them understand? How will I know they understand the concepts?
Outcomes As Processes	What processes do I want my students to practice and develop? What will I do to help them develop those processes? How will I know if they are practicing and developing them?
Outcomes As Dispositions	What dispositions do we want students to develop and employ? What will we do to assist their development? How might we work collaboratively to determine if students are developing such dispositions over time? What will we see or hear in student behaviours as evidence of their growth? How might we practice and assess our own growth toward these habits of mind through our work together?
Outcomes As Mind States	(Using five mind-states) In which mind states do we wish students and colleagues to become more resourceful? What will we do to capacitate their development? How will we know when the mind states are amplified? How does what we are doing today compare with our vision of what could be?

They exemplify the innermost level (outcomes as activities) with an inexperienced teacher whose outcome might be the successful playing of a videotape on Mexico to the class. This is the least student-centred of the outcomes. As the outcome level increases in complexity and vision, so does the sophistication and transformational intent of the video-playing lesson. It might, in the hands of increasingly more outcomes-oriented teachers, change:

from the successful playing of a videotape on Mexico to the class, (activity outcome);

to students learning some of the principal causes for Mexico's desire for independence from Spain (content outcome);

to planning projects to research whether the heroes of the Mexican Revolution were as brave as those of the American Revolution (process outcome);

to one of building metacognitive skills of the history students (disposition outcome), and so on.

Their treatise is, in this case, a warning that even a novice teacher might believe that they have an outcomes orientation, but still be remote from the type of re-encapsulation of the problem which is implied by the move to an outcomes orientation of DoE(WA)'s Curriculum Frameworks document, and this study. The Outcomes Based Education (OBE) principles seek evidence that a student has changed—not in a single behaviour, but in a more substantial measure represented by a longer-term, more process-like description (Hannan & Ashenden, 1996). Consider the following extracts form the *Curriculum Framework* book (Western Australia Curriculum Council, 1998a) English learning area outcome #6 (Speaking): 'Students speak with purpose and effect in a wide range of contexts' (p. 84); or Society & Environment, learning outcome #4 (Culture): 'Students understand that people form groups because of their shared understandings of the world, and, in turn, they are influenced by the particular culture so formed' (p. 252).

It is argued here that 'an outcomes orientation', or the 'OBE' principles espoused by educational authorities like DoE(WA) are only honoured by the conceptual hierarchy of Costa & Garmston from the third level of outcomes, namely 'outcomes as processes'. At this point (and beyond) we could expect to see the teacher providing 'engaging and enriching learning experiences to achieve the Curriculum

Framework's learning outcomes' (Western Australia Curriculum Council, 1998a, p. 10).

Since each level subsumes the previous, it seems obvious to recognise a dichotomy between teachers whose level of outcomes thinking is still in one of the first two stages (namely activities and content outcomes thinking), and those teachers who are planning in levels above the second (ie process outcomes thinking). This suggests teachers may be classifiable into two groups by this distinction. The first group is using relatively content-oriented thinking. The second group is characterised by their focus on the processes being achieved by their students, defining a more process-centred approach.

Value of an outcomes orientation in this study

Utilising Costa & Garmston's (1998) interpretation of a teacher's outcomes orientation, it was concluded that in their terms, a genuine or 'proper' outcomes orientation corresponded to a willingness to focus on process-centric outcomes. This described teachers whose teaching focus rated in levels 3 to 5 of their five level hierarchy in Table 2.6, in other words, for whom process-oriented (not content-oriented) outcomes were important. Teachers in levels 1 and 2 were characterised as using a teaching and learning style which sought outcomes which were much more content-oriented.

A similar distinction was made by Dwyer et al (1991) when reflecting on their ACOT research—shown as Table 2.4—when they showed how many of their teachers gradually changed from their familiar instructional teaching approach towards 'knowledge construction'. Thus it was concluded that, since much of the Student Outcomes Initiative is concerned with teaching process outcomes, there seemed to be a strong association between a (process) outcomes orientation and the extended approaches to teaching and learning which use student-centred and interactive activities as a norm.

According to the long-term ACOT study, many teachers who started with a content focus when using ICT in their classes, gradually become more concerned with processes and knowledge construction, which was described by a move from the activities on the left column of the table to those on the right of Table 2.4. The change was not linear but depended on conditions, the novelty of the work, their

confidence that week and so on. For example the addition of a new ICT component into a class activity may be the cause for a temporary return to a more instructivist mode for some teachers.

This section has addressed the purpose of an outcomes orientation. As well as providing an important focus on their students' learning, an outcomes orientation may increase the fidelity with which teachers implement the ideas, perhaps because they have had more opportunity to collaborate. An equally important characteristic is that it could help reduce stress during teachers' ICT uptake, and simultaneously to reduce the potential workload of those participating by giving them chances to overlap with other professional development or class ICT activities. Finally it seems that a concern for their students' learning processes rather than simply their content development may be a useful way to distinguish a more outcomes oriented teacher.

Multiple perspectives

The post-modernist conception that technology was not value free (Hodas, 1993) has already been presented in Section 2.1.5. The concept was not new, and simply mirrored the interpretations of which constructivism and social determinism were but two. The social determinist perspective argues that all technologies are constructed by elites operating in our social and cultural environment. The complementary constructivist view, which casts students as constructors of their own learnings, has a rather intellectually satisfying flipside in a post-modern analysis of the world—namely those who do not feel determined by their surroundings will simultaneously recognise the opportunity to construct not just their learning but their whole world view. The constructivists argue that we construct our learnings, and we are simultaneously constructed by our social environment, eg. as consumers of products developed to tempt us to spend. Recognising forces wider than just the classroom, including social factors in teaching, are critical conceptions according to the postmodern and postcolonial perspectives mentioned in the previous sections. Further, they are not inconsistent with the 'multiple perspectives' thinking principles proposed for this project.

2.2.9 Summary: Micro perspectives—ICT & schooling

This section of the literature review has addressed relatively micro issues about teachers, and learning inside schools. There are still groups who appear to believe

that they can teacher-proof the classroom, but there are also writers concerned about the future of teaching, and prepared to support teachers in a renewal process as contemporary learning principles gain ascendancy. This section has reviewed the reasons for teachers' resistance, and identified factors that appear to be helpful for any research that was intended to support teachers involved in ICT uptake.

A number of writers point out the criticality of teachers to the reform process, since they can support or subvert reforms by their individual actions in their individual classrooms. Equally important are their own attitudes towards change and their own 'reconstruction', and the fact that unnecessary stress levels can interrupt or undermine their best intentions.

Evidence has been offered that suggested ICT uptake had some interactive relationship with pedagogical style. It was evident that at least some teachers develop a more constructivist pedagogy when they take the opportunity to refresh their moral purpose through working collaboratively with others in a similar challenge.

For this research the prospect that ICT usage has for contributing to teachers' changing pedagogy is important. Possible reasons include that: by its nature ICT highlights and draws a teacher's attention to student learning; by occupying students' attention it provides reflective opportunities for teachers that may otherwise not be available; increased student expression and collaboration in front of a computer screen can surface student learning; and satisfaction with its use can increase the depth and breadth of teacher conversations about learning and related pedagogical topics.

Various writers have provided support for the following principles or conditions that need to be set, when considering the specific micro conditions that apply to teachers and useful characteristics of the learning environment which are relevant. These include:

A focus on student learning and student outcomes;

addressing teachers' personal, social, collegial and professional needs;

considering the local support as well as school and systemic leadership;

supporting and developing appropriate local development rather than imposing something from outside, no matter how relevant;

acknowledging the importance of the social organization of schools;

and encouraging development in a sustained school-wide manner;

using collaborative activity for its professional as well as supportive value; and

ensuring a genuine focus on outcomes which will be in both student and teacher's best interest.

These were some of the important deductions from the literature presented. Along with research on systemic perspectives in the next section on the change process they reinforce conclusions that under conditions of teacher renewal, this focus may be justifiable and effective.

2.3 Process perspective: Change, ICT uptake, PD design

2.3.1 Introduction

This topic considers the process of change, specifically a consideration of the developmental processes involved in ICT uptake. Ultimately the quest is to ensure that the design of appropriate PD activities neither fails to address important facets that would improve that uptake, nor hinders this uptake by covering unnecessary ground or approaching it inappropriately for the teachers involved. The problem is like a newspaper editor's decisions for the front page. The 'wrong' stories will fail to capture readers' attention, and she cannot just squeeze more stories onto a page of fixed size. In a similar way stressed teachers could be represented as having a limited 'window' through which to collect their extra 'daily dose' of information and learning.

The literature for this topic could be represented by two opposing forces. One side consists of those who argue for, seek or promote simple, achievable solutions for school reform and teacher development. The other side consists of those who argue that the system of schooling is so complex and changing that its own dynamic complexity suggests that simple solutions are unrealistic and even trivialise the real issues. In essence are there simple, achievable solutions to school reform or are schools so complex that there are no general solutions that work? This dilemma will be considered through the rest of this review.

2.3.2 ICT as part of a broad-based process of change

Change is a continual and ever-present part of the lives of teachers in most Western schools today. Whether schools are changing may not be as relevant for the teachers, who are changing all the time. Yildirim (2000) suggests that they may be less inclined than other professions to change their thinking, implying the importance of good leadership. This may be so but it seems unlikely to change substantively the approach that research should take to aid them in their uptake process—it is thus argued from the preceding literature that ICT uptake is still needed, and nearly all the research literature has been grounded in teachers' and educational issues anyway.

An appealing argument is that the very technology that is the object of teachers' concern may actually be the tool to help them change, in the view of famous scientist, inventor and thinker Buckminster Fuller. Fuller (reported in Senge, Roberts, Ross, Smith, & Kliener, 1994, p. 28) enjoyed explaining his theory on the difficult topic of teaching new ways of thinking. He argued that to teach people a new way of thinking, the answer was to provide them with the tool, *the use of which will lead* to new ways of thinking.. At school level, ICT has been represented as both a pervasive force for change and a new tool for teaching and learning. Under these circumstances it seems perhaps ICT is an example of a Fuller's tool in action, and could indeed be the vehicle to support new ways of thinking.

Teacher renewal and leadership

Teachers change all the time (Stiegelbauer, 1994) but the development and intellectual challenge needed to change a teaching style for example, must be significant. Although the trait of teaching style has been reported to be changeable within short periods (Howard, McGee, Neil, & Purcell, 2000) in general a teacher's teaching style is regarded as remarkably stable. Hence renewal for a teacher is rarely a single Catastrophe Theory-like fillip but a gradual process of up-and-down transition, non-linear development and slow integration. Sandholtz et al. (1997) describes teachers' development as idiosyncratic. Even teachers who regard themselves as having made revolutionary changes may prove on analysis to simply have integrated some modern principles into their traditional structures (say grouping desks, but never addressing tasks to students as groups), and still be utilising basically unchanged styles of instruction in their classroom (Cohen, 1990).

One representation of the transition is Mavaresh's (1996) U-curve where a teacher's perception is that, until they learn to use technology better, they will suffer a short term drop in facility and self-confidence, even though they expect a rise in skill and personal competence afterwards. This representation could explain why teachers are unwilling to start their personal change process, no matter how long or short it is. Such transitions in pedagogy may take years (eg. McKenzie, 1998; Nordenbo, 1990; Wiburg, 1996b) or they may happen within a year (Richardson & Anders, 1994). Howard and his co-workers suggested that significant, measurable changes can take place in a month long live-in in-service course (Howard et al., 2000). Teacher attitudes and teacher beliefs appear to play an important part in this process, and these factors do not preclude a short intervention or observation period identifying significant change.

Arguably leadership plays an equally important part. Under the described conditions of almost constant change and repetitive reform pressures in schools, the argument goes that the one thing that teachers need is good leadership. Traditional leadership requires that clear visions be enunciated and strategic plans be set (eg. Lashway, 1997; Leithwood, 1990). However, there is a problem here which Fullan (1993a) describes as the double-edged sword of change. For example 'how can any leader be a good listener and yet show strong leadership?'. The more vision a leader provides, the less team members need to generate their own. This leads to the problem of compliance, according to Senge:

> If people don't have their own vision, all they can do is 'sign up' for someone else's. The result is compliance, not commitment. (Senge, 1990, p. 211)

In fact visions assembled prematurely can blind people, and Beer, Eisenstat & Spector (1990) conclude that avoidance of visions is preferred, since they have a basic flaw:

> The programmatic approach often falsely assumes that attempts to change how people think through mission statements or training programs will lead to useful changes in how people behave at work. In contrast our findings suggest that people learn new patterns through their interactions with others on the job. (p. 150)

Fullan (1993a) concludes that, in times of complex change, the better leadership is that which is organic, local, and preferably comes from each one of us (p. 22). The school climate, he argues, appears to call for some form of interactive groupings and shared leadership. Stager (1999) and Yocam (2000) imply that appropriate

leadership can be self-engendering; as each describes it as one of the natural consequences for ICT-adopting teachers when observant Principals realise their value in support, leadership and advice roles in their local communities of practice.

For research concerned about constructing effective professional development, it would seem appropriate to rely upon collegial activities and to ensure opportunities for shared, interactive leadership. This does not mean that supportive administrative staff within and outside a school are not important, as Stager (1999) and Yocam (2000) have already indicated that they are. Imposed solutions from inappropriate leadership methods are apparently easily undermined by unwilling recipients. The implication is that these leaders must instead be willing to share their leadership roles and powers and adapt ideas to local conditions in a bid to encourage participation and commitment from as many as possible of the teachers who are willing and able to participate in ICT uptake and its associated professional development.

The change process is multi-stepped

Change in schools has been difficult to encourage, and notoriously difficult to sustain. In support, Evans (1996) describes change not as a predictable game but as a personal struggle, which requires a number of steps, namely new learning; practising new behaviours; and adopting new beliefs. This personal perspective resonates with the Rand Corporation's model of change by Berman & McLaughlin (1978). They delineate three categories in planned organisational change, from adoption of an innovation, to its implementation and finally its institutionalisation. Tester (1991), using Berman & McLaughlin's (1978) three-step model as a conceptual framework, was concerned that most attempts at change unwittingly aim at only a single, usually the first, step or stall there for lack of comprehension of the further ones.

School change has been mismanaged and/or misunderstood

Many recent writers agree with Evans (1996) and Berman & McLaughlin (1978) that change is a multifaceted problem, so it is not illogical that it will need multifaceted solutions. Systemic change in schools is a classic example. Huberman (1992) suggests that many teachers felt that most attempts at system-level change were simply a 'lottery', or sometimes a 'betrayal'— exhausting at best and mismanaged in the worst case:

> On the face of it, this is a severe indictment of the implementation of educational change. It suggests either that the process is typically, even chronically mismanaged or that, beyond a certain level of complexity or ambition, it is fundamentally unmanageable. Or a combination of the two. (p. 5)

This recalls the staffroom cynics' old joke about the transient nature of the latest innovation, when they recite, *Don't worry, they are just like the trains, there will be another one along within 15 minutes, dear*. Furthermore schools represent very large, non-trivial complex systems and seem unlikely to be able to make significant change quickly. Many writers point out that teachers are simply one link in a complex web that has proved remarkably stable over the last century (eg. David, 1991; Fullan, 1992; Reynolds, 1995; Sheingold, 1991).

Not only are schools complex organisational structures but they also possess a 'dynamic complexity' (Senge, 1990, p. 68)—meaning that their component parts (eg. staff, policy and administrative systems) are in constant movement, belying their superficial appearance of stability. This movement, however, was not to be confused with change. He also argued cogently for a systems perspective when addressing change in large organizations. This does not mean the abdication of communications channels with staff throughout an organization, nor reinforcing old hierarchies; rather he advocated a willingness to consider both local and systemic issues together and holistically.

So, with many and increasing attempts at reform, supported by the range of groups identified in Section I in this chapter, schools are experiencing almost constant pressure to change.

Although there was need for change, these writers have argued that the complexity was not well understood and it was often approached in a one-dimensional way. Any number of unidimensional examples can be found rather than the multifaceted approaches to change and development that seem necessary. For example, a professional development trainer writing in a monthly on-line newsletter illustrated such an approach to an innovative change, in these extracts:

> I was excited after the course and told all my colleagues. One or two of them started using some of my ideas… (Haas, 1999, p. 1)

Haas then indicated some awareness of the richness of support structures that teachers need as they learn to change their behaviours and beliefs.

> {I was taught that} providing sustained support and innovation, legitimate resources, feedback, functionality, and expert help are some of the key elements found in an effective staffing agenda…. To this end I've started a newsletter, 'Diego's Times Newsletter' to introduce my colleagues to ideas and pedagogy relating to technology. (Haas, 1999, p. 1)

This story, although a normal and uplifting story about localised progress, seems to represent many of the professional development processes which perform lower than their aim. The mismatch between words and actions is probably detectable in many failed attempts at sustained school and staff change. Fullan (1993b) argues that even multiple simultaneous changes may not satisfy another important criterion. He argued persuasively that neither top-down nor bottom-up change work in schools; instead he asserted that, by itself, neither was satisfactory.

Complex problems like innovation in schools need to rely on as much support and symbiotic activity as possible. For example Fullan (1993b) also showed that schools with stronger social networks also display higher consensus behaviours, and a more educational focus.

Using the relationship between sharing and instructional styles

The ACOT model drew attention to the relationship between collegial sharing strategies already mentioned and development of instructional style during innovation adoption (repeated as Table 2.7, below). It may be a satisfactory model for teachers to watch and reflect on their own development over time.

Table 2.7: (also 2.3) Relationship instructional evolution, sharing (Sandholtz et al., 1997, p. 115)

Instructional stage	Emotional support	Technical assistance	Instructional sharing	Team teaching
Entry	✓			
Adoption	✓	✓		
Adaptation	✓	✓	✓	
Appropriation Invention	✓	✓	✓	✓

Researchers have already pointed out the value of collaboration for teachers undergoing change in their instructional approaches. The ACOT project suggested a closer, symbiotic link, namely that increasing levels of collegial collaboration were

associated with increasing levels of instructional innovation. This relationship, implicit in Table 2.7, was important to the success of innovation (Sandholtz et al., 1997), and was confirmation of both the importance of a collegial environment and the success of an innovation as complementary conditions for change (eg. Barth & Guest, 1990; Fullan & Stiegelbauer, 1991). The advantage of using interactive computing and communications technology as the vehicle—but not the subject—of change was that it provided, via e-mail, lists, chat groups and so on, the very opportunities for communication and even asynchronous telecommunications that can support collaborative efforts. This was further support for the double-duty role that collaboration appeared to serve in such an environment.

Consistency in effort important, within limits

There have been outsiders seeking change in schools and their reasons were often different from those of many teachers (Table 2.1). Fortuitously this outside pressure was often not inconsistent with many of the views expressed by progressive teachers, who were identified as Artisans in Table 2.1. As Senge (1990) indicated there was value in considering both personal and system level change simultaneously, but the need to focus on student learning and student outcomes remains.

To maximise student learning, some writers argue that it is important to seek minimum mismatch between the whole school's aims and individual teacher's aims (Elmore, 1992; Fullan, 1998). These ideals are desirable but harder when it comes to practice. For example, Fullan warns on taking this concept too far, when it might just be a trap. Since genuinely complex dynamic systems are not linear, and are notoriously stable, he advised to aim for changing the people not the system (1996). Instead a critical mass of strategies would be needed rather than seeking coherence at all costs, from a system which may never deliver it. Another important issue is addressed by Wallace, LeMahieu, & Bickel (1990), namely that sometimes, when the level of disagreement in a staffroom is beyond healthy, they argued that moving or even removing staff may be appropriate as the only way to allow the remaining relations to be restored or to develop in a normal way.

Patterns and principles but no potted rules

It was tempting to look for simple solutions to the problem of school change, but most writers in the area made it clear there are no short cuts. The old adage *for every*

complex problem there is a simple solution—and it's wrong seemed apropos. Stacey (1992) for example makes it clear that there are no simple rules to follow in modern or post-modern organizations that face dynamic change forces.

> … the dynamics of nonlinear feedback systems are characterised by a combination of regularity and irregularity, of stability and instability. Systems of this kind develop over time by passing through periods of instability, crisis, or chaos and then spontaneously making choices at critical points, producing new directions and new forms of order. (p. 12)

In describing the process of reform implementation, Fullan (1994), indicates that neither top-down nor bottom-up reform was sufficient for successful school change or a sustained shift in teacher behaviours. Given the conspicuously unchanged look-and-feel of schools, the task is apparently one of epic proportions. Huberman (1992) notes the paradox while suggesting that attempting major change in schools was more likely to succeed than attempting minor change (p. 5).

A final point about the process of change concerns the likely antecedents. Beer et al. (1990) concludes from reviewing many organisational changes, that when an isolated pocket of change reflecting new behaviours takes root, this pocket was a more likely path to wider changes in structures, group practices or procedures than any mandated change in structures. Fullan (1998) put this succinctly when he described this as the distinction between reculturing and restructuring. He hypothesised that reculturing would lead to restructuring more effectively than restructuring would lead to reculturing. He suggested that a more productive sequence was 'when teachers and administrators begin working in new ways only to discover that school structures are ill-fitting… and must be altered', rather than the reverse.

No matter where a teacher is on his or her own change path, what one does next depends on where each one is in some instructional evolution model. This suggested that there was no single set of rules for everyone. Instead of rules Fullan (1993a) offers nothing more concrete than eight lessons, for example:

You cannot mandate what matters (the more complex the change the less you can force it);

Vision and strategic planning come later; and

Change is a journey not a blueprint (it is non-linear, loaded with uncertainty and excitement, and sometimes perverse) (p. 21-22).

Although the book then spends three chapters explaining them in some detail, the principle holds that there are no rigid rules to rely upon. The challenge at implementation time is to see how to apply them in specific situations in ways that will honour both the principles and the needs of the participants.

No matter how complex it is obvious that models of teacher change with ICT uptake can be articulated and evaluated. With the reservations of this section in mind, some models are presented in the next section, along with some criteria against which to rate their effectiveness.

2.3.3 Criteria for evaluating ICT uptake models

It should be possible to rate a typology as effective or useful. For example it could be rated against a set of criteria allowing a scoring of its effectiveness. Such a set of criteria would seek to ascertain any typology's value in the ICT uptake environment for a particular group of teachers. In this case the criteria sought a typology that would be simple and useful, and if it met these criteria it could be called effective. In the realm of quantitative statistics, such effectiveness is often translated as validity and reliability. In this context these were re-cast with a more qualitative interpretation (Miles & Huberman, 1994), namely (i) simplicity, (ii) credibility and (iii) usability. It is argued that the following three criteria were appropriate. An effective typology should not only be fit for the purpose desired, but also:

i) have relatively few steps or levels and be easily comprehended (simplicity);

ii) be strongly grounded with the range of collected teacher data (suggesting referential adequacy), and be easily linked to previous experience so that it would provide some connection into the difficulties and supports of their own uptake process (credibility); and

iii) possess an ease in implementation and provide some guidance or helpful strategies for teachers (useability). This may embody generalisability principles too, if the model being evaluated can support all those seeking to make further progress whether they were starting out with ICT or developing their ICT skills. After all, it seemed unlikely that common or undifferentiated strategies would be appropriate for a range of educators who were at different locations along some developmental path.

With the three criteria simplicity, credibility and useability in mind, it should now be possible to compare some models for teacher change with ICT.

2.3.4 Models of teacher change with ICT uptake

Some typologies of change classified the person by a personality trait, others by current behaviours on a scale. Everrett Rogers (1983) well-known classification around the uptake of innovations was an example of the grouping largely by personality trait. By dividing people according to how quickly they become adopters of an innovation, he identified five groups, namely innovators, early adopters, early majority, late majority and finally laggards. The first and last categories each accounted for about 5% of any population, he stated. Such a scheme lacks any dynamic nature as it does not describe how people change or under what circumstances they change categories. The fact that he reported percentages for the groups implied that people did not change between groups either. Such models seemed counter-productive in the current circumstances as their focus was on stability rather than moveability. The investigation therefore focussed on published models of ICT uptake, which by their nature tend to focus on the transitions rather than the categories.

Many of the typologies of ICT are taxonomic. The implied development or 'maturation' of ICT skills in such typologies was an important principle for teachers and their professional development. Such hierarchies may be an appealing planning structure for teachers coming to ICT as novices and teacher educators.

Many of these taxonomies are rooted in Fuller's work (1964) called *Concerns of teachers: a developmental conceptualisation*, which spawned the CBAM (Concerns-Based Adoption Model) movement. It is hard to serve justice in a few sentences on the CBAM approach, as it has developed into a very sophisticated set of procedures, in fact a complete methodology (see for example Newhouse, 1998) on the one hand, and has been simplified drastically by others, for example the LoTi model (Moersch, 1997).

There are many models of teacher professional development available (see for example Laferrière, Breuleux, Baker, & Fitzsimons, 1999). A selection of models which characterize the range and consider the transitions rather than the categorizations are represented by three examples:

Stages in learning new technology (Russell/Christensen)

Technological Maturity Model (Sibley & Kimball)

ACOT hierarchy (Yocam, 2000)

Stages in learning new technology (Russell/ Christensen)

This model is derived from Russell (1995). Russell argues that by showing learners the stages that they passed through and helping them understanding these stages will make the learning process less traumatic for them. The paper identified six stages as adults became confident users of e-mail. Christensen (1997) adapted and used the model when researching on the wider topic of the effect of technology integration education on teachers and students' attitudes toward ICT.

In the early stages teachers experienced tension as the technological processes dominated and intruded on their electronic interactions. Eventually, by Stage Six, Christensen describes the technology as invisible and the users who are comfortable and confident enough to use the technology creatively. The final model's six stages are: Awareness, Learning the process, Understanding and application of the process, Familiarity and confidence, Adaptation to other contexts, and Creative application to new contexts. Participants self-allocated to a stage by reading and choosing their place on a hierarchical scale (Table 2.8). These are presented with the statements that teachers were asked to read and hence locate themselves on the scale.

Table 2.8: Stages of adoption of technology (Christensen, 1997)

	Stage	Description
1	Awareness	I am aware that technology exists but have not used it—perhaps I'm even avoiding it.
2	Learning the process	I am currently trying to learn the basics. I am often frustrated using computers. I lack confidence when I use computers.
3	Understanding and application of the process	I am beginning to understand the process of using technology and can think of specific tasks in which it might be useful
4	Familiarity and confidence	I am gaining a sense of confidence in using the computer for specific tasks. I am starting to feel confident with the computer.
5	Adaptation to other contexts	I think about the computer as a tool to help me and am no longer concerned about it as technology. I can use it in many applications and as an instructional aid.
6	Creative application to new contexts	I can apply what I know about technology in the classroom. I am able to use it as an instructional aid and integrate it into the curriculum.

The paper argues that such a scale is important since understanding the stages of learning to use the technology has an empowering effect on the learner through the knowledge that feelings of tension and frustration would be overcome.

Although it has detail, this model has simplicity on its side but appears to treat the technology as an object. Note that the judgment is made by the participants themselves, leaving them some measure of control which would seem helpful in the circumstances.

Technological Maturity Model (Sibley & Kimball)

Sibley & Kimball (1998) identify four stages—called benchmark stages—in their TM (technological maturity) model describing the progression of an institution or school to technological maturity namely: Emergent stage, Island, Integrated, and finally an Intelligent Systems stage.

Each of these benchmark stages is part of a hierarchy and has some identifiable characteristics, for example the first or Emergent stage represents a school with few planning procedures and very little organised usage throughout the institution. Each stage has a series of descriptions (from five in the Emergent Stage to nine on the last or Intelligent Systems stage). As an example the Emergent stage descriptors are:

> Lack of formal support when using computing technology for instruction
>
> No formal plans, policies or procedures exist to ensure the efficient and appropriate acquisition or use of technology throughout the Institution
>
> Computers are used sporadically throughout the Institution
>
> Institution wide coordination to ensure grade level and program level access is absent
>
> Formal support for teacher training is minimal (Sibley & Kimball, 1998, p. 1)

These descriptors are school-based rather than teacher-based. The model also identifies five areas of the organization, which they call key areas, which allow the impact of ICT to be measured in each area. They become ‘organizational filters’ to allow more detailed analysis. The filters are Administrative, Curricular, Support, Connectivity and Innovation. As an example two filters are quoted here:

> **Administrative Filter**: The Administrative Filter is composed of Policy, Planning, Budget and Administrative Information criteria. High levels of maturity in this area are most reflective of resource availability and the behaviors of Administrators and Staff. This is indicated in the Maturity model Impact table. Projects that focus on this area will impact Administrators and Staff the most.

> **Curricular Filter**: The Curricular Filter is composed of Curriculum Integration, Assessment, Teacher Use and Student Use criteria. High levels of maturity in this area are most reflective of resource availability and the behaviors of Teachers and Students. Teachers indicated in the Maturity model Impact table. Projects that focus on this area will impact Teachers and Students the most.(Sibley & Kimball, 1998, p. 2)

The model is aimed, at least initially, at a whole schools rather than individual teachers and its purpose is more about benchmarking a whole school's progress as a unit rather than identifying an individual teacher's progress. Although sophisticated it is regarded as a rather top-down model with relatively little under the control of the classroom teacher.

ACOT hierarchy

A hierarchy by Sandholtz et al. (1997) delineated five stages of instructional evolution that they observed technology-using teachers passing through over a period of years in ACOT schools. The categories of instructional stages or styles were Entry, Adoption, Adaptation, Appropriation and Invention, and are summarized below.

Entry: Initiation phase where the teacher learns to master the basics, simple technical problems like software and cabling, re-arranging the physical space to suit and so on.

Adoption: Able to do introductory activities with students, including typing and word processing skills. Technical problems are still evident as they attempt to blend technology into their class activities in some comfortable way. Although much changes, there is also a lot that is unchanged about an adopting teacher's classroom.

Adaptation: Lecturing, recitation and seatwork remain the dominant mode despite increased daily technology integration. Nevertheless, observers report themes of changing curricular emphases by staff and increased productivity and motivation by students– eg. teachers allowing students to spend more time on problem-solving activities and improved engagement of traditionally less interested students.

Appropriation: Teachers who achieve the level of appropriation are past the point of simply computerising their classrooms. This step is more a milestone or turning point than a major change in instructional practices (Sandholtz et al., 1997, p. 42); it represents instead each teacher taking personal responsibility for ICT integration in the classroom. Without appropriation skills and good access teachers 'are simply

unable to move on to innovative uses and demonstrate new kinds of outcomes for students' (p. 43).

Invention: The whole tone of ACOT sites where teachers are at the invention stage starts to alter as they apply their teaching and learning skills in new ways. Teachers report being more reflective, and questioning old patterns; students are more active, committed, are more collaborative and curious.

There are two important factors evident from this hierarchy. Firstly, they have reported significant long-term changes in students too, and the way that they chose to work in the classrooms of these teachers. Secondly, reaching the final Invention stage is 'a slow and arduous process for most teachers' (Sandholtz et al., 1997, p. 47). Not all teachers reach this high plateau apparently, but those who did indicated that they were now comfortable with a whole new set of educational beliefs and practices that were initially uncommon. For these teachers there was more recognition of the active, creative and social nature of learning; the concept of knowledge construction by students; and more willingness to question old beliefs about learning and instruction. Taken together these two factors show an interest in the underlying educative process about which teachers are concerned, and which justifies an interest in ICT uptake in the first place.

These five stages represent a hierarchy and delineate the stages an individual teacher passes through in their development with ICT usage. Since writers like Fullan and Little have suggested that some local or bottom-up development was appropriate, this model has an instant appeal. The fact that Sandholtz et al highlight that not all teachers reach the final stage is not consistent with the other models of change, but may be more realistic, since it was ethnographic research. This may imply that other factors, yet unaddressed, may be determining the prospect of a teacher reaching the final stage. Nevertheless the orientation towards the class teacher, the broadness of the topic and practical nature of the model differentiated it from the other models.

Identifying effective models

Each of these models suggested that a scale or hierarchy could describe the process of ICT uptake by teachers in a school. Deciding which was the most suitable of the models should be based on the criteria already established, namely simplicity, credibility and useability. This would allow the selection of a model around which

professional development activities could be designed. Each of the three models will be evaluated against each criterion.

Simplicity: The Russell and ACOT models both follow rather simple hierarchies, the former with six and the latter with five steps. The TM model has added levels of complexity for example the organisational filters which allow different perspectives on the organisational components.

Credibility: All three models have been applied in schools and appear credible. The TM model takes a top-down approach compared with the bottom-up approach of the Russell and ACOT models, and is aimed at whole schools and their measurement of their global progress rather than focussing on individual teachers. The teacher-level phrasing of the latter models would seem more in accord with the interests and leanings of classroom teachers, whereas the TM models language seemed aimed at school administrators and leadership staff. In summary it seemed that the referential adequacy of the Russell and the ACOT models would make them more appropriate contenders for constructing a PD program for class teachers.

Useability: It was not clear how any of the models in their described forms could provide guidance for the design of professional development activities, for example. Each hierarchy implied a journey, however, and this could be useful, perhaps as a review of individual's development. Describing the milestones on a journey does not say how to travel between milestones. As they were presented, none of the models provided any genuine usability, although the ACOT model had more generality in its descriptions and was therefore applicable in a wider range of circumstances.

Nevertheless there was a source of guidance which came, interestingly, from some of the ACOT materials, namely descriptions and a diagram suggesting a strategic approach to designing professional development materials and activities.

Sandholtz 'three core principles'

In the final pages of their book describing the ACOT work Sandholtz et al (1997) suggest three 'core principles for supporting technology integration' (p. 183), namely *technology, learning* and *professional development*. The triumvirate was akin to the theoretical model proposed by Fullan (1998), in other words it is reminiscent of Figure 2-1. These three key processes could be represented as three overlapping elements, as in Figure 2-3 below.

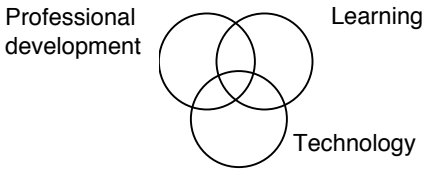


Figure 2-3: Three core principles for supporting learning technology integration; the 'ACOT model' based on Sandholtz et al (1997)

These three factors seemed relevant to professional development for teachers around ICT uptake. They also made an appealing and simple visual which seemed to summarise the micro processes of the ACOT work well.

It was evident that such a diagram, focussing on PD, learning and technology was the basis of a successful approach already used in the ACOT structure. The difference was that the ACOT schools talked about by Sandholtz et al (1997) did not usually address whole schools, nor did they tend to have good local support available. These were examples of the issues becoming important in the design of suitable ICT professional development in schools.

2.3.5 Professional development in schools

Professional development has increasingly come under fire over the last twenty years as writers and practitioners question its ineffectiveness at changing teachers' behaviour (for example Castner, 1998; Fullan & Stiegelbauer, 1991; Guskey & Huberman, 1995; Joyce & Showers, 1982).

Burke (1997) cites Michael Fullan who stated,

> Nothing has promised so much and has been so frustratingly wasteful as the thousands of workshops and conferences that led to no significant change in practice when teachers returned to their classrooms. (p. 3)

Numerous studies have found that the introduction of technology can lead to important changes in teachers' method of instruction. For example, in a study on the potential of interactive learning tools for improving the quality of education, the Power On! report [Office of Technology Assessment , 1988 #496] argued:

> One of the most significant impacts of the use of computers in the classroom is change in teaching style. Teachers can go beyond the traditional information delivery mode where they are presenters of ready-made knowledge and become facilitators of students' learning. (p. 91)

Most arguments suggest that the more successful approaches to professional development should address teachers' needs in three directions (for example Butler, 1992; Centre for Educational Research and Innovation, 1998):

over extended periods

within the school environment rather than at a separate single course

with teachers exercising large measure of control over the content and structure of the course

In this case the particular challenge has been the fact that professional development for teachers with ICT has traditionally focussed on improving their computer skills rather than improving student learning. Castner (1998) suggests that PD for teachers needs to address the appropriate use of ICT in schools. She quoted Ringstaff and Yocam (1997) that

> current methods of PD are woefully inadequate, because most focus on learning about computers rather than on learning how to integrate computers into the curriculum. As such these training programs do little but preserve the instructional status quo. (p.6).

An important perspective for professional development to consider is that of adult learning. Writers like Boud (1988) Knowles (1998) and Schon (1987) argue that it is important to be cognizant of the principles of androgogy—adult learning, as opposed to pedagogy—since androgogic principles allow the shaping of the learning process in a way that is more conducive to adult learners. In fact Butler (1992) has done a review of the literature on adult learning and learning theories and identified the following list of characteristics that need to be taken into consideration when designing professional development for teachers:

- Learning is lifelong but takes place more slowly with increasing age;
- Learning styles differ from person to person for different reasons at different times, with no one 'right' way of learning;
- Adults build new learnings on past experiences;
- Adults' personal, chronological and professional development impacts on their learning;
- Adults learn best when new learnings meet a need in their current situation;
- Adults control what they learn by consciously and unconsciously choosing what they want to learn and deciding how to use it;
- Adults are 'problem-centred' rather than 'subject-centred', learning best when able to apply new learnings;
- Adults learn best when 'respected as self-directed persons' and in non-threatening

> situations;
>
> - Adults learn best when they take responsibility for their own learning and actively collaborate with others in the learning process;
> - Adults require a period of reflection on their new learnings;
> - Adults are motivated to continue learning when learning goals achieved match their personal goals. (Butler, 1992, p. 1)

It is not uncommon for an article in a professional journal to describe 'PD that works'. Little (1995) has already made the point that the learning activities must be tailored specifically to the needs of those involved, and so there are no recipes for good professional development. On the other hand the literature can provide basic principles which should be met and these are summarised below.

Guidelines not explicit rules

Kalmon (1999) presents a set of guidelines after reviewing the literature on professional development in schools. These include:

> The clear consensus of research regarding professional development as well as educators' instincts argue for a process that combines professional respect with the fundamental principles of learning. Essential elements include continuous learning, a sense of control for the learners, collegiality in the learning process, active construction of knowledge, and contextual application of skills and knowledge.
>
> It's not difficult to see why these principles haven't been broadly implemented. They're expensive, and they require complex instructional design. Yet it's ironic that the educational system is unable to provide for teachers the learning opportunities we believe are essential for our students. (Kalmon, 1999)

These are translated to describe, for his situation, their principles for PD: school based activities: under teacher control; preferably over extended period of time, perhaps up to a year; using teams of say 3 to 5 people; including university faculty as co-workers; teachers remaining responsible for the topics and learning; using technology in context; and giving the team a focus by having them create some actual product (eg a curriculum activity, a learning tool or a project). He was not arguing that these will work in another school in the same way, just that they are an example of attempting to follow the principles above.

The consequences of an approach like this can include the growth of communities of practice, as well as richer more sustainable development. In this case the prospect of sustained ICT uptake would be the desirable consequence. A final possibility is that teachers will learn at multiple levels. He describes this as achieving 'both concrete

application of what one learns in daily practice and a larger sense of vision or purpose' (Kalmon, 1999, p. 106).

Little (1995) suggests that all professional development should be tested against certain broader principles if the PD was intended to 'stand up to the complexity' of the broader ideal of reform. These principles are:

> 1. Professional development offers meaningful intellectual, social and emotional engagement with ideas, with materials, and with colleagues both in and out of teaching.
> 2. Professional development takes explicit account of the contexts of teaching and the experience of teachers
> 3. Professional development offers support for informed dissent.
> 4. Professional development places classroom practice in the larger contexts of school practice and the educational careers of children.
> 5. Professional development prepares teachers (as well as students and their parents) to employ the techniques and perspectives of inquiry.
>
> The governance of professional development ensures bureaucratic restraint and a balance between the interests of individuals and the interests of institutions. (Little, 1995, pp. 153-155)

Little (1995) submits that these are ambitious and not always easily achieved (further, she agrees that principles 3 and 4 are more difficult to locate than any of the others). Nevertheless they provide guidance for designers and implementers of professional development activities who seek more than superficial change, and so they seem appropriate to keep in mind for this study.

Another view on broad principles is offered by Guskey (1995) who identifies a range of features characterising successful professional development including seeing change as both an individual as well as an organisational process, the need for group support, the need for continued follow-up, support and pressure, and the advisability of integrating different innovations so that they are mutually supportive.

Overall there is some commonality but no clear agreement in the literature on what constitutes guidelines for running successful professional development. The principles below are an attempt to synthesise key features from the guidelines mentioned above and target the particular challenges of ICT uptake and apprehensive teachers.

No doubt it will be easier to make a judgement after the event as to whether the particular professional development met the schools' and the teachers' needs. Although there are many simple ones which can be addressed relatively easily, the key features that this study will attempt to follow are that the participants are

encouraged to take both a broad view and a personal one as they design their activities and that teachers should perceive that there is much overlap between the themes of the study. These issues will be addressed in the summary section of this chapter.

2.3.6 Summary: The change process

The following points of guidance and suggestions for PD design and implementation are derived from the literature presented in this section. It has been made clear that there are no 'recipes' to follow in such a complex area as this, and there are no explicit guidelines to follow to guarantee a result (eg. Fullan, 1996; Gunter, 1995; Hamilton, 1994). Nevertheless it appears that the following characteristics of research on teachers and technology are of consequence:

Symbiotic relationship: Researchers report the stimulus and professional rejuvenation that comes from participating in curriculum renewal. In addition, it appears that collaborative activities and innovation adoption are complementary factors, and hence that increasing amounts of ICT usage may have some symbiotic interaction with pedagogical approach.

Everyone can progress: There is hopeful evidence that even those who did not actively choose to use technology can use it successfully, even if they will not attain the highest stages of a hierarchy of ICT uptake. Perhaps for them especially it seems likely that the process of reform may be eased when they focus on the use of technology in their teaching rather than directly trying to change their pedagogical style. The conclusion appears to be that the very use of ICT in the classroom can gradually lead to more constructivist classrooms, as indicated in Section 2.2.4. Using ICT may be hard for some teachers but it seems appropriate as a catalyst with potential multiple benefits including teacher change, classroom reformation and school improvement under the right conditions.

Critical value of collaboration: Collaboration has been represented as a factor of critical importance to buffer those undergoing change and to maximise the chance of sustaining changes for many teachers. It may be that technology encourages that collaboration, or that collaboration is the best vehicle to encourage technology adoption. Nevertheless, the reciprocal relationship between collaboration and technology is acknowledged.

Value of an Outcomes orientation: A specific local factor was important for this research, namely the pressure in Western Australian elementary schools to address the Student Outcomes Initiative, which is the DoE(WA)'s outcomes based education scheme. This could increase the pressure on teachers but also for many, their stress levels. At the same time some writers indicated that this may therefore reduce the window of learning opportunity when attempting to work with already stressed teachers. Because of its direct connection with learning this topic provides an opportunity to re-direct worried teachers away from the purely technical aspects of ICT uptake. Thus a sensitivity to this opportunity could be very useful.

Multi-level, consistent approach: The readings have highlighted the value of a simultaneous multiple focus on both individuals as well as their system, along with the value of consistent aspirations between the individual teachers and the infrastructure that supports them. In a similar way attempting to arrange the overlapping of PD activities so that for example an Outcomes activity is joined with an ICT one was recommended as a way to reduce stress pressures as well as cognitive loads as teachers learn new skills.

Flexible and non-dictatorial support for individuals: The school improvement literature (eg. Fullan & Hargreaves, 1992; 1996; Guskey, 1995; Little, 1995) emphasises the need for supportive and shared leadership structures, for flexibility, the willingness to accept uncertainty, and the value of placing reculturing before restructuring, that is focussing not on changing formal structures but on first supporting changed behaviours of successful groups or subsets within a school.

These issues will therefore be considered in the creation of a supportive environment and the design of appropriate professional development for elementary school teachers willing to become involved in ICT uptake in their school.

2.4 Review: Technology, teachers, schools and change

2.4.1 Overall Summary and Conclusions from the literature review

The literature has been reviewed in three parts, introducing topics of ICT within society; ICT, schools and learning and their challenges; and the prospects of teachers and schools adapting to change.

Each of these topics has been shown in the reviewed literature to be multifaceted, and often to be riddled with conflicting pressures. Each discourse represented a dilemma which was considered in the course of the literature. Potentially the variety of thoughts, results and reviews dealt with in each section may make it harder to design appropriate professional development for teachers, but as well will provide some scope to cater for the variety of views and encourage teacher participants to acknowledge the breadth of realities in their lives, and practice 'informed dissent'.

Each of these dilemmas, taken from the introduction to each section, will now be addressed in order to prepare for the delineation of a conceptual framework in the close of the chapter.

Dilemma 1: How will the stability of schools be resolved against the relentlessness of technological change?

Dilemma 2: Should schools be seeking proofing against teachers or renewal with them?

Dilemma 3: Are there simple, achievable solutions or are schools of such complexity that there are no solutions that work in all circumstances?

These dilemmas are all-pervasive issues that teachers are aware of at all times, even though they are often left unspoken. For example many teachers are aware of the largely unchanged nature of the average classroom, even if they think that they have changed themselves. Even jovial comments about computers replacing teachers still draw agreement, and perhaps a rolling of the eyes from many teachers, suggesting that such issues may not be as far from their thoughts as one might expect. Thus their resolution will provide some guidance in the design and structure of appropriate PD for teachers in ICT uptake.

Dilemma 1: The stability of schools vs. the relentlessness of technological change

There appears to be more pressure on teachers than ever before to change. Not everyone agrees exactly on what the changes ought to be, but there was enough agreement that four coherent apologist groups could be identified, all with goals about reforming, reculturing or restructuring schools. Furthermore, there was enough evidence to indicate that teachers are starting to make use of ICT, that it was not difficult to conclude that the immovable object of schools may be now well enough

understood for the irresistible force of ICT to be increasingly likely to succeed. Perhaps, however, it will need to be directed towards the humans involved rather than regarding them as objects in a metaphoric or semantic tug-of-war.

There is no doubt that the process will not occur overnight, and there will be some costs, for example teachers' stress levels are unlikely to decrease. Any professional development on ICT uptake will need to consider the all pressures on the teachers involved, both at work and away from it, personally and professionally. Individualised rather than standardised treatment appears the justified course of action. After all the pressure to change may be relentless, but the ability of teachers and schools to resist has proved profound. Calls for minimum standards in teacher development and generic ICT competencies are therefore approaches which seem doomed to fail unless they take an extremely long view. Probably few governments and proponents of such change have such stamina (McLaughlin, 1990).

Dilemma 2: Teachers—proofing or renewal?

Different schools of thought have different proposals about the best way forward, but there was some confidence that teacher renewal through the contributions that ICT can make has potential. Despite the importance of teacher qualifications and standards, these can be regarded not as in conflict with but as orthogonal issues to the larger issue of encouraging more student-centred learning approaches. Contemporary learning approaches that emphasise knowledge construction rather than instruction are relevant not only for student interactions but also for teacher interactions.

Where there is a conflict with teacher standards then teachers—and their Principals—will be asked to leave them aside temporarily on the grounds that stress-reduction is more useful at a time when they are already working on topics which are important and correspond to DoE(WA) priorities.

Collaboration has been highlighted often as a factor which can contribute in multiple fashions; and an outcomes orientation was shown to be a useful focus for teachers attempting some pedagogical change. An outcomes orientation had secondary power also because of its special place in WA schools thanks to the recent imperative to introduce the DoE(WA)'s Student Outcomes Initiative. Although this is potentially a stressful time for teachers, the overlap between this research and the expectations on

teachers about Outcomes may appear to be a stress-reducing activity rather than a more stressful one, and this idea could be emphasised when introducing the program.

Dilemma 3: Multifaceted complexity – are there no solutions?

There is evidence that previous attempts at school and teacher change have totally underestimated or mismanaged the complexity of the challenge. We now believe that the dynamic complexity of schools prohibits any simple recipes working in any but the most contrived situations. For this research, a number of principles stand out. These are: Senge's (1990) work on systems thinking, and the need to be multi-faceted and flexible; Newmann & Wehlage's support (1995) for the 'Communities of Practice' principles which can provide a critical focus and powerful support for teachers; the ACOT research which highlighted instructional and collegial development over time, and Fullan and Hargreaves' work (including Fullan, 1990, 1993a, 1996; Fullan & Hargreaves, 1992) on teacher and school development, especially the need to be flexible, adaptable, to be trust-building and to take a longer view to retain one's perspective.

All of these can be interpreted as supporting a broad-brush, comprehensive framework for using technology as a double-edged sword to address change in schools, particularly as a tool for constructivist change. No-one is suggesting that it will be easy, partly because of the chronic underestimation of effort needed over the years which has generated cynicism across experienced teacher groups, and partly because the school system is so large that the constant movement within it is often confused for change outside it.

It seems that there are no simple solutions or recipes, only broad principles, which tend to need careful and flexible application to specific settings. Principles need to be adapted to suit the people, the pressures and their needs, as a way to fine-tune the planning process, which must remain dynamic and flexible. For example the concept of consistency across a school group should be balanced against the likelihood of progress. If a sub-group of teachers can offer a consistent team-like environment, then that sub-group may make more progress and generate more 'value' than expending effort on the larger set with much more inertia. This set could still provide the stimulus for the next round of development by the whole group, too.

2.4.2 Fine-tuning the research topic

In the context of this study it was decided that Fullan's change model on school reculturing (Figure 2-1) could become the basis for a slightly different change model which considered ICT uptake. Fullan (1998) argues for reculturing in a school using

(i) Professional learning communities,

(ii) Student assessment and

(iii) Pedagogy.

This study was interested in ICT uptake for teachers. Its setting was Western Australia and there were local activities going on which could help this research if they were able to be integrated usefully. The Curriculum Framework initiative seemed particularly fruitful as an option, given its focus on students and their learning. It was decided that at the teacher level there was some equivalence with the topics of (i) Collaboration, (ii) an Outcomes orientation, and (iii) ICT as a learning tool. This model was a reminder that such changes would need to be school-wide and broadly integrated into the school culture to achieve success.

As an exercise it is useful to show the match between these topics using this model of change as a start point. There were some minor changes needed, and these are elaborated in table form below. The three Fullan topics (listed in) are recast across the columns from left to right towards topics that are arguably as plausible but allow a more technological as well as a greater 'micro' orientation.

Table 2.9: Deriving a research topic based on Fullan's (1998) model of school reculturing

Fullan's Reculturing model topics with no obvious ICT connection	**Comments about the ICT connection with learning and change**	**Recast topics for this study with a more obvious ICT orientation**
Pedagogy	First, change in pedagogy was connected with ICT usage, according to the ACOT research. Second, contemporary styles of learning often address the issues Collaboration and Outcomes. Third, ICT will equally serve as an input and an output, rather like pedagogy does in a school…	ICT
Professional learning communities	Building the professional learning community in a school requires support, collaboration and planning. This suggests that people working together is critical. A major component of such communities is the ability to collaborate…	Collaboration
Student assessment	Student assessment is intimately related to students' outcomes. Since the whole area of students' outcomes performance is a focus of the Western Australian State Government Department of Education's (DoE WA) recently initiated multi-year Student Outcomes Initiative called Curriculum Framework (Western Australia Curriculum Council, 1998a), then this very topic would be highly relevant to teachers in schools in WA, even though it does NOT have any special ICT significance, on the surface.	Outcomes

All these factors suggest that a joint attack on the two activities of student outcomes and ICT uptake could be addressed with the support of collaborative learning teams, and hence possibly achieve some useful change in a school, not just for the individuals but for the whole school. Thus in one sense this model came to represent the researcher's study.

A final concern for researchers on school improvement is the need to move beyond a 'deficit' model of teacher training to a more developmental model (eg. Guskey & Huberman, 1995). After all, Richardson & Anders (1994) argue 'that teachers are not recalcitrant but change all the time' (p.159). A better rationale for teacher change was not a training-for-deficits model but a collaborative research model (Richardson & Anders, 1994), with a rich, multi-method design, using and reviewing research and collaboratively structured (p. 165-167).

Hence the issues of collaboration and outcomes orientation were identified as particularly relevant for a PD-based initiative occurring in Western Australia at this time, for two reasons. Firstly the increased emphasis on collaborating is one of the consequences of a more student-centred style of working (eg, Yocam, 2000). As well as attempting collegial relations with peers, sharing the learning with one's students was a natural consequence as well, he argues. Secondly for the teachers in this research in Western Australia, where the recent DoE(WA) Student Outcomes Initiative was demanding attention, a concern with students' educational outcomes was doubly appropriate and easily justified.

2.4.3 A Professional Development Model for Teacher Renewal

What would the design of some optimal professional development using these principles look like? Since general principles, like those presented above, are guidelines rather than specific steps, they tend not to say exactly what a program should look like, or even how it should be designed, but what to avoid, and ways of working once a specific method has been chosen. They are now applied to the concept of constructing some appropriate professional development model for staff at schools who express interest in ICT uptake and will meet the criteria for selection.

Foreground and background ideals

In this case a total of nine principles or ideals are identified which are arguably highly relevant to the principle of professional development in ICT uptake for elementary school teachers. In general some of them are more obvious deductions from the general principles surfaced in the literature scan, and others are more specific to the actual program needing to be implemented. In other words there are some 'background' ideals that are not directly relevant to the planned program, but without which the program would have little chance of success, according to the literature already reviewed. Secondly there are 'foreground' ideals, namely ones which direct the course of the program or professional development activity, perhaps less connected but hopefully consistent with the overarching tenets already identified in the preceding literature scan. The background ideals could be regarded as independent of the specific program being planned, in that they represent important general principles that could apply to many such programs. On the other hand

foreground ideals are totally dependent upon the actual program being run, and are tailored accordingly.

There are four background ideals identified here namely

that such programs ought to be school-based,

that they require a significant, preferably whole-school, commitment,

that they embody easily comprehendible major aims, so that the project can be summarised in a few words or diagrams, and

that such programs possess sufficient ICT to support a 'critical mass' of willing ICT users.

The foreground ideals identified here are tailored to meet a little more specifically the needs of a professional development program for teachers interested in ICT uptake in Western Australian elementary schools. The ideals are:

that their PD is presented as a journey to be enjoyed rather than an endpoint to be reached,

that they should work to reduce not increase the pressures on themselves,

that they will need to adopt a multi-levelled approach to their own development,

that they seek and build support through collaborative activities and

that they focus on developmental learning principles before anything else.

All the principles are detailed below. Principles 1 to 4 are background principles, and 5 to 9 are foreground ones.

1 School-based:

Rather than relying on withdrawal activities and isolation from their day-to-day environment, the evidence supports the value of PD which is integrated into the school structure. Although there are no absolutes, there are few dissenters to this principle (for example Shelton & Jones, (1996) argue it should be off-site) and a number of supporters (for example Butler, 1992; Centre for Educational Research and Innovation, 1998; Guskey, 1995; Tytler et al., 1999)

2 Whole school commitment:

Many writers pointed out the self-evident fact that the more a whole school regarded an initiative as important, the greater was its chance of success (for example Brand, 1997; Centre for Educational Research and Innovation, 1998; Little, 1995). Thus consistency and breadth of support for a project is identified including from principals and fellow colleagues. If the whole school is not committed, then at least a significant sub-set of staff would be needed to provide a self-sustaining support group, and ensure that the activity has sufficient priority that it will not be bulldozed by another activity supported by other sections of the school. After all many schools often took on significant changes for effectively expedient reasons, and adapted them to suit their own particular settings (McLaughlin, 1990). An important corollary is that the project's value must be made evident to the teachers involved, to encourage and engender the ongoing commitment necessary.

3 Base it on simple major aims:

Teachers are busy people and any new project has to be quickly comprehensible and easily introduced, even if it has much complexity within it. Only this way will they rapidly be able to identify its relevance and importance for themselves. One way to ensure this is to present it visually. When introducing change, writers like Fullan (1998), Hargreaves (1994) and Sandholtz et al. (1997) have chosen to utilise relatively unsophisticated visual models to explain simple but powerful ideas—consider Figure 2-1, and Figure 2-3, which could admittedly be criticised as platitudinous. In particular an optimal program might chose simple visual representations of the major principles. For example the principles could express the notions of journey:

'Where are we going?'

'How will we get there?' and

'How will we know when we are there?'

The answers to these three questions would explain the journey inherent in such a project. It might be that a few simple diagrams explain the overall purpose of the program, or some diagrams and a list of principles might suffice.

4 Sufficient technology:

There should be enough technology to ensure that lack of ICT is not the problem. Sheingold & Hadley (1993) referred to the need for a critical mass of ICT in a school, and a critical mass of ICT-using teachers as a result. It would not be until this critical mass was assembled that they would provide the 'fuel' for the rest of the school to recognise the value of ICT and start considering its use themselves. Although few other writers mention it, without some minimum level of ICT with which to implement their plans, observers could otherwise argue that any shortcomings would be due to a lack of sufficient ICT which would undermine their efforts.

5 Acknowledge the journey

The uptake of ICT is a long and slow process for some people, and the principle like the 'extended conversation' (Yocam, 2000) takes a more realistic approach than attempting to compress PD into single sessions or one-off activities. The idea of PD as a journey fits well with many of the principles mentioned including the long-term nature, the participative ideas and the extended conversation concept (eg. Kalmon, 1999; Little, 1995). By making the journey more important than the endpoint, it may be possible for nervous teachers to relax and participate rather than feel there is some huge but distant goal which is so far away as to feel unachievable. This also encourages reflection along the way, rather than any suspension of judgement until the end, which will encourage the setting of smaller more achievable goals and more sharing of progress opportunities (Brand, 1997). Because of the importance of reflection they should be encouraged to use a reflective journal on a regular basis to record and reflect on their progress; ask students to provide feedback and ideas; visit other team members' classes and reflect on what they are doing and whether others could use or adapt these ideas, and so on.

6 Plan for stress reduction:

It seems relevant to address the pressures teachers find themselves under including lack of time (Hammond, 1999; Raywid, 1993). The principles embodied in the three circles could contribute as a stress-reduction technique. In other words teachers should be encouraged to drop less important or peripheral activities that are not focussed on outcomes and learning, teaming and collaboration or ICT. They could

integrate some existing activities; defer all extra school activities on the grounds that this is important PD; or find ways to combine activities to meet these requirements (Brand, 1997).

7 Multi level approach:

In the same way the teachers are multi-faceted human beings so any training they do should take a multi-faceted approach. The project will need to address issues in multiple ways and at many levels. For example it will need to be flexible and support variety, dissent and complexity as well as support simplification when appropriate. It will clearly not work as a single one-off PD activity but would be better as a series of activities over an extended period (Tytler et al., 1999). The idea of 'an extended conversation' (Yocam, 2000) seems more appropriate, but may not be sufficient alone.

Another perspective will be the need to encourage breadth—the old conservationist saw of 'think global, act local' seems a relevant approach for teachers whose need to learn to simplify is matched simultaneously by a need to consider the complexities in their own professional development.

8 Share, support and collaborate with their communities:

Collaboration has been shown to have both an emotional support and a learning support role (for example Barth & Guest, 1990; Bosworth & Hamilton, 1994; Jackson, 1999; Snodgrass & Bevevino, 2000), and both these roles should be encouraged. Teachers could meet regularly in collaborative teams, preferably daily or weekly, to plan activities, gauge progress and generally maintain interest as well as support each other's efforts and review previous activities. They could be encouraged to support each other and attempt to establish broad-based support systems at local, neighbourhood, school and system level (for example Fullan, 1999; Gerlach, 1994). Other collaborative activities include joining a good Listserver on the Internet; and encouraging the Principal to take some interest in their work and attend some of their meetings if appropriate.

9 Consider developmental learning principles:

Professional development with ICT may represent a major change for many teachers; they are being asked to consider becoming more constructivist in their ways of

working with students, as well as their ways of thinking about ICT and the fact that one is connected with the other. These changes are non-trivial and are best implemented—predictably—in an environment using the same constructivist principles of learning, carefully adapted to suit adults (Knowles et al., 1998). Effectively they should consider learning and assessment issues first because cognitive change is arguably more valuable than ICT skills alone (for example McLoughlin & Oliver, 1998) and otherwise less important issues will steal precious time from their plans. This issue of developmental learning was a critical underpinning of the Outcomes Initiative currently topical in Western Australian schools.

In summary a total of nine overarching principles or ideals are proposed as important and valuable for the style of professional development activities relevant in this research. These principles or ideals should be honoured in any PD which is concerned with ICT uptake in elementary schools in WA at the time of this research.

2.5 A design for appropriate PD

A model suitable for coordinating the professional development of teachers around the issue of ICT uptake is proposed. It is based on the nine principles proposed in the previous section, and will emphasise the concept of professional development as a journey. It will attempt to be multi-level and many-faceted in its design. Finally a suggested list of guidelines is proposed which will be offered to the teachers who participate as a body of guiding principles to support them on their journey.

2.5.1 Professional development as a journey

The journey metaphor can be interpreted as supporting a focus on process (the gradual development towards some endpoint) rather than product (the endpoint alone). Presuming a journey can be summarised by the answer to the three questions mentioned above, namely: Where are we going, How will we get there, and How will we know when we are there? Then these answers are worth elaborating. The first question, 'Where are we going?' suggests a direction or purpose and this is addressed by reference to the developmental steps of the ACOT progression. Their steps are Entry, Adoption, Adaptation, Appropriation and Invention with ICT. This presents

easily in a visual way as Figure 2-5 and is likely to be an instantly comprehendible and appealing representation for many teachers.

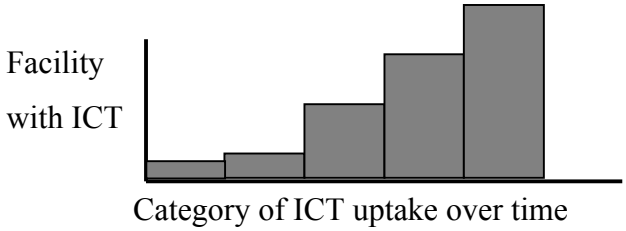


Figure 2-5: Implied journey via progression in instructional stage from ACOT taxonomy

Although it is simply the list of the ACOT hierarchy as a figure, it also can be representative of a journey, and its shape strongly implies improvement over time.

In a similar way 'How will we get there?' introduces a methodology and this is easily addressed with a second diagram in this case a modified version of the key principles of the ACOT research. Sandholtz et al. (1997), propose three overlapping circles to indicate the joint nature of the factors, which are shown below as Figure 2-7.

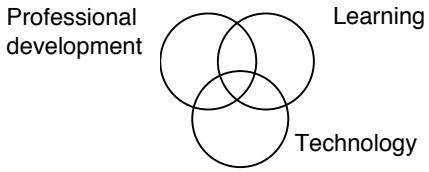


Figure 2-7: A summary of the key principles of the ACOT research, proposed as an answer to the question 'How will we get there?' for this study.

The third question, 'How will we know when we are there?' is a reference to assessment. The evaluation of progress is perhaps best undertaken by a combination of factors. By having participants maintain a reflective journal they will be able to determine their own progress through reviewing their own words and images. Also by working in teams it is expected that they would often find that topics like their development crop up in discussions; and the researcher will take the opportunity to remind participants of their improvements whenever the opportunity arises. At the same time they will be reminded that their progress is part of a long journey and so the idea will not be to wait for endpoints but to highlight and celebrate all progress along the way.

2.5.2 Multi-level, flexible approach

This research plans to reformulate the three key processes of Figure 2-7 to address both personal, or micro level, and school, or macro level, change and development. This is chosen as a simple and memorable focus for teachers being introduced to the project's aims. A micro interpretation might use different phrases from the macro version of the model. For example the macro words: Professional development, Learning and Technology , will be re-cast at a micro or classroom level as Teaming, Outcomes and ICT (as in Figure 2-9). For comparison these are grouped into a table—Table 2.10—to illustrate the two different levels.

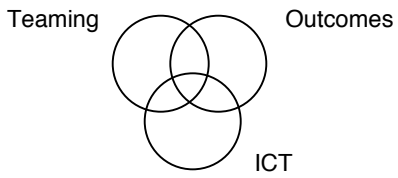


Figure 2-9: Micro level methodology for this study's intervention

For this study the methodology was conceived of as having three parts, namely a method, a focus and a tool. These are the headings of the table, Table 2.10.

Table 2.10: Macro and Micro versions of the journey principles

Level of approach	Method	Focus of effort	Tool to help
Macro (from ACOT)	Professional development	Learning	Technology
Micro approach	Teaming	Outcomes	ICT

Although both the figures suffer obvious weaknesses like over-simplification, they are intended to be easily comprehended and in their favour they are relatively rich in their explanatory power. It will be important not to let teachers confuse these visual summaries with rules and guarantees, which they are clearly not intended to be.

The three circles diagram represents a snapshot. Effectively they are a short-term view and are not indicative of long-term change. Longer-term development is associated with the typology of instructional 'maturation' eg. like Figure 2-5 Whether higher is better, or even how one moves between the categories is ignored by such a diagram, but its simplicity and parallel with the taxonomy is offered as justification, as well as the equally memorable ladder-like progression for participating teachers and schools.

The approach chosen for this project will be to utilise the three factors thus: (i) encourage *teams* with their associated collaborative values to (ii) design student learning activities which are *outcomes oriented* and technology-based, and (iii) to *use ICT tools* as the vehicle. All three facets are intended to therefore aid ICT uptake. The eventual outcomes (beyond the aims of this project) may well include teacher renewal and classroom and school improvement. This model is intended to be broadly consistent with the systemic awarenesses from Sections I and III, and issues as well as constructivist learning principles, presented in Section II.

2.5.3 Summary of key features and guidelines for teachers

Here is a summary of key features that this program will recommend that individual teachers attend to, which is concerned with professional development and improving their ICT uptake. It will consist of a purpose, a method and some guidelines.

The purpose will be to 'climb' a developmental ladder like the ACOT sequence given in Figure 2-5.

The method will be described as a three-spoked approach considering Teaming, Outcomes and ICT as represented by Figure 2-9.

A series of guidelines (reduced from the nine principles identified earlier), which they will be exhorted to adapt to suit their own needs.

The purpose and the method are both easily represented diagrammatically. This will be useful to provide both a long term and a short term focus by changing the headings to either macro (Figure 2-7) or micro (Figure 2-9) topics as described in Table 2.10.

Guidelines

Since explicit rules would contravene one of the key doctrines uncovered in the literature, teachers will be encouraged to read, reflect on and identify their own suggestions like those below. These seven points are a modified version of the foreground principles presented in the last section. Participants will be expected eventually to refine their own key principles.

Enjoy the journey:

celebrate progress

allow time to reflect

keep moving

make it fun

allow time for the view to change

Plan for stress reduction:

seek congruence

simplify - avoid anarchy but not chaos

share the anxiety, pressure and stress

Address learning and assessment issues first:

- choose outcomes you can identify with
- use only enough technology to meet the need
- don't let the volume of lesser issues block your target
- keep ICT in its place

Aim high but start small and local:

- address global and local issues together
- a simultaneous concern with both 'levels' is proper
- juggle the big picture with the 'noise'

Embrace complexity AND simplicity:

- You need to stay multi-faceted
- Try not to lose focus when something trivial occurs
- look for powerful, elegant, simple models to follow

Collaborate with your communities:

- build understandings by sharing problems and successes
- embrace conflict, diversity and resistance as 'normal'
- remember strength in numbers—promote your work
- look for fellow travellers to share parts of the journey

These six principles are consistent with and supportive of the literature on teacher professional development which takes a developmental rather than a deficit approach. Also consistent is the principle that teachers need to consider both their personal and professional lives, and so this should be mentioned as support for their own development. A final principle suggesting that they make sure they include others in their development is regarded as critical to the self-determination of any participant.

- Find time for someone else in your plans…

is an acknowledgement of this seventh principle.

2.6 Summary

The previous section described characteristics for a model for professional teacher development supporting elementary teachers in WA interested in ICT uptake. It is proposed that the version elaborated in this section is a fair implementation of the principles deduced from the literature reviewed in the previous sections. To honour the 'only guidelines' principle, teachers who join the study should be invited to further translate them into personalised working principles. As they stand these principles could be used to create some examples of teacher activities as well as ideas for classroom practice. Such a list ought to be developed to provide a model for case study participants. A printed copy of the written examples and ideas will be included in Appendix 4.

In summary this chapter has documented an effective professional development model for ICT uptake by elementary school teachers in WA. The development was based on literature from areas bounded by technology, schools, teachers and change.

The resulting model should be appropriate to support teachers seeking to implement the use of ICT in their classrooms in a sustained way.

The next chapter will introduce the research questions and document the plan to test the robustness and effectiveness of the model and its capacity to meet its aims.

CHAPTER THREE

METHODOLOGY

Introduction

The purpose of this research study was to explore a professional development framework for ICT uptake. Chapter 2 introduced a model for a PD format which was planned to be effective with teachers in primary schools in Western Australia in the current educational context. This chapter aims to show that the framework developed was indeed implemented in this research, which will allow the testing of that model in action with a specific group of teachers.

This chapter describes the methodology and associated research context of this study. It also introduces the research questions and elaborates the data collection and data analysis techniques before concluding with discussion on considerations about the trustworthiness of the data and some ethical issues.

3.1 Research questions

As stated in Chapter 1 the research aim driving this project was:

- To investigate a professional development model which integrated with current educational needs to address the ICT uptake of elementary school teachers.

The research sought to develop, describe and evaluate the implementation of an ICT uptake model. In particular it was designed to test in classrooms the effectiveness of the model of teacher uptake of ICT developed in the previous chapter. The ultimate purpose was to help identify approaches that could improve that uptake for individual elementary school teachers and from this, general research questions were derived. In Chapter 2 the literature identified the factors of collaboration and an outcomes orientation as useful. The first was a powerful support tool, and the second was a fortuitous local event worth capitalizing upon. As a result the three general questions identified for this research were:

- RQ.1: How does collaborative activity support teachers' ICT uptake?

- RQ.2: How does an outcomes orientation support teachers' ICT uptake?
- RQ.3: What typology of ICT uptake effectively discloses teachers' attitudes, understandings and behaviours?

These flag the research's interest in the roles of collaboration and an outcomes orientation as elements of the ICT uptake process. As the methodology was elaborated each question was converted into a series of more detailed and answerable questions which are presented in a following section.

3.2 Rationale for the research methodology

3.2.1 Choosing a paradigm

Research paradigms are the hidden assumptions that researchers use when they begin to comprehend, analyse and present the significance of their data. Traditionally the trade-off was between quantitative and qualitative paradigms, but increasingly the distinctions between the paradigms are becoming blurred and arguably less of an issue (Denzin & Lincoln, 2000). Ultimately the purpose of any methodological paradigm is to adequately address the research questions, and a quote from Homan, in Miles & Huberman's sourcebook, seemed apropos: 'People who write about methodology often forget that it is a matter of strategy, not of morals' (Miles & Huberman, 1994. p. 2).

In this case the focus was to be on individual teachers and their adaptations and reactions to the influx of ICT in their classes and its impact upon their teaching and learning approaches. A trade-off was sought between research questions that were too open-ended, and those that imposed too much pattern on possible relationships just because it would speed the process of, for example, data saturation—in other words the point where the rate of extra contributory data has dropped away as more cases were added to the sample (Morse, 2000).

It was evident that 'rich' description (Patton, 1990) of teachers' uptake of ICT in schools and the opportunity to uncover meanings and causation were valuable aspects of the research. Since the methodology chosen to investigate any research should be guided by the research purpose, a qualitative approach set in a naturalistic paradigm was therefore deemed appropriate. Traditionally educational research is

strongly oriented towards numerically-oriented analytic methodologies, and so many of the qualitative and action research methodologies use quantitative principles for their springboard. Nevertheless there were significant strengths that a qualitative approach brought to research such as this. According to Miles & Huberman (1994) they include:

> 'the ability to focus on naturally occurring ordinary events in natural settings' rather than imposed, pre-determined questions;
>
> the fact that data are collected within an environment, close to a specific situation, so they possess 'local groundedness';
>
> the propensity for 'richness and holism', in other words to uncover context and complexity whose realism can have impact on the reader;
>
> the ability to improve on simple snapshots with the 'sustained period' of collection, which can even permit the imputation of causality;
>
> the 'inherent flexibility' which allows a researcher to adjust data collection as a project progresses, and hence allow greater confidence that understanding has been achieved; and
>
> the ability to uncover the 'meanings people place on events, processes and structures in their lives' because of its emphasis on the lived experience. (Miles & Huberman, 1994, p. 14)

These strengths were relevant to a study looking at the effects and consequences of collaboration and the effects and consequences of an outcomes orientation on the ICT uptake of classroom teachers. Hence the preferred research methodology for this study was qualitiative in character, using rich narrative descritption for the cases and cross-case analysis to compare them.

There is no reason to choose one paradigm exclusively if there is value in allowing an overlap since they need not be exclusive choices. In fact, if the quality of description can be improved, or if confirmatory evidence can be added by including more quantitative measures into qualitative research, then one should not be afraid to do so (Miles & Huberman, 1994). In this study aspects of action research are clearly evident and some quantitative summaries are also used. Thus the research paradigm is described as mixed mode.

3.2.2 Data processes

In qualitative research, Wolcott (1994) distinguishes three major steps or processes. These are a descriptive phase, describing what is happening, including using the participants' own words; an analysis phase, showing the relationships and how things

are working; and an interpretation phase, providing sense and meaning to everything, and showing a purpose for it all. Although all three processes are needed in any study, their proportions depend upon the needs of the study. The challenge for a qualitative researcher is to use the richness of 'their' data to find coherence and pattern, and at the same time be able to show how the gaps, weaknesses and contradictions that are integral to real data, still contribute to these explanations.

In this study all three processes were important. Appropriate data collection methods allow rich description of the people, the setting in which they work and the processes at work around them. Clear analysis methods substantiate unmistakable and justifiable conclusions, and support credible interpretations of meaning derived from these data.

Miles & Huberman (1994) point out the value of descriptive techniques which contribute to data reduction and data display. Even though these stages may be considered pre-analytic phases of research, they argue that the process of deciding which data to display and how to display them are in fact analytic choices. Such decisions can help contribute to making a clearer picture of the story the researcher is trying to tell. Data displays help to compress, organise and assemble data which is inherently voluminous or bulky, which in turn helps the reader understand the data better and draw meanings and conclusions from it. The broad use of displays in this thesis, including both descriptive and summary tables, was an acknowledgement of the value of these techniques in qualitative research, and an attempt to provide visual guideposts for the reader.

How these processes were enacted in this study is detailed in the next sections.

3.3 Framing the research context

3.3.1 Overview – when and where research occurred

This research was conducted through the second semester of the 1999 academic year, which in Australian schools runs from July to December. The case schools were elementary schools located in the same educational district in the Perth metropolitan area of Western Australia.

3.3.2 Plan of the study

The study used a largely qualitative approach to examine cases of schools and teachers adopting learning technology in their classes. The researcher was a participant observer in research across two schools and their teachers. The form of the research was two case studies and a cross-case analysis between those two schools. Some quantitative data were collected, namely responses to short questionnaires and an 'Experience of Change' instrument (Ainscow, Hargreaves, & Hopkins, 1995); the qualitative data were semi-structured interviews, e-mailed and personal observations by the participants and interested observers, records of conversations with the researcher, printed materials from the two schools and occasional publications and bulletins from their District Office.

For reasons of ethics, all identifying names and a variety of details, from the schools' structures and locations to the classes in which teachers taught, have been changed to protect anonymity, whilst at the same time attempting to preserve the overall nature and characteristics of the relationships and groups involved.

3.3.3 Sample

Sampling issues in qualitative research are quite different from those of quantitative research, since the sample is intended to provide information rich cases, rather than simply representative ones. Under such circumstances only a small number of cases may be required. Sandelowski (1995) advises that too many participants can interfere with the case oriented thrust of the research, when the aim was maximising understanding rather than measuring variables. On the other hand there should be sufficient cases to allow saturation, and the opportunity to extend the sampling if appropriate should also be there. Morse (2000) points out that four factors affect the final determination of sample size, namely the scope of the study, the nature of the topic, the quality of the data and the study design. Ultimately she concluded that the broader the scope of the research, the longer it would take to reach saturation.

Case studies and phenomenological studies can vary from a single case to tens or even hundreds of cases (Stake, 1998), and similarly the principles of saturation vary too. The important issue is that the researcher is able to observe that enough data was collected to produce consistent, reliable evidence, with variations and dissonant data contributing usefully to the analysis. Cases in this research were selected on the basis

that they were fair and reasonable examples of schools and staff in one Educational District, without any special problems that would make them harder to see patterns in. To identify suitable potential schools, guidance was sought from a number of sources, including knowledgeable staff in Department of Education (DoE) Central Office and Education lecturers at two Western Australian universities. Schools were sought in a single district so they would not have dissimilar support structures that would provide unnecessary variability. Patton (1990) calls this approach alone, Homogeneous Sampling; but there was another facet to the sampling. Schools and their teachers were required to have significant access to ICT or the issue of access would override the important challenges of addressing ICT uptake. There was no point in considering either schools without a 'critical mass' of ICT in the school (Sheingold, 1991) or schools where the teachers were not encouraged to support the project.

Therefore, schools were selected for their estimated ability to address this technology-based project, based on two relatively arbitrary criteria set by the researcher. These were that (i) at least 50% of the classes' teachers should be willing to participate, and (ii) each participating teacher should have access to at least three computers on a regular basis. The purpose was to ensure that lack of ICT facilities could not be described as a major problem, and the researcher could be assured that a lack of ICT availability was not a significant determinant of the potential results. Patton (1990) describes this as Criterion Sampling. Thus a combination of techniques was used in order to identify appropriate schools, and reduce and simplify potential extraneous problems, which the review of the literature had highlighted.

After speaking to nearly a dozen elementary school principals and receiving some invitations from individual teachers to visit their schools, presentations were made to three schools in May and June 1999, in order to recruit participants. Sufficient staff from two of the schools then committed themselves so that two schools met the criteria. The two selected schools—called, for the purpose of this study, Regis Street and North Waygo Primary Schools—both reached the initial project threshold criteria, as indicated in the summary at Table 3.2.

3.3.4 The participating schools

Both Regis St Primary School (hereafter abbreviated to RS) and North Waygo Primary School (NW) were publicly funded metropolitan schools in the Fremantle Education District. This is one of eighteen education districts in the state of Western Australia in the state's Department of Education, DoE (WA). Both RS and NW were relatively small elementary schools with 7 and 10 classrooms of students respectively covering grades 1 to 7, although RS also had a Pre-Primary class for 5 year olds as well, giving it 8 full-time equivalent class teachers.

Their statistics were that RS had nearly 200 pupils which was enough for eight classes, and employed a total of 22 staff. A number were part-time positions, so they worked the equivalent of 18.0 FTEs. At NW they had almost 300 pupils which was enough for ten classes, and they employed a total of 31 staff. This corresponded to 22.8 FTEs. Both had, according to the DoE website, less than 1% aboriginal children or children with disabilities.

Both schools were built post-war, although RS was much older. Both had relatively stable staff populations, which is reasonably predictable in a major central metropolitan area with few new housing developments nearby. These factors were desirable so that the case studies were not too dissimilar, and to minimise the prospects of unusual factors reducing the opportunity to make appropriate analytic generalisations (Miles & Huberman, 1994, p. 28).

An important background and potential support for the study were two concurrent State Government initiatives. The first was the re-structuring of the curriculum with a focus on student outcomes called the *Curriculum Framework*. The second was to provide a $100 million funding boost for ICT in schools over four years. The study began in the first implementation year of this four-year stimulus, whose aim was to provide a ratio of 1 computer per 10 elementary pupils and 1:5 in secondary schools. This would put some pressure on schools that had very little infrastructure, and provide useful support to those schools that were making progress towards these benchmarks.

Both schools already had some computers installed and being used (see Table 3.1), but they had taken different approaches to the providing of resources and their support staffing structures. Firstly RS had a history of avoiding labs of computers

and giving them to staff in their classrooms. Secondly the Principal at RS was keen to support ICT and took the ICT support role personally. At NW, they had installed a lab of computers two years earlier; and the Principal had appointed the current ICT coordinator at the same time, partly in acknowledgement of his own perceived lack of ICT skills. She had then persuaded the staff that a part time support person was also needed for when they each brought their classes to use the new lab.

Subsequent events (at RS two withdrawals, at NW one withdrawal, two staff going on long service leave) meant that eight of the teachers and support staff in RS and six at NW participated to the end. This corresponded to 64% and 37% respectively of the full time teaching staff. Although North Waygo Elementary School had fewer teachers participating in the research (down from an initial 50% to 37% of the teaching FTEs), there was already a significant focus at that school on the teaching using the Student Outcomes Initiative, arguably more than at Regis Street. For example the ICT coordinator—who already chaired a large ICT committee—had encouraged the establishment of a Teaching and Learning Committee, and nearly all the IT committee at the school were regular participants. This activity was strongly supported by their Acting Principal, who had recently been active on both committees as a Year 7 teacher. Also, the ICT coordinator felt that the topic of this research was already sufficiently supported across the school and there was little doubt in her mind that the lower head count was not a significant issue. It was decided to persevere with the two schools as case studies, and indeed subsequent results did confirm that her observation was well founded.

Table 3.1 is a summary matrix of the case participants—that is teachers, leadership and support staff—who were incorporated in this study, as well as the ICT resources that were available.

Table 3.1:Summary descriptive matrix of the case participants and ICT resources available, by school, indicating their match to the selection criteria

	Regis Street	**North Waygo**
Individual classes	7 classes (called a single stream school, one class for each grade from 1 to 7), as well as a Pre-Primary (5 year olds) class.	10 classes, from Grades 1 to 7, with a number of 'split grade' classes.
Minimum planned criteria	4 class teachers plus any support staff (50% of 8)	5 class teachers plus any support staff (50% of 10)
Initial teacher commitment	8 teachers + 2 support staff	7 teachers + 1 support staff, which included the ICT coordinator who was already one of the class teachers.
Participating teachers and drop-outs	6 teachers covering 5 grades including a tandem pair sharing Year 6; excludes 2 withdrawals who continued to provide some data.	4 teachers covering 4 grades; excludes one withdrawal and 2 interested who went on long-service leave for the research period.
Admin and support staff	2, namely the Principal who was also the ICT support person, and the librarian.	2, namely a participant who became the acting Principal just prior to the research period; and the IT support specialist who was also 1/2 time Art.
Computers available to each case teacher at start	All classes had 'pods' of two 2nd-hand non-networked computers at the rear, with a new printer, and all case teachers were offered at least one 2nd-hand loan computer, with software, by the researcher; A set of 5 computers was available in the library for casual access.	A networked lab of 16 machines rostered for all classes, with a support person as well; Pods of 2 old stand-alone computers in each class; often unsupported; A few classes had up to 4 new networked computers allocated in the middle of the year.
Ratio, start	11 pupils per computer average	8 pupils per computer average
Computers available by end	All classes were allocated a new computer for their mini-lab; three classes took up the researcher's loan machines as well.	After negotiation over under-utilised computers, all case teachers had at least one new stand-alone computer as well in their class.
Ratio, end	6 pupils per computer (8 new)	6 pupils per computer (12 new)

3.3.5 Implementation

At both schools the study began with a presentation to interested teachers which was intended to translate in a practical way the principles for appropriate PD described at the end of Chapter 2. To simplify the presentation a visual format was chosen and the research plan was introduced as a series of diagrams. The idea of ICT uptake as a journey, as described in the previous chapter, was represented by a diagram just like

Figure 3-1. The daily focus of their efforts was represented by a diagram just like Figure 3-3.

Then the foreground principles (given already at the end of Chapter 2) were presented as 'The Seven Big Principles'. The headings are listed below, and the complete list with examples of each principle is provided in Appendix 2:

1. Enjoy the journey
2. Plan for stress reduction
3. Address learning and assessment issues first
4. Collaborate with your communities
5. Aim high but start small and local
6. Embrace complexity AND simplicity.
7. Find time for others in all this

Attendees were shown the examples of the application of each principle and asked to adapt them to their own circumstances by adding some of their own examples.

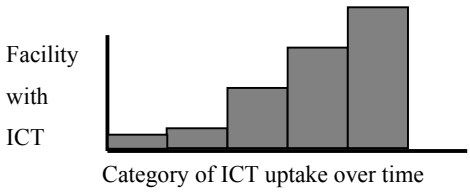


Figure 3-1: Implied journey via progression in instructional stages, from the ACOT taxonomy

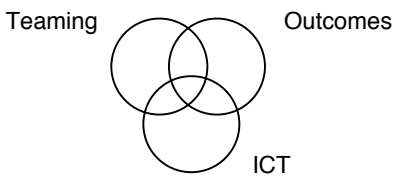


Figure 3-3: Micro level methodology for this study's intervention

Next the four background principles first given in Chapter 2 were mentioned. Since each school had already qualified on these factors they were not important enough to mention earlier. These were:

- that such programs ought to be school-based;
- that they require a significant preferably whole-school commitment;
- that they embody easily comprehendible major aims the project should be able to be encapsulated in a few words or diagrams; and
- that they possess sufficient ICT to support a 'critical mass' of willing ICT users.

Finally they were asked to consider who they would team with during the study. Everyone who attended from the two schools initially offered to continue, although some withdrew later for different reasons, as detailed in Chapter 4.

Many of the principles were exemplified by the activities undertaken at the opening presentation. For example two relevant education office leadership staff were faxed details of the research well beforehand and invited to attend, and both spoke about the importance and potential value of the research. One was involved in implementing ICT uptake programs at DoE head office, the other was a manager from the school's district office. A number of the teachers commented afterwards how hard usually was to get hold of her, commenting that this research must therefore have been important to her. Their attendance was regarded as exemplifying two big principles, namely collaborating with their communities (build understanding, promote your work), and aiming high but starting small and local (showing a concern for both 'levels' simultaneously).

As well as discussing the journey aspect of the research and the multi-level flexible approach needed, the most attractive individual topic during discussion was that of planning for stress reduction. Despite encouragement and reminders that in the long run the activities they would be doing for this study were mainstream DoE objectives and all else could be seen as peripheral, few of the teachers appeared able to decline other activities and obligations. Thus even though it was apparently the most appealing principle, it was probably the least implemented.

Part of the local groundedness was the researcher's willingness to adapt and adjust the support activities and data collection procedures to suit the differing needs of the schools, within the principles already described. After offering any relevant help, the staff at the two schools reacted differently.

At RS, for example, some teachers began asking for classroom support on a regular basis; and at the end of term 3—the middle of the study period—the Principal asked for some appropriate PD in the ICT area that would involve as many of the staff as possible. Although it was a serendipitous event, it was taken as a sign that he was supportive of the principles of the study, and prepared to direct school resources towards it. The staff there regarded the Big Principles sufficiently that a large sheet listing them, which was left up after the presentation, stayed up on the staff room wall for all of term 3. At North Waygo, the researcher was invited to various team/committee meetings and occasional after school drinks on a Friday, and the rest of the role was based around observations, visits and interviews.

All teams were offered the example activities sheet (Appendix 4) and the opportunity to discuss and adapt it to their needs. This was seen as an opportunity to personalise and adapt the team ideas to meet their own local needs (stress reduction) and locate activities which put them in touch with their local communities (global and local issues; collaborating with their communities).

As a further example of the translation of the foreground and background PD principles (from Chapter 2) into action, the PD design process at RS will be described. It was considered important to leave the responsibility for individual activities with the teachers, and so a two-step process was used to identify desired PD. First they were surveyed to identify preferred topics and interested parties to minimise the imposition on their time (stress reduction); next a timetable was drawn up with a member of the RS staff named as the ‘contact’ person for every course all of which were designed to dovetail into the class activities of the attending teachers (stress reduction, learning first). In one case the contact person offered to run the course as well, and although this was not considered necessary it implied that they were enjoying the journey.

The PD activities were all undertaken using adult learning principles, building on the participants’ existing knowledge and establishing the relevance of every stage and activity. Small evaluation forms were sometimes used to gather feedback about next steps for the teachers involved, which helped direct subsequent rounds of conversation.

The courses were run either at the school perhaps with some borrowed equipment like some digital cameras or using the facilities of the local university after school

hours. Food and time for reflection were part of each course (enjoy the journey). At each course both immediate local issues (like 'how do I do this tomorrow with my students') as well as broader issues (like 'what effect will such equipment have on students' thinking and planning') were addressed each time—addressing the principle of considering both complexity and simplicity together.

Another level of activities involved visiting, observing and interviewing staff at the schools. By modelling and/or mentioning the 'Big Principles' during visits and conversations, the teachers at the case schools were reminded to use them themselves. For example a question about technology ('should we choose a scanner or a camera?') or a software package ('what do you think of package x?') was easily turned into a discussion of purpose and possibly led to a conversation about putting a learning, an outcomes or an assessment issue first.

3.3.6 The research questions in detail

Each research question was operationalized into a series of specific sub-questions, which are detailed below. Note that the sub-questions have an identical pattern for the first two questions:

For general Research Question 1, the specific research questions were:

a. What forms of collaborative activity were identified?
b. How did these forms affect teachers' willingness towards and views about ICT usage?
c. How did these forms affect their teaching ideas/pedagogies?
d. How did these changes manifest themselves in the use of ICT?

For general Research Question 2, the specific research questions were:

a. What forms of outcomes-based teaching activities were identified?
b. How did these forms affect teachers' willingness towards and views about ICT usage?
c. How did these forms affect their teaching ideas/pedagogies?
d. How did these changes manifest themselves in the use of ICT?

For general Research Question 3, the specific research questions were:

a. How do teachers describe their sequence of ICT adoption?
b. What observable behaviours indicate teacher progress?

To demonstrate the patterning more clearly in research questions 1 and 2 a descriptive matrix is presented in Table 3.2 below. Research Question 3 (RQ 3) is included for completeness.

Table 3.2: Summary of general and specific research questions to illustrate the pattern of the first two research questions.

	RQ 1: Collaboration	**RQ 2: Outcomes orientation**	**RQ 3: ICT uptake typology**
SQ a	What forms of …… were identified?		How do teachers describe their sequence of ICT adoption?
SQ b	How did these forms of …. affect Views?		What observable behaviours indicate teacher progress?
SQ c	How did these forms of … affect Ideas/pedagogies?		—
SQ d	How did these changes manifest in ICT Usage?		—

Key: RQ: General Research Question SQ: Specific Research Question

These specific questions need data to answer them. The data collection techniques are described in the next section.

3.4 Data collection

This largely qualitative research study involved the inter-related processes of 'watching, asking and examining' (Wolcott, 1994) over an extended time period. How these processes were implemented is described in the section on qualitative methods below. The next step, the analytic stages of processing these data into purposive form, involved tasks like data reduction, data presentation and conclusion drawing and verification (Miles & Huberman, 1994), and is described in the section on Data Analysis.

Both qualitative and quantitative data collection types were used, and each is discussed separately in the next section. The quantitative data were collected by a Likert-style questionnaire on views and attitudes to ICT (Appendix 3) and an instrument called Experience of Change questionnaire (see the next section). The qualitative data were: participant comment and e-mails, school artefacts and

materials, reflective journals, semi-structured interviews (schedule in Appendix 6) and researcher diaries and observation.

3.4.1 Quantitative methods

Questionnaire Surveys

A short questionnaire was given to the participating staff at each school twice over the study period—one after the start and one after the end—to gauge their views and perceptions about teaching and learning technology, and any recent changes that may have occurred. A number of non-participating staff were asked to complete it each time as well. The questionnaire had 17 questions mostly of the Likert-type with some short answer opportunities as well. Its purposes were to provide some triangulation with the observations and interviews over the same period, and to help identify any salient differences between the project teachers and the rest of their staff. Appendices 5b and 5c summarise the responses to the first 12 of the questions.

Experience of Change instrument

There are only limited resources for measuring the dynamics of school change, and traditional research collection tools are both cumbersome and slow, according to Ainscow, Hargreaves, & Hopkins (1995). They developed and tested six new ones based around the two key elements in change, namely the class teacher and the institution. They reported the usage as well as validity and reliability measures (see Ainscow et al., 1995) which suggested that that all six instruments were indeed successfully able to tap the dynamics of change in a school environment. One that appeared particularly relevant for this research was the instrument called the Experience of Change. They describe it in their manual (Ainscow, Hargreaves, Hopkins, Balshaw, & Black-Hawkins, 1994) thus:

> The Experience of Change instrument taps the feelings teachers have about a specific change. Teachers review a series of 24 cards containing a range of feelings and then select those that best reflect their feelings about the change, which may lead into a fuller discussion or interview. Feelings about change are very difficult to uncover during conventional interviews. This technique legitimates participants talking openly about their feelings, but without forcing any particular words into their mouths. Since the technique takes on average only 15 minutes to complete, it is a very efficient way of capturing hard-to-reach data…

The administration of the instrument takes no more than 15 minutes; it is detailed and easily followed. It requires the interviewee to allocate 24 cards into 4 piles. The

cards contain one of 24 words representing feelings from Strong Positive through Positive, Negative and Strong Negative. The piles are labelled *Often feel, Sometimes feel, Rarely feel* and *Irrelevant/Discard*. The documentation provided by Ainscow et al. (1995) described in detail how the test was to be administered and these instructions were followed carefully each time. The potential scores range from 20 for people who confidently and exuberantly welcome the particular change to –20 for those for whom the experience is strongly negative, or who feel deeply cynical or extremely frustrated by the process.

A second administration of the EoC instrument was arranged just after the end of the research period, only at RS, because it was evident to the researcher that some significant changes had taken place in the attitudes of many of the staff there. The datasets are included in Appendix 5a.

3.4.2 Qualitative methods

The qualitative methods included the use of observations, records of participant comments and emails; semi-structured interviews and observations; school artefacts and materials, and the teachers' reflective journals. Each of these is addressed now.

Observation, participant comment and e-mails

The researcher kept handwritten journals and recorded many observations, all interviews and most teacher comments there. These included observations at teacher meetings, staff room interactions at morning teas and lunchtimes, classroom activities, the placement and use of computers, Principal-teacher interactions and the Principals' comments and views. A notebook was carried during every visit to a school, whether it was helping with a professional development course, visiting a case teacher, answering some questions or attending at morning tea or lunch; and observations and notes were made regularly. By the end of the research period a good range of data based on substantial amounts of handwritten notes had been gathered, and their contents indexed for ease of access.

Interviews, observations

Nearly all case teachers were interviewed twice; all were interviewed once early in the second semester of 1999, and those who were still available were interviewed

afterwards as well. Two staff changed schools and were difficult to track down in time, or failed to answer the researcher's e-mails in time.

Also interviewed were a number of head office staff who were in regular contact with these schools. A number of unrelated schools in different educational districts were visited during the time of the study to gauge roughly their relative progress in school development and ICT adoption.

School artefacts and materials

Each school was asked to provide a pigeonhole for the researcher, which was to provide a conduit to collect all of the written materials, regular handouts, meeting notes and the other information and newsletters that were distributed around staff. The school registrar at RS created one above all the existing staff pigeon-holes, and this was used as well by staff to pass information, and leave notes, diaries and so on for the researcher. At NW, the ICT coordinator, Leanne, proposed a sharing arrangement of her pigeonhole, for anything with the researcher's name on it.

Reflective journals

All case teachers were given a notebook called a reflective journal, with their name on it, and including a page suggesting ways they might use it during the project. Over half of them made entries, including one who began to use it as her own journal and asked to keep it afterwards, but this was unusual. The journals were collected once during the study if they had any entries in them, and then at the end. Table 3.3 indicates the range of usage that the reflective journals attracted, varying from an empty journal retuned by Brenda with a note saying 'I didn't get round to using this'; to Ann who was on her second book by the end of the year and asking for the first one back so she could re-read her comments looking for insights.

Table 3.3: Indicates the range of usage of the reflective journals

Journals Use	Journals handed out	Returned empty	Lowest (in pages)	Median (in pages)	Highest (in pages)
Regis Street	10	2	2	3	70
North Waygo	6	1	1	1	3

The shorter reflective journals tended to be of low quality as data collection tools. If their size were regarded as a proxy for the teachers' level of commitment to this research, then the staff at NW seemed substantially under-committed. On the other hand they were already committed to a significant project involving ICT and the Student Outcomes Initiative through the ICT coordinator's committees. Both of these were congruent with this research's objectives. The low figures for NW were probably a better indicator of the fact that these teachers were already stretched more than the RS teachers and did not have a lot of time to give. They probably regarded this study more as a duplication of time than unimportant time, or perhaps favoured their 'real' ICT work at the school viewing it as having more 'real' benefit for themselves and their school.

3.5 Data analysis methodology

Both quantitative and qualitative methods were used for data reduction and analysis. Each paradigm needs to be applied appropriately as there are underlying assumptions and models inherent in every methodology, which should be considered as part of their justification for use. These issues are addressed in this section.

All the data was gathered, managed and analysed with the help of several computer-based methods. The questionnaires were entered into Excel®(a spreadsheet with some database features) to provide easy data access as well as graphs, simple statistics and scattergrams. The same approach was taken with the data from the EoC instrument.

Interviews were taped, transcribed with dictation software, then coded and entered into the NUDIST®(an acronym for Non numerical Unstructured Data Indexing, Searching and Theorising) software package. All relevant e-mails were filed, printed and entered into NUDIST® if appropriate. Data reports, lists and displays were generated from NUDIST® and exported to Excel® and Inspiration® software for display. Much of the data in the appendices is organized using these software packages, along with Word® for tabular presentations.

3.5.1 Quantitative data analysis and techniques

Due to the small number of participants the quantitative analysis involved a straightforward summarisation of questionnaire items. The intention was to represent

data in visual and graphical ways wherever possible and to make all quantitative data displays understandable using descriptive statistics such as means, medians and frequencies. In many cases raw frequencies were the most appropriate summary function for the chiefly ordinal questionnaire items. The researcher chose wherever possible not to obscure the data by converting these to percentages.

3.5.2 Qualitative data analysis techniques

Techniques associated with the three processes of data reduction, data presentation and conclusion drawing and verification were employed to ensure the quality of the resulting analysis. They are detailed below.

Data reduction

The data were reduced and presented using the approach of inductive content analysis (Patton, 1990). The units of analysis were varied, but the most common was the quote—a statement made by the individual teacher, Principal or outside observer that expressed a single facet about an experience, issue or feeling. Also important were the questionnaire data and the EoC instrument data. Finally the researcher's field notes and other observations provided contributing, substantiating or corroborative data, especially data about performance and observed behaviours, which may not be the same as people's descriptions of those behaviours.

Coding categories in NUDIST

NUDIST is technically a structured database for storing data as a network. The researcher devised headings and sub-headings called nodes into a branching structure which parallels the main concepts being researched and found in the data (Richards & ECU Media Production Unit, 1995). As concepts and issues arise out of the data being gathered and organised, these nodes can be added and sub-categorised. A structured, ordered tree of the data emerges as it is entered into and analysed with the software. Questions can be asked of the database through the software that allows combinations of the node categories being devised to answer queries.

The construction of the categories began as soon as the first interviews were transcribed and introduced to NUDIST. The research problem was used as the basis for the construction of nodes in the NUDIST tree, namely 'the effect of collaboration

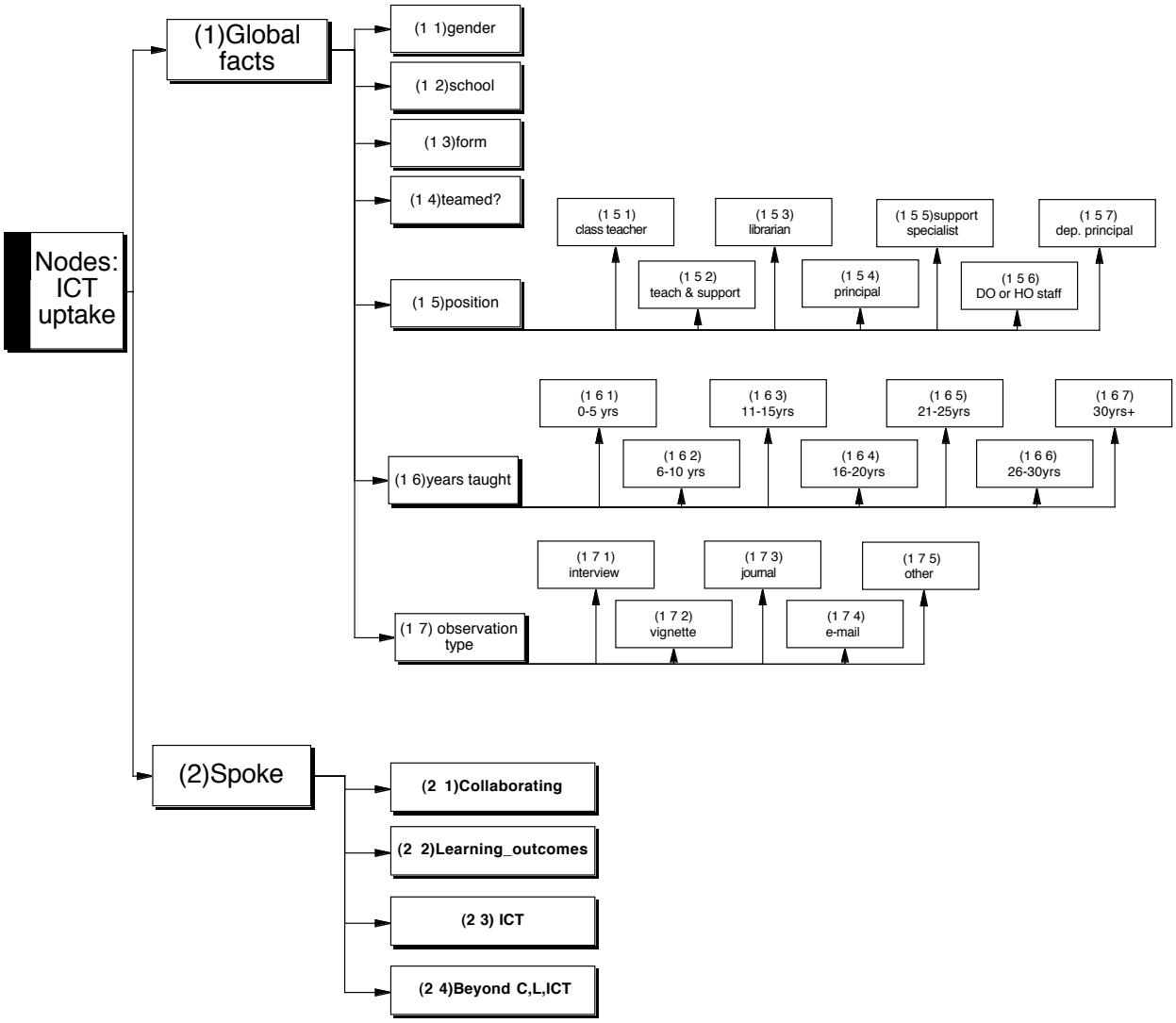
and a learning outcomes orientation on elementary teachers' ICT uptake'. The first three main nodes became *Collaboration***,** *Outcomes orientation* and *ICT uptake*.

Further nodes were then added under each of these topics, based on the interview questions and other data collected as these structured the content of the data collected and the information gathered, and a Global Data node was created to store the descriptive details of the participants.

The flexibility of the software meant that as data was gathered and new categories emerged from the content collected, the nodes could be changed, added or combined with others in an iterative way to represent the emerging structure of the data. An example of this development was the changing of the main nodes. As more data was entered they were restructured as *Global Data* (Age, gender, and so on), and *Spokes* (Collaboration, Learning, ICT and Other). See Figure 3-5 for an early listing of two of the key nodes.

It can be seen that the two main nodes shown are called Global Data and Spokes. The Global data referred to personal identifiers.

Figure 3-5: Sample of the NUDIST index system for the major nodes 1 & 2 ('Global' & 'Spokes') after the first round of iteration of node headings



The Spokes referred to the three key factors in the overlapping circles model, which was called the SpokesTeam Study to the participants, as a way to attempt to encapsulate the key characteristics in a few words.

Systematising the coding with NUDIST

By the time all the transcribed and emailed data had been read through several times, categorised and re-categorised, the node structure gradually evolved. After two iterations it stabilised in a way that suggested that a level of saturation had been reached. It had been refined and adapted to suit the emerging data, with supportive and evident commentary from the case participants at the key nodes. Simply to count the numbers of entries at each node risks ignoring the qualitative value of those entries; nevertheless, the nodes storing the most data gave an impression of the

emblematic issues for and characteristics of the participants. This helped with the subsequent re-framing of the data as analytic features were derived.

Validating coding with a research associate

The researcher was able to ensure some crosschecking of the credibility of the coding process. A research associate was asked to verify the consistency of the coding. The associate, whose research interests were in a related area, and who already had some experience with the NUDIST coding process, was introduced to the coding scheme during the second iteration phase. On two occasions and in two different transcriptions, the variation between the researcher and associate was measured. On the first occasion the average variation was 1 in 9 coding items, and during the second the variation was 1 in 12. It was decided that this was acceptable variation, especially since the associate had only been recently introduced to the coding scheme. Part of the improvement between the measurements could have been due to a practice effect, but the discussion was also useful and contributed to further modifications to the coding scheme that may also have contributed to the improvement.

3.6 Trustworthiness

The researcher sought strategies to ensure that the conclusions drawn from the data had value. The intention was that the reader should be able to see how this researcher has been led to the conclusions drawn, based on the data presented in this thesis, and feel that they are drawn fairly, and possess believability and credibility— often summarised as the trustworthiness of the data (Mills, 2000). Techniques for ensuring the value of the data, covering traditional quantitative concepts like validity (construct, internal, external) and reliability are now well elaborated in the qualitative field (e.g. Kidder, 1981; (Mills, 2000). Yin (1989) suggests that an important phase to address external validity concerns is during the research design.

3.6.1 Qualitative conceptions of data quality

These originally quantitative notions must be addressed differently under qualitative design conditions, and some writers even suggest different names for what are essentially different concepts. Wolcott (1990) proposed that basically the purpose of

all qualitative research is to improve understanding. His conception has some support as a fundamental purpose for such research (Mills, 2000).

This concept is promoted by Maxwell (1992) in his paper *Understanding and Validity in Qualitative Research.* He argues that understanding is improved when the key criteria of validity and generalisability are addressed. These include descriptive validity, interpretive validity, theoretical validity, internal and external generalisability and evaluative validity.

In this case, careful design in the selection of cases and their setting could allow a reader to judge that the cases exemplify broader groups of teachers and schools than just those selected. This was the purpose of the selection strategies described earlier, in an attempt to improve the generalisability of this research to the broader interpretation of the research questions. Maxwell could be interpreted as implying that readers should be allowed to generalise to a broader range of teachers as well.

Denzin & Lincoln (1998) list trustworthiness, credibility, transferability and confirmability as four factors for a researcher to address. Mills points out that the new vocabulary attempts to capture 'the essence of *validity* in a way that applies specifically to the methods of qualitative research' (p. 73). He mentions trustworthiness as a general descriptor for this process. All are simply ways to assure the researcher and the reader that the data do indeed represent or describe the underlying system sufficiently to provide confidence in the conclusions drawn from them.

3.6.2 Trustworthiness: ensuring the value of the data

Trustworthiness has been defined by Guba (1981), as a series of characteristics that would improve trustworthiness: credibility, transferability, dependability and confirmability. The study chose to follow the following strategies suggested by Guba which are elaborated with specific detail about how each topic was sought or achieved in this research:

a. *Prolonged participation at the study site*: As the study followed the participants for a research period of one half of a year, including visits and e-mail contact, there was less likelihood of obtaining a picture of the processes involved in teachers' uptake of ICT which was a temporarily distorted one. Furthermore,

ongoing contacts which continued after this formal observation period, increased the likelihood of gradual changes being discerned.

b. *Peer de-briefing*: This research and its progress was regularly discussed on an informal basis with peers. The concept of an uninvolved colleague as a sounding board and provider of independent observations was helpful and was provided by a number of interested peers and the researcher's supervisor. This was especially so towards the end of the research period when the opportunity to talk with experienced peers about insights from the teachers about their processes of ICT uptake occurred, and due to the feedback generated by the production of a refereed paper for an international conference (Clarkson & Oliver, 2002).

c. *Triangulation*: This is the process of comparing a variety of data sources and methods to provide a cross check on the data. Triangulation occurred when, for example, the researcher was able to compare the level of concern of teachers about their ICT uptake with the Experience of Change instrument results for overlap and similarity of results; or when comparing the participants' descriptions of an event against the researcher's own record, to verify commonalities. Such looking for validation of conclusions by identifying support from multiple sources was an important part of aiding the trustworthiness of the results derived from this research.

d. *Collect documents, artefacts, videotapes and other 'raw' or 'slice-of-life' data items*: The pigeonhole provided at each school proved a valuable conduit for school and teacher notes, feedback and publications, which provided further data and corroborating evidence for teacher development over the research period. The researcher also took photos, with the permission of the teachers involved, of interesting and representative activities and used them as starting points for conversations of what was happening in a teacher's class and what they were planning and thinking, and how things had changed since that time. This proved to be a useful form of feedback especially for those who tended not to otherwise reflect on their previous activities.

e. *Do member checks*: This is 'the most crucial technique for establishing credibility' say Lincoln & Guba (1985, p. 284). This was undertaken a number of times, and allowed the researcher to test and improve the growing insights through interaction with the other participants involved in the research; for

example with transcript checking by each teacher; and by asking key staff at each school to read early drafts of chapters that were relevant.

f. *Establish referential adequacy*: In other words, show that the interpretations match the actual collected data by matching with documents and recordings collected within the research. This is addressed in this study by using quotations from transcripts and e-mails to show the underlying data and thus provide evidence to improve the credibility of the research.

g. *Collect and develop detailed descriptions of the context*: This process reflects the concept of information-rich detail which permits the comparison of the current setting and other settings. It also allows outsiders to perceive the richness which lead the researcher to his or her conclusions. The multiple sources of data, now filed and indexed, that allowed the construction of the settings and vignettes described in Chapter 4 would permit this judgment.

h. *Establish an audit trail*: An audit trail is a way for an independent 'auditor' to follow the data collection 'trail' and its development. Records were kept including descriptions, computer files and drafts, as well as 'one-pagers'—visually oriented models and descriptions of the processes observed that fitted on one page that were developed during the research. Such records were helpful in detailing the development of the final body of work. An equivalent tool is built into the NUDIST® software, which automatically adds text records to all nodes as they are moved, adjusted and combined, to show their development over time, and this was useful too.

i. *Practice reflexivity*: One way to intentionally reveal underlying assumptions and generate new insights is to keep a journal for records, notes and insights, so that it can be reviewed easily over and over again, as the research progressed. The one-pagers mentioned above were often handed to critical friends at times during the research for feedback and to stimulate discussion and reflection.

3.6.3 Further techniques to improve credibility

Techniques like maintaining a chain of evidence, and keeping multiple sources of evidence (Yin, 1989) are different ways of asking for evidence supporting the accuracy or believability of the collected research data, and conclusions extracted

from the data. Other measures taken to improve the trustworthiness of this study included:

a. *Maintaining a field journal*: As mentioned earlier, a field journal was carried at all times for all notes, interviews, comments and discussions, and a substantial written dataset resulted. Each was then indexed to simplify access and retrieval, and to provide confidence in the reliability of the data record for anyone checking.

b. *Rich description*: Extended and credible description allows the reader to judge the authority of the findings and their relevance to them (Patton, 1990, p. 485). The detail provided through the school and teacher vignettes was an attempt to allow for such judgement.

c. *Rigorous data-gathering*: All tapes were filed securely as they were transcribed; they were then checked for accuracy and introduced to NUDIST®. All emails were automatically archived in a specially constructed folder using rules to re-direct all the e-mails to and from case teachers. Relevant e-mails were also introduced to NUDIST®; surveys were collated, graphed and inconsistent or missing data was checked and followed through; contact was made with principals on a regular basis to ensure there were no problems or issues that would hinder data collection and to maintain contact.

d. *The use of software* (NUDIST®, Inspiration® and Excel®) which were used to store and analyse the dataset can also contribute to improved reliability, according to Yin (1989), as it allows subsequent researchers the chance to reconstruct the analytic strategies.

e. *Use of supportive quotes* from transcripts and e-mail messages adds a measure of internal reliability; and the use of tape recordings and archived email messages could similarly be seen as a means of strengthening the reliability of the results. This use of real data was critical to give voice to the individual case teachers.

3.7 Ethical considerations

Before this research commenced the proposal was given approval by the Edith Cowan University Ethics Committee. They scrutinised the proposed methods to ensure the rights of the participants would be protected, and their anonymity

guaranteed. They were satisfied with the detail provided by the researcher for this purpose.

Written permission was sought from all teachers and support staff involved. Strict codes of confidentiality, anonymity right of withdrawal and storage of data were adhered to. Two staff at one school chose to withdraw from the research, but continued to talk with the researcher and were willing to complete the questionnaires, but chose not to join any teams. One was prepared to be interviewed as well. Although they had not completed the written permission forms they assured the researcher than they were prepared for their data to be used under conditions of anonymity.

From a very early stage in the analysis, the names of the schools and the people were replaced with pseudonyms, and these have been used in all public occasions since. To further assure protection but without wishing to compromise the data, some details about some of teachers' current classes, some histories and other minutiae have been altered in complementary ways to preserve the overall integrity of the data record. Also, transcripts and audio tapes with the original participants' names have been stored securely in a locked cabinet at Edith Cowan University and will be held for at least the minimum of five years, when they will be erased and destroyed.

One of the principles of ethical research is the importance of providing feedback when using human 'subjects'. This is more than just utilising member-checking—which has been done—and confirming the credibility of the collected data; it is also ethical to keep them informed of how their data is being used; and if it keeps them well disposed towards such research then this bodes well for future researchers. All those who agreed to participate were thanked by mail, as part of the member checking process. A final thank you letter will be sent as soon as the researcher publishes a summary of the findings, and inviting them to request a full copy of the report if they wish.

3.8 Summary

The principle that this research should satisfy professional standards for research whilst demonstrating some credible environment for a range of teachers with a breadth of interests in ICT uptake was presented as a realistic one. This chapter has

explained how the implemented model was a fair representation of the theory derived from Chapter 2. Both quantitative and qualitative data were collected using ethical methodologies, and the value of the research, and its potential generalisability, have been addressed.

The next chapter presents the settings for this research. The chapter starts by introducing the schools, and then introduces the teachers who participated in the study in a series of vignettes.

CHAPTER FOUR

DESCRIPTION OF SETTING AND PLACE

Introduction

This chapter introduces the case schools and their staff at the time the research started, through a description of their historical context, their current settings and vignettes of the teachers. The schools, called Regis Street Primary School and North Waygo Primary School, are introduced in order.

4.1 Case 1: Description of setting and place, Regis Street Elementary School

4.1.1 Historical context

Regis Street elementary school was built just after WWII only a few minutes drive from the Fremantle CBD. Built during a time of strong growth in the inner metropolitan area, it attracted a diverse migrant student population from its catchment homes. As vacant residential blocks declined the region matured and although a wide spectrum of socio-economic circumstances is present, the population is relatively stable. Part of its stability could be attributed to the paucity of rental accommodation, especially higher density accommodation. Although the ethnic mix had changed with new migrant intakes, the school administration reported a continued decline in the number of families who did not speak English at home. This suggested that there were few untoward factors affecting the school as its teachers continue their efforts to adopt learning technology in their classrooms.

A few years ago, as populations ebbed and flowed around Regis St Primary School whose school motto was 'Together we achieve' the school gradually became one of too many elementary schools in its region. At about the same time, the whole school decided to instigate its own review and evaluation process involving parents and staff. After any major review and a renewed sense of direction, any threat of closure would naturally cause frustration, so when that very prospect

was mooted during a rationalising phase by the State Education Department recently, it must have been undermining for the Principal, staff and parents.

In his time as Principal over the last two years, Jerry, Regis St has not only survived but has undergone some physical rejuvenation. It had a new library and pre-primary accommodation, as well as some administrative upgrading including a spacious new staff room. As a result the site is a typical mixture of old, demountables and modern buildings. To see Regis Street may be to understand its form, but this gives little clue to the educational developments on the inside.

The 15 teaching staff and 7 non-teaching staff share the work-loads of 16 FTEs – full time equivalent people. They are responsible for nearly 200 pupils in this 'single stream' school meaning it has one class per year group. The staff are evidently as stable as their parent population, with a number of them having taught there for over 10 years. One claims to have been a long term inmate – 'I have been at Regis Street for nearly 60 years, I was one of their first pupils!', joked Evelyn, who had been back teaching Year 1s for just the last seven years. A number of the support and teaching staff were also parents at the school; and the President of the Parents & Citizens body was often observed by the researcher around the school, including helping in the Year 3 class on Fridays where he had a child.

The school community demonstrated energy by conducting its own review, and assembling mission statements and school visions before Jerry arrived. Perhaps some of the social and consultative energy has faded since then, as the school-supplied descriptions on the Department's web site have not really changed for a few years, in some cases reporting 1997 data as though it were current.

4.1.2 Learning Technology setting

During 1996 a previous Principal had authorised buying two dozen second-hand ('but 50% under-utilised', Jerry reported) computers. Interestingly these were nearly all distributed throughout classes – except for a small cluster in the library – rather than all concentrated in a lab. For the time, such an arrangement was a relatively sophisticated approach suggesting that either they had a number of keen computer-using staff, a good support system or they had overestimated their computer users' sophistication. Another explanation was that they were short of rooms and could not allocate space to create a laboratory of computers.

The school's learning technology plans had been a priority since Jerry arrived, which happily coincided just 6 months later with a $100million four-year State Government plan to sponsor a large increase in ICT in schools. Under his guidance, and continuing to avoid a computer laboratory, Regis St began networking stand-alone computers in classrooms to allow access to the Internet and a networked 'curriculum server' stored and managed in the Principal's office. By the end of the study they had around 40 computers, about half of which were very recent. All the new ones and some of the old could be networked, and the last of the classrooms were networked just after the study period ended. This included a cluster in the new library, but at request of the Year 4 teacher, it left a small group of unlinked ones in a large corridor area outside the middle school classes. The level of access to computers for teachers and their students gradually exceeded the project preferred guidelines of three computers per participating teacher.

In his first year Jerry commissioned Kris, an acquaintance and ex-teacher, as a 0.5 time technical support person. A number of staff in interviews commented on the support role that Kris played in helping keep their frustrations down a little in that year when trying to use the older computers. This implied that there had been insufficient support in the first year or two after their initial classroom computer allocation. The next year Jerry would call Kris in on contract occasionally, and Kris began selling computers to some interested staff as well. It would seem that the plan to avoid a computer laboratory, which is a perfectly understandable one, was founded in this case less on practicality than ideology or even expedience.

4.1.3 The study teams and their PD practices

At Regis St eight teachers including the Principal, Jerry, initially agreed to participate, but Iain (Year 4) withdrew almost immediately. David (Year 3) expressed reservations about his own potential contribution. Because he then transferred at the end of the year, only six of the seven were interviewed twice over the life of the project. A ninth teacher, Brenda(Year 5), was prepared to be interviewed but said she was too busy to participate in another commitment. A number of the part-time specialist staff expressed interest, and even attended in-service courses, but never counted themselves in a group. The teachers formed teams based around year groups and existing friendships, except for the Year 6 tandem pair

who opted to work together. The three 'teams' were Year 1, 2 and 3 teachers, namely Evelyn, Ann and David (who was a peripheral member, until he left at year's end); the Year 6 tandem of Fiona and Gail; and Christine in Year 7 after Iain (Year 4) withdrew. Christine, who was acting Deputy Principal at the time, offered to act as the local coordinator of the project. With hindsight it transpired that this offer was indicative of a major problem for the project, but this was not initially evident.

4.1.4 Data collection at Regis Street PS

It was made clear that the researcher was available as a support person on the topics of Outcomes and ICT, and was prepared to provide support on whatever would help them in this study. One of the early requests, from Evelyn and Ann, was for more computers that could use the Concept Keyboard (a large flat programmable keyboard replacement which is useful with younger children). The researcher was able to progressively secure four working machines and Concept Keyboards, and then supported their use. Visits to the school occurred approximately weekly, providing support when asked and attempting to encourage teams to meet, plan and reflect on their progress.

In the second half of the semester, Jerry suggested that the remaining in-service activities for the year become a series of ICT in-services, to be arranged by the researcher. Such supportive opportunities cannot be planned, but it was a welcome chance to become involved even more deeply with the staff at Regis Street. The PD was implemented, designing a series of six in-service activities in consultation with all the staff according to their interests, and following where possible the outcomes focussed principles of the project. A key feature was that one staff member was asked to be the 'coordinator' for each activity, so that responsibility for the success of the activity did not rest solely with the researcher. Most of the staff attended these courses including those not in any teams, and all team members attended at least one activity.

At the start of the study all staff were asked to complete a survey (which was repeated at the end) and ethics forms were collected from willing participants. They were also given their reflective journals, and gradually interviewed. They were engaged in conversations in and around the school, in their classrooms and some in e-mail conversations as well. This data was collated and contributed to the

descriptions of their initial situations, which are summarised as personal vignettes below.

4.2 The team members

There were two 'non-teaching' or support staff who participated in a leadership role, namely Heather (librarian) and Jerry (Principal). Another seven staff were nominally arranged in three teams, which seemed to be derived from the classic Lower. Middle and Upper divisions in many schools. The pre-existing friendship groupings that were evident were those of Iain and Christine, and the tandem pair of Gail and Fiona. Brenda (Year 5) agreed to participate then withdrew almost immediately, but was prepared to be interviewed. After Iain's self-exclusion, nine staff were interviewed. For simplicity their vignettes are presented in alphabetical order.

Table 4.1: Case participants at Regis Street Elementary School and their teams

Pseudonym	Year group taught	Notes
Evelyn	Year 1	
Ann	Year 2	
David	Year 3	
Iain	Year 4	Chose not to participate but did surveys
Brenda	Year 5	Withdrew but interviewed
Fiona	Year 6 tandem	Shared 5 days each in 2 weeks
Gail	Year 6 tandem	eg. 3 days in first week, 2 in second
Christine	Year 7	Christine also Acting Deputy Principal
Heather	support & p/time Librarian	Recent convert to value of ICT in schools
Jerry	Principal	Also took the ICT support role

4.2.1 Ann (Year 2)

In 35 years Ann had taught every form in elementary school and at the time of the study opined that teaching was still an enjoyable occupation. She had been teaching Year 2s at this school for a number of years. She referred to some health problems that had led her doctor to suggest that she may have to retire earlier than anticipated.

Ann expressed the hope that this would not eventuate, because of the great satisfaction she derived from teaching, which she described as her ‘calling’.

Ann judged her ICT skills as low, but described herself as interested. This was confirmed when she was the first teacher to nominate herself after the initial presentation at her school. She had enjoyed some success with technology in a previous school, with a supportive Principal, so her interest in learning technology was perhaps a natural and understandable progression. Examples of the general technology activities she described included a whole class participation in a mock-up she designed of sailor John Sanders’ triple solo circumnavigation of the globe. The students emulated the isolation of a lone sailor by, for example, separating their desks from her usual groupings, and deciding not to speak for the day. She also described the student constructions for another general technology activity called ‘Protecting The Lighthouse Keeper’s Lunch’, which she and the Principal helped arrange. It was judged that she enjoyed creating student-centred activities, and that they were a critical contributor to the satisfaction she derived from teaching.

She had bought a computer at home a few years ago when she started some further study at a local university, but had only used it for writing occasional assignments and letters, and did not feel that she had mastered it. At school she encouraged her young students to use a simple editor rather than a full-featured word processor for their writing, as an apparently knowledgeable parent helper had advised her to do. The other activity she encouraged was one of two CDs of drill and practice packages on language and maths which she had the pupils use in the class as they were rostered on a computer. She was obviously prepared to take advice on a subject which she regarded as rather arcane, but her class’ usage was largely restricted to low-end cognitive tasks. These stand in contrast to her normal classroom activities, and it was perhaps predictable that she was sufficiently interested in computers to investigate their use further.

That she offered to involve others, like David, and did so, turned out to be typical of her natural collaborative approach. Ann described herself as collegial and someone who enjoyed the sharing process. It was obvious that she was unwilling to be critical towards others, as her comments about her colleagues were always positive, or at least couched in charitable terms, suggesting she would be an easy person to work with. In fact she quickly collaborated with the researcher, easily and

with perspicacity. She was not 'laid-back' about her work, though, as revealed by later evidence of her e-mail use. The times on her messages indicate that she was often up late, and her comments indicated that she was always doing some school or student-related task, which I took as an indication of her continuing dedication and enjoyment with her calling as teacher.

Ann's Experience of Change (see Appendix 5a) score of -4 suggested someone with a reticence about change and even some trepidation towards ICT adoption. She had not been willing to put extra effort into ICT as she had not been aware of its role in learning, other than the fact that children seemed to like using them. It could be argued that the score reflected her natural reserve as much as her views on ICT. For example of the four possible Likert-like categories, from Rarely to Often, she chose the 'Often' category only twice Frustrated and Isolated instead rating all her positive emotions as 'Sometimes'. She appeared to be someone who took a moderate stance on things in life.

She was curious that the study offered to tie together Student Outcomes and ICT, issues that she had regarded as unconnected. She was already interested in the Outcomes approach, and her curiosity was piqued by the prospect of integrating the two. Despite her willingness, she was concerned firstly that she was not very 'computer-literate', and secondly that she was still studying part-time and may not have a lot of time spare. Nevertheless she committed herself and suggested that she might be able to persuade some of the other teachers near her to join as well.

4.2.2 Brenda (Year 5)

Brenda was a difficult person to categorise and write about since she quickly withdrew from participating in any team activities saying she would not participate, but was prepared to be interviewed and at the same time completed the first Change score using the EoC instrument. She had a noticeable public role to play at the school as she supported Christine (Year 7 and acting Deputy Principal, described next) whenever there was an opportunity and this was particularly evident when there was a division between staff. Nevertheless she did not appear to want to share with anyone, and did not do any other of the activities undertaken by the rest of the case teachers from either school. Her 'no documentation' rule meant that she would talk

with the researcher in the school staff room and answer questions when asked, but did not complete any questionnaires or make any journal entries.

Brenda's change score was very reasonable at 9 but it was also very different from all the others on the feeling of Commitment, where she was the only person who did not report feeling some commitment to the school's ICT program. She took extended stress leave in the year immediately after the research finished.

4.2.3 Christine (Year 7)

Christine began as a Physical Education teacher before becoming a generalist elementary teacher. She had taught for 36 years, including 12 years in country schools in Western Australia, and some years ago she took a specialist curriculum position at the Education Department for few years. She took some time out to upgrade her teaching qualifications about 10 years ago after a death in the family caused her to take stock of her life. Christine had been at Regis St nearly six years, and was acting as the deputy-Principal at Regis St for the year of the study.

When computers began to appear in her class she reported feeling pressured: 'I started to panic, because I had no idea what to do…. So I went to courses. I bought lots of handbooks, whatever…' During her computer course she appeared to make up her mind quickly about some computer tools, for example, '…the Concept Keyboard? It was a total waste of time because it was meaningless to me. It didn't fit in to teaching, so it didn't happen'. After that she reported that she bought a computer for home. By the time she arrived as Regis St, she said,

> 'it was a case of 'go with it'. And the bug bit. I spent hours sitting at home, playing into the night, typing up my assignments…'

She installed Internet access at home, and began asking for it in her class. When this finally occurred, she felt able to help her students by working at night-time.

> I would spend enormous amounts of time at home, looking for what I was looking for, and then bring the sites to school so the kids could get there quicker…'.

Her approach suggested someone at least as interested in the technology as reflecting on desirable student learning, which is perhaps understandable of a novice to computer technology. A less traditional teacher could argue that the searching was a legitimate activity in itself, and that she could have worked on ways to make the searching more beneficial.

Her Year 7 class was usually observed neatly arranged in rows, and the three computers (one with Internet access) were distributed down one side. Rostered students were regularly seen using them, although she was always seen to stop them when she wanted to talk to the class. Once, during a fortnight when she had a prac. student, the desks were seen to be arranged into groups of four and six. It appeared that Christine did not mind the students working together, but did not actively encourage it at all times.

In the initial survey, she was asked who she would like to collaborate with. Rather than name people, Christine wrote simply that she was prepared to collaborate with anyone. Despite her stated preparedness on collaboration, there was not much evidence of collaborative activities, either with other staff or within her class. When an arrangement of teams evolved, based on junior, middle and upper school teaching groups, Christine's potential partners (Iain, Year 4, and Gail and Fiona, Year 6) never coalesced. In the end she mentioned some talking with Iain, who had withdrawn from the study but seemed very helpful with his ICT skills, and she was seen conversing but always only briefly to the other Year 6 tandem pair, who taught in the adjacent class. She also reported talking with Brenda (Year 5), who had chosen not to commit herself in this research.

There were other relationships that were even more disquieting. For example the researcher was made aware of some unpleasant comments that passed between Christine and another teacher at a staff meeting. Other staff described it as a serious breakdown in communications. Another time, when Christine wanted to do a class activity that emulated a successful one Ann had done earlier, it appeared that she chose to ask the researcher rather than make direct contact with Ann. These little observed dysfunctions in the relationship net at Regis St could be expected to undermine otherwise healthy collegial activities.

Christine's Change score of 6 was satisfactory and suggested a teacher with a reasonable confidence, warmly accepting of ICT at school and indicated her optimism about it. It was obviously a change that she was enjoying, hinting that there was not much other change in her life. When asked what changes had happened in teaching over her lifetime, she answered:

> CHRISTINE: Nothing! Nothing is really changing… 35 years, teaching is still the same. ... Instead of doing programs, we now do plans; instead of having objectives, you now have outcomes. Instead of saying this is content I'm going to teach you

> (that's still in the back of your mind), this is where I'm going to lead you. So it's just a different style. I don't think teaching has changed really.

It would appear that some of the key characteristics of the recent initiatives on Student Outcomes had not yet made any impact on Christine, as her minimalist distinction between objectives and outcomes intimated. Other teachers who had seriously changed the way they taught thanks to tools like computers and approaches like constructivism might argue there was less style and more substance embodied in the changes she referred to.

Christine was rated with only reasonable technical skills using a computer, based on the rate and types of questions she asked about ICT, observation of her Word editing and her own comments. She showed a noticeable teacher-centred approach to learning and teaching, and did not appear to encourage collaboration in her students at all times. Her collegial interests were apparently undermined by her personal feelings towards other staff members, to the extent that she appeared to prefer to make her own progress or to make changes on her own terms. Nevertheless Christine was very accepting of change, and was still enjoying teaching and the challenges that ICT brought, saying 'to me there are always things I can do to make me better'. This seemed a satisfactory reason for her participation in the study, and initially augured well enough for her prospects of progress.

4.2.4 Teacher 3: David (Year 3)

David, the Year 3 teacher, had returned from a year's teaching exchange in the UK the year before the study. Despite his elementary teacher training, he began his teaching career in a country high school fourteen years ago, but very quickly gravitated to the primary sector – 'not so many hormone problems' was his explanation. His experience since then had always been Year 3 and Year 4. He offered to participate in the project early on, after encouragement by Ann, but immediately expressed reservations about his own usefulness. Shortly afterwards he withdrew, but then said he would like to be involved 'without any commitment'. This ambivalent behaviour seemed always to characterise his approach. After the study began he continued to talk with Ann (one of his 'team'), and was always willing to talk in the staff room. Later his reservations had ameliorated enough that he submitted to an 'anonymous' interview without complaint.

David indicated that he felt unsupported when adopting and teaching ICT literacy, arguing that neither the Education Department nor schools were satisfactorily supporting their teachers. His language included words like 'irritated', 'angry' and 'upset':

> DAVID: This sounds predictable I suppose, but yeah I have really no idea. I have no idea, and this is organizational thing, how to make the best use of one computer with 30 kids. It's just to me a kind of an irritation. I feel irritated as far as computers {go}.

The language he used indicated his ambivalence as well as frustration:

> DAVID: A lot of what I'm saying, {pause} I feel angry about it, then I feel kind of powerless about it, but then again there is a certain amount of responsibility that I have to take to develop my own skills in these areas; but its a question of time and resources.

David pointed out that his ICT skills were relatively low, and he reported at this point that he was not particularly interested in computers. At the same time he described that he was 'developing an interest in it', which was supported by his purchase of a computer just after the study began. He continued to display this vacillation when he reported that he was quite prepared to use it when he could see a use, eg. 'e-mail {is} something I feel excited about… because it gives a real activity to the students'.

David's Change score was -14. He was one of only three people to score negatively, and his was the lowest score of anyone recorded during the study. This suggested that a worrisome level of negativity dominated his perceptions about ICT in schools. When asked how he would become an adopter of computers he illustrated again his ambivalence as well as his frustration:

> DAVID: I don't have a clear idea in my head, or goal, of how the computer can be used in the classroom. To me it's always been a token gesture… I can't see how it's integrated into the learning environment. I do actually like the idea very much of using it for remedial purposes, like teaching phonics, that sort of stuff. And I like the idea of using the Internet in the classroom.

Understandably for an unconvinced and novice adopter, his view of ICT was as a specialist tool for only some children, rather than as a general resource.

His classroom, adjacent to Ann's, had the pupils' desks similarly arranged in groups, suggesting a teacher for whom collaboration is an important part of teaching. David's classroom activities were often characterised by big, thematic projects, for example a huge puppet performance his students prepared for a school assembly, after a theme

of theatre in which parents came and helped over many weeks. He appeared to be the sort of teacher who involves parents where possible (based on his teacher reports in the regular school newsletter), a situation to which a number of parents reacted positively, according to comments overheard afterwards.

At a staff meeting he spoke forcefully about the ease with which teachers are distracted from their task by unnecessary marking and laborious reporting systems, and David explained afterwards that teaching was making him increasingly frustrated. At the same time he failed to take opportunities to collaborate, citing as defence a lack of time:

> DAVID: Do you set-aside time after school? But then you {still} have to go home and do your other work … really, {pause} teaching shouldn't have to take up your whole life.

Despite his reservations about computers, he had bought one and was apparently willing to learn more about them. He showed increasing concerns about the pressures on teachers, and indeed his vacillating participation in this research suggested he was deeply ambivalent. This included his approach to collaboration. For example despite rendering Ann significant technical support when she was having some difficulties with her computers, he indicated that he was unwilling to take responsibility for more substantial activity and continued to collaborate on a casual and non-committal basis with her.

4.2.5 Evelyn (Year 1)

Evelyn first worked as a bookkeeper and office manager for years, before she followed through a childhood wish and trained as a teacher, after her last child was born. At the start of the study she had taught for 23 years, mainly at the early grades. She indicated that health concerns, both personally and in her family, meant that she was starting to consider plans to retire very soon.

Evelyn had used computers for a number of years, but felt like she never had enough time to 'learn them properly'. She had owned one at home for 6 years, including keeping an e-mail address for the previous year. As a result there seemed to be some optimism when she reported managing to fix most of the problems her husband caused when he played around on it. Nevertheless she still regarded herself as threatened when she considered computers in school. She rated her current ICT skills

as low, offering a rating of 3 out of 10; but the support at the school was even lower at '2 or 3' out of 10.

She described the increasing pressures to use computers in her class as disconcerting, and perhaps saw this research as a way to 'get help' on a topic that she felt was going to become more stressful. Her biggest reported concern were the diffuse feelings of lack of time, and that she was 'falling further and further behind'. She explained that this was especially difficult for someone who was used to being competent, and in control. Her Change score was -1, which was clearly representative of her combined optimism as well as sadness and frustration as she learned to try and make use of ICT in a learning environment.

Evelyn reported another pressure that she has not faced before, about getting older, namely the way people challenged her when she voiced her concerns about change. This had not happened when she was younger, she objected. People were unfairly attributing her objections simply to her age, she felt. These two issues come together for her in adopting learning technology:

> EVELYN: … but if you're younger, and you object then that's okay. It's quite strange I find… but it's also my personality that I like to do things well, and I like to be able to say 'I did that'. I'm going to tell you, I'm quite proud my life and the things I've done with it, so when it comes to something where I'm not quite keeping up, you can see where it {ie. some of the pressure I feel} comes from…

She perceived teaching Year 1s as a special responsibility, and she described how different it was to upper grades in her opinion:

> EVELYN: My DOTT time is mostly just short half-hour breaks, because the children are not able to do one lesson for an hour. I walk past teachers here like Iain {Year 4} and Christine {Year 7} sitting at their computer while the kids are all doing things. I know they've certainly got to mark that work, I'm not saying that they have it easy...

In her view it was very hard to arrange collaborative activities during the day, even brief ones, that included a Year 1 teacher:

> EVELYN: I think the *other* grades can do it, because they can set their kids to work and sit and fiddle. You don't have this luxury in Year One.

Evelyn professed interest in collaborative activities, and described how keen she was to work with people like Ann, but her aspirations did not seem to be realised. She found that she had less time after school to attend meetings because of health issues like her extreme tiredness and it seemed likely that she was going to have no great breakthroughs with ICT, in her current circumstances.

Evidence gleaned from observation, interview and casual conversation identified a teacher whose enjoyment of and skills in dealing with young children were beginning to be undermined by her changing physical health characteristics and its associated consequences. This, along with her very high personal expectations for herself, and the reported lack of time, appeared to contribute to the increasing pressures she felt as a teacher.

4.2.6 Gail (Year 6 tandem)

Gail and Fiona were a tandem teaching pair, so they shared a full time teaching position. Gail was the substantive holder of the position and they currently shared the hours equally, although she had only just returned from twelve months off on maternity leave. She had taught for seven years each in country and city schools and at all age levels. She was sharing the Year 6 class at the start of the study. As a tandem pair they had a hand-over and planning meeting twice a week, which the researcher attended on a number of occasions. They also kept a log-book in which they passed daily information to each other about the class, pupils and lesson progress. They obviously enjoyed working together and had built some effective, albeit time-consuming, means to simplify the process of doing so, like regular phone contact and a get-together at school most Saturdays.

Gail and Fiona's classroom was always well decorated, for example at the project start there were hanging silvered plastic strips filling the ceiling and covering the door, to indicate seaweed and underwater sunlight, suiting their underwater theme at the time. Pupils were arranged in collaborative groups, and she was rarely seen standing at front of room addressing them. Usually the students were observed either quietly working or in some active discussion.

Gail's interest in ICT had been higher, she admitted. For example, she had become the 'computer person' at a previous school some years earlier, albeit under amusing circumstances:

> GAIL: The next year I was the computer person. Not because I was good at it, but because I did a dummy-spit! The software was kept in a library, you had to go and suck up to the librarian, and I didn't think that was right, so I offered to look after it the next year. I used to be released for an hour and a half a week to go around and to get people's computers going. You know, I was really into it then. I was thinking about it the other day, before talking to you, yeah, I used to be really into this.

She also wrote the documentation for a reporting package used at her school, when she decided the provided material was insufficient. Later she granted the publishers permission to use it instead of their own.

She had persuaded her husband to buy a home computer about eight years previously, but over time and with pressures of young children, her interest in learning technology had been relegated to a lower priority. She said in interview that she regretted the purchase later. Game playing seemed all he did at home, and her children were too young to use it. Recently her husband had begun talking about another upgrade, and was likely to win the battle, she said. She admitted, in a light-hearted way, that she did not want to improve the home computer again, saying, '…priorities! My famous deck! It's going to happen!' Her flippant riposte when people told her how useful an upgraded computer could be, was, 'so, who wants to be able to do more work at home?'

Because of her regular meetings with Fiona, she admitted that adding e-mail facilities at home could be justified; nonetheless, by the end of the study she had not done this. The fact that they still managed to meet during the week for a 30 minute handover, both attend staff meetings, write in their handover book, talk on the phone about immediate issues and then meet on most weekends was taken as testament to their joint dedication. At one stage she admitted that the weekend hand-overs with Fiona had been derailed by the pressures of young children, saying, 'we'll get that weekend stuff back on track shortly'.

Gail's Change score was 3, which was a combination of frustration and enthusiasm, optimism and confusion. Overall she did have a positive handle on this change, she was also maintaining a positive attitude, suggesting that she was likely to keep moving forward with her ICT adoption.

She rated her ICT usage in class as 'quite good, 6 or 7 out of 10, I suppose', and indicated that she was hoping that next year would be better. Gail explained that both she and Fiona rostered student computer use for equity and gender fairness. She described that there was little variety to their ICT activities, just using word processing, some CDs and searching of Internet sites. They had some drill and remediation style of software on CD, including one on the THRASS teaching literacy and handwriting model, which they planned to make heavy use of when they moved to Year 3 the subsequent year.

One related incident occurred much later, but represented their limited knowledge and understanding of the Outcomes resources. They (Fiona and Gail) explained that they wanted to find where handwriting was in the new Curriculum Framework courses (because of their THRASS interest), since they could not find it themselves and were too embarrassed at the time to ask anyone else and prove their own ignorance of the Student Outcomes materials. The fact that handwriting was now considered simply a technique to help implement an outcome rather than an outcome in itself suggested that they were novices with outcomes as well.

Although it was evident that she worked closely with Fiona and they shared their work in a collegial way, her perception of the collegial nature of the whole school was not positive. 'I think we are trying to be, but I don't really think that we are, no. Not really'; furthermore, she reported feeling that not much could be done about it, supporting the implication that significant personality differences may have been the cause.

Overall she was happy to work collaboratively with her tandem partner, but felt there a number of problems militating against their progress. First there was a lack of support around the school, then a lack of access to good technology (she cited the need for at least one digital camera and scanner as examples) and finally that issues like collaboration and outcomes were low in priority at the start of this study. As a parent of young children and working part-time, she indicated that her time to collaborate was somewhat reduced, as indeed was her time to focus on teaching as well.

4.2.7 Fiona (year 6 tandem)

Fiona had taught for the last 13 years. Before she earned her teaching qualification, she owned and ran a book exchange. Because she already had a family by the time she started teaching, she has never wanted to do the obligatory country service for those seeking permanency with the Education Department. Instead she chose to take temporary and casual teaching positions in metropolitan Perth, but reported that she had never found difficulty finding suitable jobs, implying that she was a perfectly competent teacher. She shared the job over the last few years as Gail took time off to have children.

> FIONA: Gail owns the job, and I sub-lease half of it! {Laughs}. I rely on Karen, but she relies on me, because she has young kids.

Fiona had been the full-time person in the tandem for the previous 12 months. They started working five days a fortnight each in the middle of the year, just at the start of this study.

Fiona's Change score was 8, which suggests a positive and relaxed view about the process of ICT adoption that they were going through. She was clearly comfortable with change; for example she was ready to change careers again, as Gail's children would soon grow up, and her own interests were moving, she reported. At the time they were shifting towards antique furniture.

It was Fiona who volunteered Gail and herself as a team for this study. She felt it would help give them stimulus for a topic that she felt was appropriate. She had had an interest in computers for nearly 15 years, when they first bought a PCjr for the children. At the time of the study she owned a reasonably upgraded computer at home, and explained that for e-mail she had a Hotmail account. Their Year 6 classroom was arranged with various 'resource' corners like a reading corner and a computer corner where the three computers were, including one Internet-connected computer. She regarded computers as another resource in her classroom, and appeared to use them reasonably regularly:

> FIONA: Basically I still see it as a valuable word processing tool, although I haven't used it half as much this year as I have before. The CD-ROMs and information that holds for the kids, the encyclopaedias, the atlases etc. I think are brilliant, and similarly with the Internet. Again, I don't know enough about them myself yet, to know what I could do with it. Really, I see that there are a wealth of ways to apply it, I just don't know what they are yet.

When the opportunity to collaborate with other staff was raised, Fiona was prepared to, she said, but argued that working part-time made it a little harder. Instead she suggested that she and Gail made a natural team, and were so compatible that the contrast with the rest of the staff was almost unfair:

> FIONA: It's easy, it's like working with myself, it's really not a good comparison! {Laughs}
>
> *: In what ways is that like working with yourself?
>
> FIONA: Because we are so alike anyway, I may as well be working with my doppleganger my double so to say 'collaborative' is not a good comparison, because we do work so well together.

She expressed reservations working with other staff about the school. When asked if it was a collaborative environment, she replied delicately:

> FIONA: No, because I don't think we do a lot collaboratively... I don't think the others out there are anti, I just don't think it's come up much. No I'd say not..

She appeared to share many common ideas about students and teaching with Gail, and to have some understanding of ways to use ICT in class. Furthermore she was the one who instigated their participation in the study. With her enthusiasm and Gail's background in using computers, it seemed natural to expect that their ICT adoption would proceed with some gusto.

4.2.8 Heather (Librarian)

Heather was the teacher-librarian at Regis St. She originally qualified as a teacher 27 years before but retrained during 1994-1995 as teacher-librarian. In her six years there she gravitated from a part-time classroom teacher/admin relief person to teacher /part-time librarian to full duties inside the library for the first time in 1999. She made it very clear that she enjoyed her work, using phrases like, 'I love school', and 'I cant wait to get out of the house' and 'I hate to have to go home in the afternoons'. She bought a home computer during her studies 5 years earlier, and found it easy to use and come to terms with. She described the key value of her role was the ability to take a broad view on the place of technology in schools, citing as an example her approach when visiting other schools:

> HEATHER: When I go to their meetings… it is to find out about the big picture… not just the implications for a school library but for the whole school in general.

Her recent training as librarian and her perspective as a primary teacher gave her a taste of the value that ICT has in schools, and she is positive about the role she can play. Jerry, the Principal, involved her in the design of the new library, and her research included visiting other schools going through the same challenge. She was evidently pleased with the way it worked out:

> HEATHER: I'm exhilarated about the new library, optimistic about my changing role in the school, and my ability to do my job well…
>
> Working within the constraints of department plan and guidelines, we have made very sensible changes, I think. For example, it is as passively solar as we can make it given the location and direction. We have a verandah all around, for shade for the kids.…

Heather rated her own ICT usage at medium, but was determined that it would jump after the move to the new library to very high. She mentioned her firmly held belief that her home computer platform was better than the one the school provided. Other than this, it was judged that most of her topics of conversation were oriented towards helping teachers find practical ways to enhance learning using computers rather than providing computers and waiting for them to be used.

Despite her enjoyment of work, she reported suffering a gruelling experience with another member of staff, which appeared to colour her views of the school. She once described it as a personality conflict, but preferred to describe the problems only in general terms:

> HEATHER: There are still people in the school that I think don't particularly like me, and don't like the way I do things. And I have had a lot of trouble with some people on the staff…. So hopefully, things might change…

Although she was apparently optimistic about a resolution, this personality clash probably had ramifications for Heather. For example it must have undermined some of her efforts at arranging collaborative activities. From conversations with other staff it was obvious that the conflict was with Christine, although Heather chose not to name her.

She described how she expected to help and support class teachers who wished to use the library and its resources:

> HEATHER: Well, I'm used to programming together, for example. We have a thing in libraries called CPPT -- Collaborative Planning Programming and Teaching. So … the teachers … and the librarian ... do programming together, they do part in the library with the teachers, some in the classroom, collaborate with the art teachers, and so on. No this is not a collaborative school…. this {collaboration} only happens for a couple of teachers here.

Heather's Change score was 11, the highest in the school. It would appear that she was an optimist, and that despite the difficult circumstances that she had come through and the challenges facing her, she was determined to perform as well as she could during this change process. Her words seemed defensive when she said:

> HEATHER: I hope that the work I have done, perhaps reflects well on me as a person, so that people who have doubted my {value} being here, may think that it wasn't a bad idea that I got this job after all.

In summary Heather was a recently trained and motivated librarian who voiced appropriate attitudes about collegiality and support, and who was remarkably optimistic in her views. It was clear that some of Heather's relationships at Regis St

militated against the prospects for collaborative activities there, despite her keenness to do so. Even staff who wanted to support her would know that they were doing so at the expense of the other person, which might simply exacerbate the existing rift, until some significant change occurred in the relationships net at Regis St.

4.2.9 Jerry (Principal)

Jerry started as the Principal in1998, the year before the study. He had taught in both city and country primary schools in WA for about twenty years and had been a Principal for over a dozen, including the last nine years in metropolitan Perth. He described it as a time of significant upheaval in schools, especially with learning technology, which is one of his partialities. There had been some significant re-furbishing in his school in recent years, and the recent library was, as explained earlier, largely due to his efforts.

His interest in the project was based around his perception that adoption of ICT was both important for teachers and productive for students; and he was of the opinion that distributed 'networked' computers were more conducive to student learning than a large lab. It was evident that he had no fear of computers and a reasonable understanding of them. For example he had a modern computer on his desk with an internet and e-mail connection, where he demonstrated reading e-mail with only occasional difficulties; he had owned a home computer for a number of years already; and there were two servers under a desk behind him both under a full service and maintenance contract though which required occasional minor management that he reported he could do.

His Experience of Change score was 4, suggesting moderately positive but balanced feelings about the changes to do with learning technology at RS. Given that the Change scores ranged from –14 to +11, it is instructive that Jerry's score of 4 was quite close to the average of a little more than 2. This average was calculated using the scores of all but Iain, whose ICT skills were already well known around the school, and may well have been quite positive anyway.

Jerry understandably had some weaknesses in his ICT knowledge, best illustrated by a comment he made near the end of the study, 'Here we are near the end of the year, and many schools haven't even spent their technology money, let alone got their network {when he meant Internet} connection'. The comment not only indicated that

he felt that his school was going well, but also illustrated his still-incomplete technical knowledge, using the words network and Internet interchangeably. This later caused the researcher some difficulty whilst planning an in-service course, when seeking genuinely 'networked' computers, that did not need Internet access.

Based on a review of the researcher's notes, he was always ready to instigate talk about technology and computers, with common topics being networking, servers, maintenance and cost minimisation. He also liked to talk about the Internet, and occasionally e-mail and cameras. Perhaps his lack of teaching load explained the lack of conversations on learning activities with technology.

He appeared to be far more pro-active in the technology domain, where for example he took responsibility for the school ICT plans and the ICT budget (arguing that teachers did not have enough time anyway), than the area of curriculum leadership. When asked about his curriculum leadership role, he expressed the view that DoE(WA) was not providing enough support for Principals interested in providing in-service for staff on Student Outcomes.

> JERRY: Those kinds of things, I don't think EDWA {the Education Department} has trained us well enough in. Some of us may have got those skills, because we have come through the grassroots, teaching etc. … I have a slight concern that I need to up-skill myself in that area.

He was of the opinion that if he established a good ICT base at his school, that this would *allow* good ICT use; but then it was up to the teachers:

> JERRY: I think most of the difficult hurdles have been covered, from a managerial and administrative point of view. The rest {ie. next challenge} is the people learning the potential of what they have available, and what they can do with it to make learning in the classroom more effective.

He stressed this idea further in his journal:

> JERRY: To see the potential use of various software will require a desire by staff to review software of an educational nature.

It seems reasonable to conclude that Jerry regarded himself as a manager of resources but preferred a role as a smoother-of-the-path for people. He took responsibility for and showed leadership in the ICT and ICT infrastructure development of the school, as well as the normal Principal's responsibilities. He was evidently a little less easy with his curriculum or people leadership role. The things he appeared to manage well were the more visible ones and there was a sense in which to succeed with his school's motto of 'achieve together' required the

overcoming of many more subtle pressures and disagreements than were obvious on first inspection.

4.3 Summary of the RS teachers and school at the start of the study

A careful analysis of all the Change scores of the contributing staff (see Figure 4-5) allowed a number of further observations, firstly about the Principal, and secondly about the teachers who chose not to participate. If Jerry's EOC score was not far off 'average' for his school, then it could be that as Principal he was already aware of many facets about the teachers at that time. Hence, such a score suggested that he might have reflected, whether consciously or unconsciously, the 'average' perceptions of the whole school staff. The idea that he had a not unrealistic grasp of staff perceptions about ICT adoption is reinforced by the fact that his score came from rating as *Often* just two items, and these two items namely 'Interested' and 'Committed' were some of the ones selected more commonly by all staff.

An interesting aberration was recorded by Brenda. She was less 'non-participant' than Iain, having been interviewed and completed the first EOC instrument. Her Change score of 9 suggested a positive approach. However, she was the only person measured to rate the item 'Committed' as *Not relevant/Bin*. This was unusual given that all other staff members rated it *Often* (4), *Sometimes* (3) or *Hardly Ever* (1). She is even more of an outlier when you find that the one person who gave 'Committed' a *Hardly Ever* rating was the ambivalent and frustrated David, whose Change score was –14.

One possible consequence of this knowledge was that it may be important to know whether Brenda held views about commitment to ICT adoption which were commonly held across other schools in Western Australia or not. Without more information about Brenda, or indeed the other non-participant Iain, this was hard to ascertain. The issue will be revisited in the next section, where the profile of each group's aggregated Change scores will be examined in more detail.

Vignettes of eight teachers and mention of another two have provided an introduction to the staff and some of their relationships at Regis St, and given an

indication of what the school was like at the start of the study, based on the participants who worked at close quarters there.

4.4 Case 2: North Waygo Elementary School

4.4.1 Historical and physical context

North Waygo was built in the late 70s in a comparatively recent suburb some distance from the coast, also in the Fremantle Education District. It has a diverse ethnic mix, with a great predominance of mid- and northern European groups, for whom family ties and stability are important social factors. North Waygo is described in the Education Department schools database (data supplied by the school itself) as having a stable well-qualified staff. They had a number of teachers holding advanced skills status, implying an extra source of potential leadership in professional development activities.

Multiple ethnic populations provided students from approximately two dozen language groups The staff estimated that half the pupils hear one or more languages other than English spoken at home. Because a significant social characteristic of these groups was family-centric, the students were reported to be generally well-supported by their parents and family groups at home. Predicably the teachers and acting Principal reported no real discipline problems or transient children whose parent/s moved them from school to school.

The school site comprised a series of single-storey classroom and non-teaching blocks arranged in an irregular fashion. An extra classroom block was added about ten years ago beyond the existing structure, leaving a newcomer with a disjointed feeling when attempting to navigate around the school initially. Altogether there were three classroom blocks, with admin, music, tuckshop and library areas and 10 classes of students.

Of the 31 staff, 11 were non-teaching and administrative staff. This left 20 as classroom teachers not all of whom were full-time; in fact they were equivalent to 14 full-time staff (FTEs). This corresponds to ten in classrooms, and four staff to run all of the extension and ancillary programs like music, PE, Art and ICT. Four of the teachers taught in two tandem pairs, where each pair shared the full-time job owned

by one of them; and both deputies had teacher-relief for their administration time which also involved sharing some of their teaching.

Most classrooms had one openable concertina wall to their neighbouring class, making it easy to arrange shared activities or cluster work. It was obvious that a number of these dividers were always left open or partly open by some of the teachers, for example Paula (Year 3/4) and Nora (Year 3) never closed their divider during the period of the study. This concertina wall could be justified since many of the classes at North Waygo were split grades, for example Paula's class was called a 3/4 class, because she taught students in both Year groups. These split classes and the teacher pairings would have provided increased collegial opportunities for staff who were interested.

The acting Principal, Ross, explained they already had a sophisticated system of committees which had worked well at the school over a number of years, as well as an active P&C which did fundraising every year for the school. Another characteristic of the school was the range of social activities for staff, suggesting a reasonably collegial environment. A timetable published by the social committee arranged special morning teas, Friday afternoon drinks and outings like meals at restaurants on a regular basis, which were usually well attended. Again such activities suggest a relatively strong set of social and work relationships were built and reinforced by the structures in place at North Waygo Primary School.

4.4.2 Learning Technology setting

The previous Principal had only just retired after many years. Three years ago she decided to ensure that their set-aside ICT money was spent usefully. Two of her skills were organising committees and delegating, but ICT was not, according to one of the staff interviewed. Consequently, a group of interested teachers and parents found themselves on a special 'computer committee' chaired by the Principal. They already had some 8-bit Acorn computers in their classrooms, which had been an earlier DoE(WA) standard, but provided an older, non-graphical user interface. These computers had not been upgraded for years and as one staff member said, 'some people just let them stand in the corner'.

Leanne, one of the Year 5 teachers and a committee member who was later to become the Coordinator of Information Technology (hereafter referred to as ICT),

described their brief as ‘to work out platforms, how we want to use computers in the school and so on’. They reported back to the rest of the staff ‘It took us six months to investigate and decide’, she explained. This Computer Committee had continued, although it was eventually renamed the ‘IT Committee’.

Just before the original ICT Committee was formed, a nearby business, headed by a very keen parent, donated 17 second-hand computers. Although they were not new, they were more modern than anything else in the school and provided a timely stimulus, and were allocated to classes. Shortly afterwards, the school decided to spend its own money and installed a network of computers in one laboratory.

All staff were expected to use the lab for at least an hour a week, with help to be provided by a part-time technology-support teacher. It quickly transpired that some staff wanted to send their students without turning up themselves, and this was the challenge that Maya, the first appointment to this position the next year, had to face. Leanne also found Teresa, a willing parent, who had good technical skills, who then provided both technology and maintenance support.

About this time Leanne applied for and won a competitive grant from DoE(WA) to assemble some multimedia resources as part of an ambitious cross-curricular project involving the community. Initially she planned to involve two or three other staff. Other activities occurred, and gradually some North Waygo teachers became involved in presenting their work-in-progress at educational computing conferences, public days and so on. Soon the school began to gather a reputation for its ICT programs, especially for its interest in multimedia and having students generate their own multimedia presentations. For example they were invited to present sessions at a state conference, and the DoE(WA) asked Leanne to present at a large workshop in 1998.

By the time of the State Government’s $100 million funding boost for ICT in schools, North Waygo already had plans in place. In the opinion of Leanne and her team, the school had already planned as a first priority to extend the lab network to networking the school so they could install distributed mini-labs of networked computers in individual classrooms. The plan was to annually purchase a set of computers and do some cabling, then install them in the next one of the non-

networked classroom blocks each year as funding permitted. This plan corresponded to stages described in the school technology plan.

At the start of the study one of the three classroom blocks had already been networked back to the lab, and the next block was due to be added by the end of the observation period. By the end of the study there would be 17 networked computers in the lab, around 15 second-hand and 16 new networked computers spread around the 10 classes, two thirds of which should be networked as well. Most of the 16 new computers were in the blocks that were networked, but one or two under-utilised ones had been moved to keen teachers' rooms even though they were not networked. It seemed likely that equitable school access to ICT would be at a sufficient level to meet or exceed one of the major ground conditions of this study.

4.4.3 Data collection at North Waygo

After being informed of the study, the acting Principal, Ross, consulted with Leanne, the ICT coordinator, and together they invited the researcher to the school. It transpired that such collaboration was typical of many of the school staff. The resulting presentation was to one of Leanne's recent innovations, the Teaching and Learning collaborative group. This involved up to 14 staff, she explained, but on the day a total of 10 people participated, including occasional appearance by the acting Principal. The membership of this group overlapped with the (smaller) Technology (ie. ICT) Committee in all but one case. A regular non-school attendee at these meetings was Victoria, a curriculum adviser from the local Education District Office. She explained that she was impressed with the school's efforts in teaching and learning, and especially their Student Outcomes work, and wanted to 'keep in touch' with their progress.

The opening survey was filled out by ten staff. Because of long service leave, drop-outs and other issues, interviews were eventually conducted with only six teaching staff, the new Principal and Victoria from District Office. For the same reasons, final surveys were completed by seven of the teaching staff.

The plan was to invite the researcher to a variety of the Teaching and Learning committee meetings and Technology meetings. In the end three invitations were extended to these meetings, which were attended; and four morning teas were

attended also. Leanne estimated that they met approximately 10 times over the period of the study. Most of these meetings were for the T&L group.

Leanne suggested that the school's ICT Committee of seven staff could be treated already as a team. It was judged appropriate to observe these teachers as they proceeded along their chosen path, particularly as they represented a group taking personal responsibility for its own professional development.

4.5 The study team and their PD practices

The major group observed was based on the ICT committee at North Waygo, less one member who chose not to participate as she was shortly going on Long Service Leave. The PD activities that the committee were planning to undertake were already committed, according to Leanne. They were already meeting on a regular basis for two reasons. Firstly nearly all of them were part of the Teaching and Learning collaborative group and their major focus was attempting to implement the Outcomes approach inherent in the recently introduced Curriculum Frameworks document, in a teaching area. Secondly as the ICT committee they also were meeting to address immediate concerns and to continue their planning for the next school year. As with Regis Street PS, it was made clear to the group that the researcher was available for any support, development or associated PD activities that they regarded as appropriate.

A review of the actual PD activities which the members of this team undertook over the semester of the study revealed that, excluding the Acting Principal, the six team members committed approximately 22 hours of PD time on average. This included 20 hours of after-school committee meetings, followed by Cyber cafes at school and a variety of outside PD and conference activities by 5 of them.

Table 4.2: Case participants at North Waygo Elementary School and their teams*

Pseudonym	Role	
Olwyn	Year 2, Deputy Principal	
Nora	Year 3, acting Deputy Principal	Teamed with Paula
Paula	Year 3/4	Teamed with Nora
Leanne	Year 5 tandem, ICT coordinator	Convenor of the ICT & outcomes c'tees
Wendy	Year 5 tandem, owner of the position	Leanne's tandem but rarely mentioned
Maya	Tech-support and p/time Art specialist	
Ross	Acting Principal (from Year 6 class)	
Sam	New Principal (arr. Jan 2000)	Arrived as research period ended

*Note that Leanne described all the members of the two committees involved (the ICT and the Outcomes committees) as very friendly and already teaming.

They are presented below in alphabetical order of their pseudonyms. Also interviewed during the study was Victoria, the local District Curriculum officer. The purpose was simply to determine comparisons between NW and other schools in her District, and their relative progress with Outcomes and ICT in general. It was therefore felt that there was no need to include her in the observation schedule.

4.5.1 Teacher 1: Leanne, Year 5 and IT coordinator

Leanne taught Year 5 in tandem with Wendy. She had been at South Waygo since 1992, when Wendy went on maternity leave, and they have shared Wendy's position ever since. Wendy was not interviewed or involved in the IT committee and Leanne summarised that she was supportive, 'but tended to follow my lead'. Leanne was appointed the Information Technology coordinator in 1998, and felt that her main reason for participating in this study was that she was interested to find out how their school compared with others.

During the course of the study, DoE(WA) awarded Leanne an educational leadership position called the Level 3 Classroom Teacher status. This was the first time they had created such positions. Very few teachers qualified for these prestigious awards that also attracted a release from teaching time (0.1 FTE) for three years. All Level 3 teachers had to negotiate some leadership role in the school, and this time release was to be used by the Level 3 teacher to support their negotiated role. Leanne chose to use hers as technology support, preferring to deliver it in one full day per fortnight. She also had a coordinator's allowance from teaching to help ICT. Along with Maya, the part-time computing support teacher, and Teresa the technologically adept parent, she provided support on two levels. The obvious support was for teachers as they

brought their classes into the lab. Most of the actual classroom support was done by the other two though, as she was also responsible for a class for all but one of her days at school each week. She also wanted teachers to have help as they attempted to integrate the use of networked computers into their learning plans.

From the start of her role as ICT coordinator, Leanne made two things clear to staff. Firstly that she was interested in student learning activities rather than technology skills, and secondly that she wanted to work with other people rather than by herself, but that she preferred to involve interested people rather than force anyone. In fact this had been obvious earlier, when, after her multimedia grant in 1996, Nora (the other Year 3 teacher) explained that Leanne asked her and a second teacher if they would like to become involved. In 1996, they were both teaching Year 3s, and she felt that her project about harsh environments would integrate ICT into an appropriate student-oriented activity. By 1997 when the software funding arrived, they were teaching different grades, so in the end Leanne persevered with Wendy (Leanne's tandem partner) with Nora observing and the second teacher withdrawing.

Leanne described how she had been invited to present at a State Education Department workshop, and how unsettling it was for her to put herself forward alone.

> LEANNE: Doing that conference presentation {by myself} was probably {pause} Well, I like to do things with other people, rather than being the sole focus. That was very hard for me.... I find it very difficult.

It would seem that she felt embarrassed by the opportunity when she was more interested in working with and supporting a team. Listening to other staff, it was the impression of the researcher that her collaborative approach had won her supporters at the school during these early stages of ICT adoption.

She had provided leadership for the school and its ICT program. As one example, Maya complained that some teachers using the lab wanted her to choose the activities and take the class. Although understandable, this contravened the intention of the mandatory hour each week as an opportunity for the teacher to begin seeing ways of integrating ICT into their teaching program. Therefore Leanne, apparently after discussions with Maya, proposed formalising her planning role into explicit ICT planning days at the start of each term. This was clearly appropriate as part of her Level 3 leadership role. Ross agreed to provide teacher relief for an hour per teacher per term, and by the end of the year, a trial was in progress.

Her Change score was 5, suggesting that she is positively participating in and optimistic about the change process as her school adopts ICT. Although she had an 'old' computer at home, she did not have e-mail access there. She admitted almost never checking the school-provided e-mail account in her name, despite exhortations from other staff. 'You can always contact me by fax or phone', she laughed. It seemed reasonable to assume that she felt little fear of it; more likely is that she held a non-user's disregard for e-mail, regarding it as an example of a technology rather than a curriculum or communications tool. This disregard for such a common example of 'technology' extended to her lack of understanding of how the school network worked. Even her interest in software seemed to stop at the current package that she was using with her students. Instead she appeared to rely rather strongly on Maya and Teresa for technical support.

Her technical skills were probably weaker than she would like, but she would defend this position by her total commitment to integrating ICT into learning, and her manifest ability to gather strong technical people around her. This weakness was evident when she was once reportedly unaware that the network had stopped working properly, a number of weeks earlier. Recently she confided that, after three years of using a multimedia package, she had some time to sit in her class and use it for an extended period. She reported being pleased that she learned to use many features that she knew 'about but not how'. Perhaps someone like Maya would regard this incident as indicating her ICT weakness, but it would be more interesting to know whether Leanne recognised the real contribution of the network in providing that opportunity. For example, she would probably not have been able to sit undisturbed in the laboratory, as it would have been full of students. More subtly, the networked machine in her room gave her the freedom to use it whenever she chose, so that she would not have had to make the decision to go to the lab in the first place.

Leanne described how she wanted to avoid becoming a 'techo', as she was concerned that this might mean she lost touch with her major focus and personal educational goals about student-centred learning. This reservation may have been at the price of her own learning technology skills, suggesting she was avoiding something not worth avoiding. It was deduced that she had a strongly student-centred style of teaching and that her ICT skills were only satisfactory. Her interest in

collaboration was high and through her leadership she provided a number of supportive opportunities for ICT use in the school by other teachers.

4.5.2 Teacher 2 Maya (ICT support and part-time Art Specialist)

Maya held the part-time Computer Support (ICT support) role at North Waygo, assisting Leanne and working closely with Teresa. She regarded her role as both teacher support, PD provider and planning helper, as well as a student support when teachers brought their class to the computer lab.

As a young teacher Maya emigrated to Australia and at the time of the study had been teaching for 4 years in this country. Immediately after arriving, she decided that computers were going to be important for her as a teacher: 'I realised that if I were to stay in teaching I would have to upskill {myself}'. The decision appeared to be based on her perceptions about the inevitable advance of computers. 'There was no one saying you have to, but I realised it was the way the world was going'.

Initially Maya trained as an Art specialist, but she also enjoyed the challenges that computers provided. She said this explained her interest in multimedia and using ICT for learning. Her first jobs were part-time and relief work whilst upgrading her qualifications especially in ICT. She took a number of classes in a short time period, always looking for upgrading of her skills rather than formal credentials. Consequently Maya had a number of incomplete qualifications to her name, but felt empowered and competent about computers: 'I'm very comfortable with technology…. I've been to different courses and I've got enough knowledge'.

Her interest in ICT was recognisable by Principals who were in need of skilled people, and her teaching background made her an obvious appointment to an ICT support role. For example she must have been pleased when, during one of her jobs, at Kyle St Primary School in 1997, the Principal, Jack, approached her:

> MAYA: At that time… Jack said to me 'I see you have an interest in technology…. This teacher who has been looking after technology is going on maternity leave would you be interested?'

She started at North Waygo in the year before the study with two roles, namely as Technology support person (3/5ths time) and Art teacher (2/5ths time). At the time of the study she was still doing ICT support three days per week there, with the other 2 days as Art specialist at Kyle Street Primary School.

Maya described herself using words like optimistic, enthusiastic, confident and exhilarated when talking about adopting learning technology in schools. Her enthusiasm for technology was evident:

> MAYA: I'm enthusiastic about everything! There is big potential for creativity; every child in my class can access technology in a non-threatening sort of way and I think that's really great.

This attitude was reflected in her Change score of 19. Not only was this the highest of any participant in the two schools, but it is one less than the maximum possible on the instrument. She obviously derived immense (almost pathological!) pleasure from her association with such change. Maya missed a 'perfect' score of 20 by choosing 'occasionally satisfied', instead of 'often satisfied'. The fact that she felt any satisfaction at all suggested perfectionism was not a problem for her, but her high score also implies she may have held unrealistic expectations of others around her, who may not have appeared as willing to change.

Before she started at North Waygo, she was shaping her ideas about what a 'good' technology-using school would look like. As she developed her ideas, she used tentative language to describe her earlier development:

> MAYA: What was happening here {Kyle Street} at that stage was that paper projects were becoming computer projects and I felt this was an avenue that needed to be explored.

Nevertheless such restrained phrasing gradually gave way to more assertive approaches as she became more confident in her philosophy. At the start of this study and after a year and half working with Leanne, Maya had begun to feel more certain of her philosophical agenda:

> MAYA: I kept saying teachers need to have these skills, teachers need to have these skills. And people {like Leanne} kept saying oh no, we are all about learning, we are not about IT. But {I argued} if you don't have the {ICT} skills, then you won't be able to offer them to the kids. That was one of the major things.

Her increasing confidence meant that she was prepared to assert her views on 'good' ways to use learning technology onto one teacher who had his students play games as their ICT activity in the lab:

> MAYA: For example at North Waygo there are still a few teachers, like Paul, who are playing games even though I practically {pause} I had really strong words in the staffroom with him.

Perhaps as explanation she observed, 'I am a pushy leader'. However, it would be wrong to conclude that Maya was not supportive of those around her. For example

she had constructed a 'Give A Little Love' book, a simple neatly covered exercise book full of staff names and kept in the staff room. In it staff were encouraged to give other teachers 'a pat on the back' for good things they had done. At the start of the study it contained a range of both anonymous and named comments. She was supportive of Leanne too ('a fantastic teacher'), in her difficult job of IT coordinator. Maya felt that she showed self-restraint, despite the differences of professional opinion with Leanne, about ways to encourage teachers to use learning technology. 'We get along, don't get me wrong, we are very good friends, but it… {is} frustrating. She probably doesn't even know that I have the frustration'.

When looking back at her collaboration at North Waygo, she felt she gave 100%: 'I did collaborate with all the teachers at a very high level.… I think I gave everything I had'. She talked of her good relations with key staff at North Waygo, but felt it was not always a satisfying environment to work in. 'It was exciting but still frustrating.' Her concern was with the slowness with which staff were adopting learning technology as a classroom tool. 'They were great otherwise, really nice, but {in} adopting technology they had no direction', was her opinion.

Maya's ICT skills were rated as very good. She was a regular user of multimedia software in the school and could always answer students' questions. She used both Windows and Macintosh platforms with confidence. She was a very regular e-mail and mail-list user, usually from her home computer, as well as a committee member of her professional association, an educational technology body. She was able to perform common maintenance and diagnostic tasks on the school computers and diagnose some network problems.

Maya gradually developed some strongly student-centred views on learning.

> MAYA: It is still quite frustrating seeing teachers 'doing projects on computers' and that's about it. They are saying 'oh, we are using computers', but they're not using technologies to support the learning.

She had begun to look for and attend PD that was more about learning than about technology, which no longer worried her. In her view, better approaches included the use of more open-ended tasks, and giving students more responsibility for their work:

> MAYA: In the bigger picture, what I want to see, is all the teachers being trained to unlock their children's brains not just feed them the answers. Basically. I want them {their pupils} to come up with the answers.

A teacher's role, for Maya, is to pass on as much information as possible to her pupils so that they could become independent. Her interactions with her students were still more transmissive than collaborative, if these following two quotes are representative:

> MAYA: …it was all student centred. I wanted students to get IT skills and whatever they needed I would help.
>
> I want to be able to tap every child on the shoulder and say now you are that kind of kid, this might be the way for you to go – and maybe computers are not the way. Because I know how you learn, I'm going to give you those {appropriate} resources.

In summary, Maya strived to collaborate and share with her fellow teachers, and felt she had a lot to share about LT. She had learned a lot about student-centred approaches to teaching, although the collaborative approach did not seem to extend to her pupils. She had worked very hard on her own ICT skills in a relatively short period, and was possibly less willing and a little frustrated waiting for others to take the slow road. She appeared to hold increasingly firm views about ways to use ICT appropriately in schools, and was learning to assert her views when appropriate.

4.5.3 Teacher 3 Nora (Year 3 and acting Deputy Principal)

Nora had been at North Waygo for 10 years, and for the previous few years had taught Year 3s. She has never regarded herself as a 'boring, traditional teacher', but on the other hand she admitted that she had always enjoyed 'being in control'. She was beginning to appreciate, she explained, that she would be a better teacher by relinquishing some of that control. She was also interested in catering for the wide range of student abilities in schools, and was encouraged by the DoE(WA) initiative called the Students at Educational Risk (SAER) program. This program encouraged teachers to cater for the range of individuals in one's class, including the weaker ones.

In 1997 she and Leanne (then teaching Year 3s too) considered collaborating on Leanne's first multimedia project. Nora was interested but reticent, since she later described it as, '…mainly just an observation role'. It was much more than this. It was actually one of the major milestones she mentioned in interview, on her journey to using LT better. Although she felt Leanne's multimedia project was too much to take on at the time, it helped her recognise a different way of using computers in learning, which she explained thus:

> NORA: It was an interesting time, in that it made decisions in my head.… I really enjoyed what Leanne's kids were doing, and I could see how much they were learning. It changed my ways of possibly teaching in the following year, … that started me on a different way of thinking... using technology as a tool rather than {the traditional} 'oops, its a computer, let use it'.

Nora admitted that she was impressed at the progress Leanne's children were making, but unable to 'let go' in her own classroom.

> NORA: At the time, it was a bit scary for me, because she was doing all this technology stuff with the kids. I didn't necessarily agree with it, because it was taking up the whole day… they seemed to be doing a lot of learning.… but I wasn't ready for that. I wasn't ready to stop spelling in the book, stop social studies in the book... things like that.

Later the same year Nora bought a computer at home and started using the Internet and e-mail at home. She described how her two children helped show her how to use some tools, and proved immensely helpful in this early stage. She described this purchase as another major milestone in the development of her skills with ICT, as well as helping her develop her approach to student-centred learning.

She commented a number of times on the difference between the Macintosh graphical user interface (GUI), at school, and Windows GUI at home. She said they were not insurmountable but still caused her difficulty sometimes. In fact she used the difference as an illustration of how little it mattered, since she usually seemed to 'get there in the end'. Her overall technical skills were rated as satisfactory, based on the clarity of her comments, the wide range of software she reported using and the only occasional confusions she appeared to face.

By the next year (1998) Paula was her adjacent teacher. They began to leave the dividing wall between their classes open ('I like to see what other people are doing, pick up ideas and so on'), and with Paula's encouragement and Leanne's support Nora started to integrate some computing into her class activities. She reported using word processing, some games, tutorial software and, through the Internet, began using Book Raps. Her home Internet connection helped here. Over the same two year period she found time to upgrade her teaching qualifications, and one of the educational computing units in the course encouraged her to consider using ICT in more individualised ways in schools. This meant she found some more relevance for her SAER 'hat' by using and encouraging other staff to use LT for this purpose.

In the year of this study, she had begun to take her changing role as a student-centred teacher more seriously. She extended the existing LT activities by involving her

students in another Internet activity called Travel-Buddies, initially around Australia and then other countries too. By this time she was becoming clearer in her perspective on what constructivist learning was starting to mean for her in her class. When asked what helped most in this re-orientation, she pointed out that she had been 'picking up ideas' for nearly three years, 'out there':

> NORA: I think, the number of PDs I have been to, and seeing ideas out there. I'd been to every single PD there was since 1996, since my own children were old enough for me not to have to come home at 3 o'clock exactly. That has made a huge difference.… So just seeing what is going on out there.

Her development had included visiting teachers at other schools, ongoing conversations with staff at school, collaboration with other teachers interested in Book Raps and Travel-Buddies, and being prepared to pay her own attendance fees at courses that she perceived as valuable.

Nora's Change score was 3. This score was an amalgam of very positive feelings that were masked by some significant negatives, so her overall score reflected this apparent ambivalence.

In interview Nora described how her teaching style was becoming increasingly more student-centred, at the same time as she was learning to use her classroom computers and the internet as a teaching resource for her pupils. Over the last two years she had begun to attend workshops and conferences that supported her strengthening views on constructivist learning approaches with students. Her constant attention to watching other people indicated that she preferred to learn by observation; and suggested a person with well-refined reflective skills. She described the conflicts she felt as a teacher who liked control but was increasingly more committed to helping students learn in more constructivist ways. Therefore she was gradually allowing students more participation in their own learning. More importantly, she felt she was making happier pupils, by making them feel that they had more significant control over their day-to-day schooling environment.

4.5.4 Teacher 4 Olwyn (Year 2 and Deputy Principal)

Olwyn had been teaching for many years and was currently one of two Deputy Principals at North Waygo. She was aware that all IT committee members were being interviewed as part of the study, but preferred to minimise her interview, and offered only ten minutes of her time. Her explanation reflected her haste, saying she

was ‘desperately busy, but fire away, what’s the first question?’ Such an attitude could be expected to colour her answers, and many were extremely brief. Some were so brief as to leave the feeling that they were cynical or flippant detritus. Whether it was her attitude that lead her to curtail the interview or her perception of pressure (on what was the first day of the student-free week after school had finished), it nevertheless seems likely that her responses may be very honest reflections of inner feelings. After all, they are being delivered without great thought or time for reflection.

Olwyn passed an interesting comment during the administration of the last stage of the Experience of Change instrument, for which her score of 6 suggested someone quite well-disposed to the adoption of ICT. The one strongly negative emotion she indicated she often felt was cynicism. Stage Three asked the subject to look at all the ‘often’ words and use them to ‘tell their story’. Olwyn, whose Often list was in no particular order optimistic, cynical, interested, stimulated, committed and comfortable, replied ‘they all mean roughly the same except cynical. I’m cynical of all the changes the Department is introducing. I think most teachers my age are.’ She evidently saw reasons for cynicism all around her.

She took an equally direct approach when the interview questions asked her to place herself on a series of continua, scaled from 1 to 10: ‘Well, which {end} is number 10? Obviously I want to be at the top, wherever that is’. It is therefore hard to make useful conclusions about her attitudes to issues like student-centred learning, given answers like this. As an example, she agreed the student-vs-standards continuum had valid pressures at both ends and decided, ‘…in the middle. Two bob each way’, rather than offering the requested ‘most common location’. It was the interviewer’s strong impression that she was only interested in providing the answers which an interviewer may have wanted, to minimise her time commitment. This ‘guessing the correct answer’ mentality pervaded the interview.

Olwyn regarded IT as a subject, and was of the opinion that an ICT specialist was ‘critical’ in a school. This was evident from her definition of the ICT specialist’s major job, which was,

> OLWYN: …to lead the way actually, and to keep their computers in pristine condition, to keep them running... to set up programs, to advise teachers on what students are capable of doing.

When prompted she agreed that providing staff PD was also important. It seemed that the specialist's job was to teach the students about computers and then the staff if possible. Otherwise all the staff were obliged to take on another subject and they were already busy enough, she seemed to feel. This was doubly hard, since, 'well, most of us are starting with zero knowledge, and we are trying to teach children something that a lot of the children know more about then we do.' What made it even harder, under her archetype of ICT in schools, was the absence of guidance. Since computing had the characteristics of a subject, Olwyn saw one of the problems as a lack of curriculum. 'There hasn't been a set program for schools to follow. There is no curriculum, there is nothing really, it's all ad hoc stuff.' Comments like this make it hard to believe that she attended the same ICT meetings and suggest she had quite different understandings from the rest of the committee.

Her further worry was that DOE(WA) had not trained teachers enough in the usage of ICT, and this too was their fault. The biggest hurdle with respect to ICT was teacher training, she felt:

> OLWYN: There has never ever been any teacher training as such, or not something that the department has instigated.… You have probably found that with everyone else saying the same thing. There has been no teacher training whatsoever.

This seemed a marked contrast to the attitude of other staff. For example, Nora and Maya said they had attempted to access all the relevant PD that they could in the previous few years. Admittedly they were rather keen, even to the point of being willing to pay for it themselves. Nevertheless they represent a range of views on the amount of PD available and although many may have argued that there was insufficient support in one area or another, no other participant made such a strongly unqualified proposition.

Olwyn's ICT skills were rated as low. She was not unwilling to use ICT, as her membership of the IT committee indicated, but she confirmed that she relied heavily on Maya and Leanne for support during her laboratory time. In addition her admission that 'most of us are starting with zero knowledge' suggests that the label applied to her too, as did her observation that an IT specialist was critical. Her preference appeared to be to let her students do the mandated ICT activities and fit hers in when she had to. She had been to two PD activities 'recently', and all in her own time, she explained – one on the Internet in 1998, and another using word processing in 1996. This seemed a very low rate of PD attendance, and perhaps

justified her exaggerated perception that there was insufficient teacher training available.

She had some cogent justification for why people might support collaboration. For example, teaming as a method of professional development seemed to garner her approval, and she saw two reasons why teachers may want to do it:

> OLWYN: People often don't want to become a member of a team until they can offer something to it, do they? They tend to stand back until they feel a little bit more confident, and know something about it. Then there's the other side of the coin, where someone who knows nothing about it may want to become a team member to learn. They don't understand, so they become a team member to see if they can learn from each other.'

She affirmed that she was part of a collaborative school 'yes, I'd say so, definitely', and that she was personally collaborative as well. This feeling did not translate to action, when she failed to capitalise on a chance to collaborate with another teacher. When asked by Ann, who was teaching a similar form at Regis St, she refused the opportunity, saying she was too busy. Further, her indifferent approach to interview suggested that she had more reservations about being collaborative than she expressed.

One of Olwyn's comments about Maya did imply an unintentional reflection upon Leanne. 'She {Maya} has not been appointed here as a computer specialist, but as a support person.. … It is just sheer luck that one of our staff {ie Maya} happens to be a computer expert.' The obvious implication is that Leanne, despite all her good work and her focus on learning, is not an expert on ICT. Olwyn had already made it clear that she regarded this as a very important skill to have somewhere in a school.

The same comment reflected further on Olwyn. The fact that she disregarded the contribution of Teresa, the parent with good technological skills, was instructive. Teresa was the one to whom Maya said she turned when things went wrong and she could not fix them herself. Such an attitude from a busy Deputy Principal may have implied how little she had to do with ICT in the school, despite her supportive protestations. Furthermore, it also suggested that, if a deputy did not know, then perhaps too few people realised just how critical a parent was in maintaining their school's computing machinery and network.

Overall Olwyn appears to have low ICT skills, and an indeterminate student-centred approach. It seems likely that as a long-standing Year 2 teacher she was at least

slightly student-centred, especially if she was still enjoying teaching. It was only possible to take 'two bob each way', and suggest she was average. She claimed to be collaborative, and appeared to have some understanding of why one might do it. On the other hand there was little evidence that she participated in ICT collegial opportunities in more than a superficial way, other than Leanne's view that all ICT committee members were part of the ICT 'team'.

4.5.5 Teacher 5 Paula (Year 3/4)

After 28 years as a teacher covering from Year 2 to Year 7, Paula had been teaching at North Waygo for seven years. At the time of the study she had a split Year 3/4 class, sharing adjacent classrooms with Nora's Year 3 class and an always-open concertina door. Each spoke supportively of the other and it seemed likely that their development and change in teaching approaches were related to their collaborative approach, even though there appeared to be differences in their personal implementations.

Teachers were expected to take classes in to the computer lab for one hour per week. By the time of this study Paula reported that the bookings for the laboratory were so heavy, that there were some difficulties for keen teachers to find additional space to send students in. Paula indicated that she felt that the introduction of this laboratory a few years earlier had represented a major stimulus for teachers at North Waygo.

> PAULA: I can only speak for me but it should have put pressure on everybody. It did to an extent, but on myself because of my age... I wanted to last the distance, and I saw a lot of people that I didn't want to be like. I didn't want to have their attitude, and I knew that I hadn't perfected the craft of teaching because it is always changing... according to the demands of society. {…pause…} I know there's a few people {here} that haven't noticed that!

She described relationships with all but one of her fellow staff members, suggesting that relationships were important to her. It would seem that she is both accepting of change, and willing to speak her mind without reservation, when she feels it is necessary. For example, she was upset at what she saw as the lack of collaborative opportunities in the school:

> PAULA: As a staff we haven't been given the opportunity. I went berserk a few months ago and told Ross {acting Principal} what I thought for 45 minutes. Then I gave him one minute to respond and then I went home. {In summary} I said we do not get an opportunity to talk or plan, and what we do at staff meetings is an utter waste of time.

Ross, a Year 6 teacher until made acting Principal just before the study began, was not unsupportive of Paula's efforts. Some months before she and Ross had been to a course run by a well known primary education consultant, on student-centred teaching. 'I dragged Ross along', was how she described it. In fact the irony of her complaint about the lack of collaboration is that it was probably the relatively collegial nature of the relationships around her school that allowed her the freedom to express her dissenting views and still be accepted.

Her ICT skills were judged as very satisfactory. She was a committee member of one of the state educational technology associations, and was a regular contributor to one of their large listserver lists using e-mail; and she bought a home computer a year earlier which she used for e-mail and web browsing. She admitted a bias against the second-hand '486 machines in her class, and lacked knowledge of Windows 3.1. 'The kids say, I want this image, what do I do? I have to say, I don't know'. She had some justification for her view, as the machines appeared to be relatively lacking in support as well as facilities, compared with the other computers around the school:

> PAULA: Actually there is nothing on there {the 486's}, there is nothing {software} loaded because it needs licences and cost money... and it's too much messing around {to move documents}, even with zip disks, since they don't have zip drives.

Under the circumstances it seemed it was not Paula's ICT skills that were in question but rather her unwillingness to use old machines which she complained could do only half the job. When asked if the school would be better off discarding the older machines, she was aware of the dilemma of lack of access versus lack of power: 'I would almost like to say yes, because it's like having a pencil that is broken'.

Her Change score of 6 suggested a confident participant in the change process at North Waygo. In fact she felt strongly about the issue of ICT adoption and although many of her emotions were supportive (and earned a very high positive score), there were many reservations as well. Overall her score of 6 was indicative of a trade-off over the emotional spectrum, but also it may be that she was a more expressive person than other staff, who reported more of her emotions more strongly.

Her teaching and learning principles were undergoing change, and had been doing so for a few years.

> PAULA: …probably in the last couple of years. I was really disenchanted with standing in front of the class and telling them what I knew. Suddenly what I did

> know was irrelevant, and I felt I knew nothing about the present world; and what I used to do as a teacher did not make sense.

She had been to workshops on using ICT in schools and on student-centred teaching; she mentioned Canadian Principal Jerry Smith and popular Canadian presenter Lane Clark. Paula characterised her orientation as learning-centred not technology centred. For example, she would often refer to learning applications, when asked about how she was using LT in her class:

> PAULA: well... integrating it into the curriculum.... empowering the kids to learn. I use Lane Clark's thinking wheel with them. Whenever they do anything they use some of those tools; they use de Bono's six thinking hats {and} they are aware of Gardner's multiple intelligences.

Paula was already undergoing significant changes at the start of the study, and her willingness to be part of the study was attributed to her interest in collaboration and support, regardless of its origins. She had attended a wide range of PD on student-centred learning activities and ways to use LT in the elementary classroom as a means of helping her along her particular path to renewal. She was prepared to speak out on issues to do with teaching and learning, on which she was apparently becoming more assertive. Since relationships were important to her, it would seem that she has provided some positive leadership in the ICT adoption field at North Waygo PS.

4.5.6 Teacher 6 Ross (Acting Principal, from Year 6)

Ross arrived at North Waygo in 1998 as a Year 6 class teacher. In March the next year, the previous Principal left, so Ross was appointed acting Principal in her place. He had been a participant in the Teaching and Learning collaborative group that Leanne had started, until his new role. He saw value in the study because he agreed with its principles. He commented in interview on his belief that 'you can't get enough teaming ', and was interested in the feedback the study might provide on how they were going as a school.

Ross seemed reserved about improving his computer skills, and would have been the first to admit that they were lower than he would like 'no-one feels less like a computer user than me' yet he said that he used the computer on his desk for a variety of admin functions and usually checked his e-mail daily. He answered e-mails, but tended not to initiate them, explaining that he preferred to use fax or mail. He argued out that pressure to use computers came from the top, and felt that 'the

leaders in our hierarchy, from the District Director to the Director General, are well aware of the possibilities of technology'.

His attitude towards computers appeared restrained. The problem, he explained with a smile, was that, 'older people like me need energy to make changes like this!'. Nevertheless, despite any personal reservations he had, Ross was apparently very supportive of learning technology within the school. He described that he saw a number of good staff who were using LT in educationally justifiable ways, who deserved his strongest advocacy.

When problems arose, he needed all his communications and negotiation skills. For example, he elucidated the difficulties that the staged upgrade of the computer network had caused, when only one block had been networked in Stage One. 'When we networked the Senior {classroom} block, it tore the staffroom apart'. Although all staff had agreed with the *principle* of networking in stages, when it actually happened, it appeared that only some of those who had been upgraded were using their computers, whilst others were not. Some of the staff in un-cabled blocks were displeased and it exacerbated frustrations. Ross felt the full brunt from some unhappy staff. One of his reactions, he explained, was to investigate the proactive possibility of telescoping the funding for the remaining two blocks into a single year, or at least prepare such a position for the new Principal.

Ross' Change score was 0, a balanced and even predictable score under the circumstances. He was one of only two staff to feel 'often supported' during the process of adopting ICT at his school, but was the only one who felt 'often disappointed' and 'often sad' about the adoption process. This would suggest that he may have been taking the role of acting Principal very seriously, including its frustrations, but that he felt supported whilst doing so.

Towards the end of the school year, as negotiations were under way to appoint a new Principal for the school, some staff confided that they had asked that Ross be appointed to the substantive role. Although he expected to go back to the classroom again the next year, it would seem that he had correctly identified that his staff were supportive, and in more than just ICT adoption.

As acting Principal he felt an obligation to ensure that the school was set conservatively for the next Principal ('I am enjoying the challenge but it is not really

very satisfying'). However, he also knew that he needed to cater for his staff – 'some of our staff are top people, and yet how can I give them thanks when I have such paperwork loads?'

He felt strongly that one of the big challenges facing the school was lack of time for PD. One of his solutions was to try and 'buy time, through teacher relief'. He said that time was their single biggest asset, and that was the only way they were going to get to more PD, which many of them wanted to go to. He was aware of the irony that time pressures caused for groups of good teachers, which in paraphrase was, 'the ones who know what a good job you do, and could act as supporters, are too busy doing the same as you in another class, and risked never getting supported either'.

Ross enunciated some of the big challenges facing a Principal, including the recently introduced Curriculum Frameworks material, recent Languages Other Than English (LOTE) obligations, tighter accountability policies and practices and the need to make better use of learning technology. Coupled with this was pressure from parents for information, and to keep the school current. He was responsible for re-energising the peak body in the school, the School Decision-Making Group. He was encouraging more parent involvement, 'including some young blood from the P&C (Parents & Citizens Association)'.

In summary Ross appeared to have a considered and balanced view of the tradeoffs needed to be a Principal, especially with ICT. Although he appeared to personally lack confidence in ICT, he attempted to both support and develop teachers and to optimise their time in classrooms. He agreed it was a balancing act, concluding, 'you can't teach and not take risks'.

4.5.7 Sam (New Principal, 2000)

On the one hand Sam was only marginally relevant to the study as he arrived after it formally concluded, but some of the final data collection has been early in his principalship, and he had already reacted supportively to staff interest in collaborative activities. On the other hand his different style apparently caused concern for some staff, as he appeared affable and even indecisive rather than assertive and prepared to insist on standards.

His change score was 15—very positive but very different from the rest of his leadership team. It was also an understandable score as Sam had a much more

technological bent than any other senior staff. As examples he had been a well known attendee at Ed Tech conferences in the previous ten years and made good use of the computer on his desk. Also one of his proposals was to reduce the data entry load for a school when a new student arrived by integrating and sharing of student information between the various databases.

Sam had not attempted to change anything seriously, as he reported being impressed overall with the staff and the school when he arrived. Just before the interview he reported that his leadership team had paid for a whole school PD day with a well known visiting elementary school consultant at the start of the school year. It was very well received by staff and parents who attended, he felt. It had not been followed up yet, but may be later, he said.

4.6 Summary of the North Waygo teachers and school at the opening of the study

North Waygo Elementary School staff possessed a range of beliefs and approaches, but they were generally a positive and supportive group. It had some very collaborative staff, some assertive ones, some avoiders of ICT and a supportive if slightly un-technological management team. Generally teachers appeared to be prepared to speak their mind and some were even prepared to pay their own way on courses about teaching and learning.

In this school the ICT coordinator role fell to a staff member—Leanne—who had a strong learning focus, was supportive of other staff and self-directed, but rated as less strong on the ICT skills side. Leanne seemed to create opportunities to get staff working together, and has had some good successes. Her efforts had led to the school having good technical support systems and people in place. They had a computer lab, a commitment by all staff to take their students there and part-time support people who helped once they were there.

Ross, the Acting Principal, was also supportive with a good handle on the expectations he needed to meet and those that could wait. His support team was relatively weak from an ICT perspective in that he felt under-prepared and Olwyn was relatively cynical and apparently misunderstood the message being pushed by ICT staff on the role of ICT in their school.

Rich collaborative opportunities had been created in the school by the structures like job sharing and split grades. These were further supported by many staff, as evidenced by the fertile social activities and the willing attendees at regular after-school activities and meetings. These reached fruition in teachers like Paula and Nora who were both making noticeable progress in their ICT usage and were demonstrating relatively student-centred approaches to learning.

Occasional conflicts were detected between ICT coordinator Leanne and ICT support person Maya. Maya argued that Leanne showed some lack of ICT interest except where it met current educational needs. Maya took the understandable view of an IT specialist and argued that since many staff lacked some key IT skills they would not be able to provide the ICT leadership their students needed.

E-mail contact was attempted over the study period with the ICT coordinator and four of her technology committee and replies were received only from Maya, Paula and Ross. If e-mail had value as a collaborative tool, then its relatively low use in a school that appeared otherwise strongly collaborative suggested either a lack of collaborative skills or technological ones. It was strange that Leanne appeared to be choosing to forgo an opportunity to provide role-model support for the very collaboration that she so keenly espoused. This seemed to be a missed opportunity at NW, but perhaps it was compensated for by all the other ones described.

The recognition at NW that most teachers needed significant help and support to actually translate their willingness to practise ICT integration into action was a laudable initiative. Their actual funding of a shared planning time at each term start was expensive, elegant and practical, and implemented towards the end of the study. It indicated a sophisticated stance towards addressing the predictable but rarely addressed teacher concern of lack of support at planning time.

Although only limited formal support was available for staff (Maya 3 days pw and Leanne 1/2 day pw on average) it seemed certain that the school was making progress. ICT adoption was proceeding, but the development of the more reserved teachers was not being addressed given her propensity for ‘carrot-only’ solutions and her unwillingness to pressure unwilling teachers. Overall the school focus seemed to be on all students and good planning for integration of ICT, without directly approaching the ‘weaker’ staff in their dilemmas about ICT. It was perhaps

instructive that Leanne recommended at the end of the research year that the school appoint a full-time support person the next year.

4.7 Comparison of the two schools – Survey responses

All the case teachers returned their questionnaires but only a few of the rest of each school's teachers returned theirs each time. Table 4.3 provides a summary of the returns for participating and non-participating staff at each school for both surveys. The small number of non-participants showed that there were indeed some differences between the two groups if only in interest levels. At RS a large proportion (an average of 80% of the teaching staff) of the school staff replied. Although a much smaller proportion replied at NW (an average of 45%), there were other arguably more substantial signs of interest, such as the ICT Committee which contained another 5 teachers and the Teaching and Learning Committee's total of 10.

Table 4.3: Questionnaires returned by Participants and non-participants

	Regis Street returns		**North Waygo returns**	
	Participants	**Non-Participants**	**Participants**	**Non-Participants**
Survey 1	8	5	6	5
Survey 2	8	4	6	2

Overall these facts suggested that there were keen teachers in both schools, as might be expected at any school. At NW it seemed likely that the size of the committees and the support from ICT staff and the Principal suggested a largely positive school overall.

4.8 Comparison of the two schools – The Experience of Change instrument

All interviewees completed Ainscow's Experience of Change (EoC) instrument (Ainscow et al., 1995). The administration of the instrument was described in Chapter 3 as quick and quite easy. In essence the participant was shown four empty piles named Often, Sometimes, Hardly Ever and Seems Irrelevant and handed 24 word cards randomly arranged but with the first card being 'comfortable' or 'pleased', and two extra blank cards on the bottom. They were asked to allocate the cards to one of the four piles. The allocation process took a few minutes but then allowed the calculation of an EoC score and always led to useful discussion.

The scoring process is explained in some detail here to allow greater clarity during the further discussion of the teachers' scores below. Each teacher rates each pile from A (Often) to D (Seems irrelevant) and is then added to a matrix of all the teachers with the 24 feelings down the left and the individual teachers given a column each. The data are provided as Appendix 5a, but a subset is provided as Figure 4-1, so that the mechanism and the value of the instrument will be clear. The 24 feelings are recorded in order from Strong Positive, Positive, Negative to Strong Negative. Only the middle two sets of words are used in this example. The simplicity of the instrument is that only the words which are given an Often rating are actually counted as significant. Thus the scores for each person in this example are simply the number of feelings rated as A (Often). Scanning Figure 4-1 shows that Teacher A with 2 As in the positive region and one A in the negative region scores 2 – 1 = 1 overall; and Teacher B with one in each area scores 0 overall.

Rating	Teacher / Feeling	Teacher A	Teacher B	Frequency count
+	Comfortable	D	B	0
	Pleased	A	B	+1
	Interested	A	A	+2
	Satisfied	D	B	0
–	Worried	B	C	0
	Confused	A	B	-1
	Disappointed	C	B	0
	Irritated	D	A	-1
	Score	2 – 1 = 1	1 – 1 = 0	Profile

Figure 4-1: Extract from the Experience of Change Aggregate Profile Matrix

On the real instrument it was a little more complicated as any of the sixteen stronger feelings (eight positive, eight negative) were allocated twice the value. This meant that the maximum score was 8 x 2 + 4 = 20, and the maximum negative score was –20.

When all the data for all teachers was assembled on a single graph it provided what Ainscow, Hargreaves, Hopkins, Balshaw, & Black-Hawkins (1994) call a profile. The two schools are compared with the profiles of both schools given on a single graph as Figure 4-3.

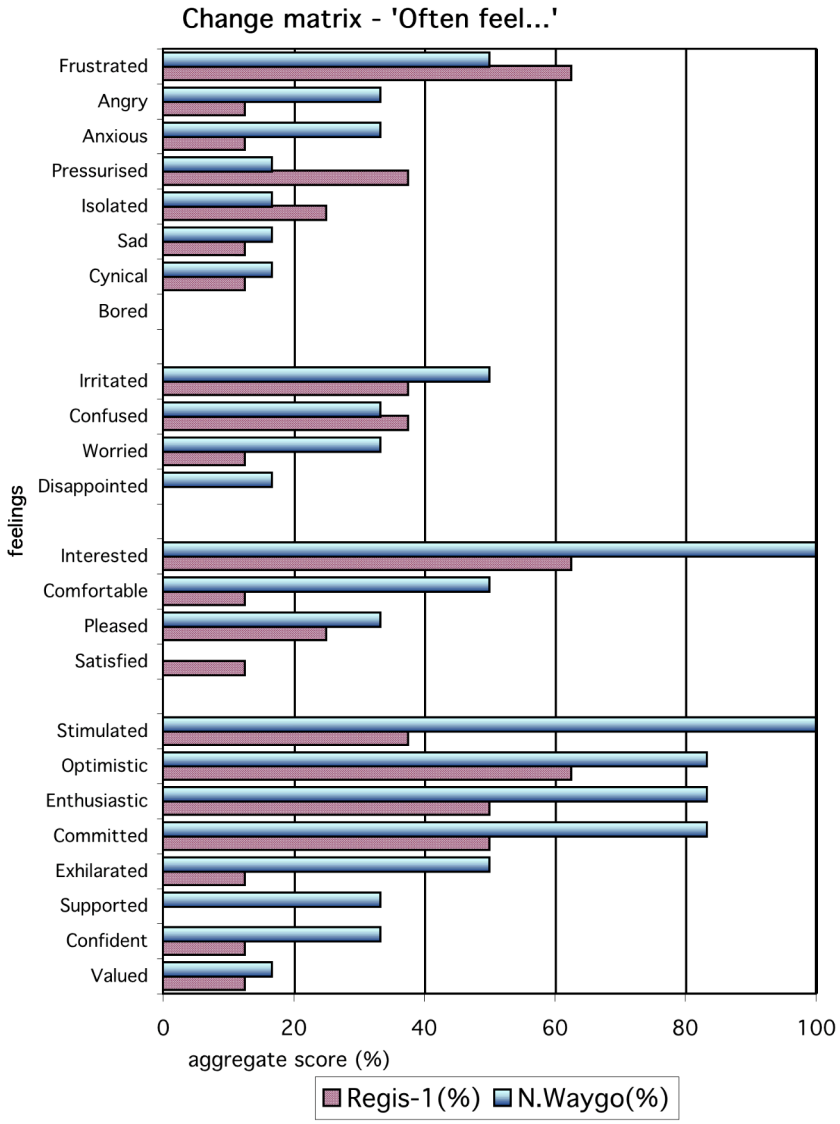


Figure 4-3: The EoC scores of the two case schools showing the percentage of staff rating each feeling as 'Often'

In summary there was a noticeable number of hatched bars representing teachers from RS in the negative emotions regions. In fact one of the highest scoring emotions was in the strong negative zone for this school. This was in contrast to the graph of teachers from NW where there were more positive emotions represented. It was also evident that there was much more commonality of feelings at NW, since the scale of 100% is achieved more often by the NW staff than by the RS staff.

The EoC scores for RS staff were also measured at the end of the research, and both early and later figures are graphed together in Figure 4-5. The significant change in

overall scores by most staff (the average moved from 1.5 to 7.5) is evident in the summary graph.

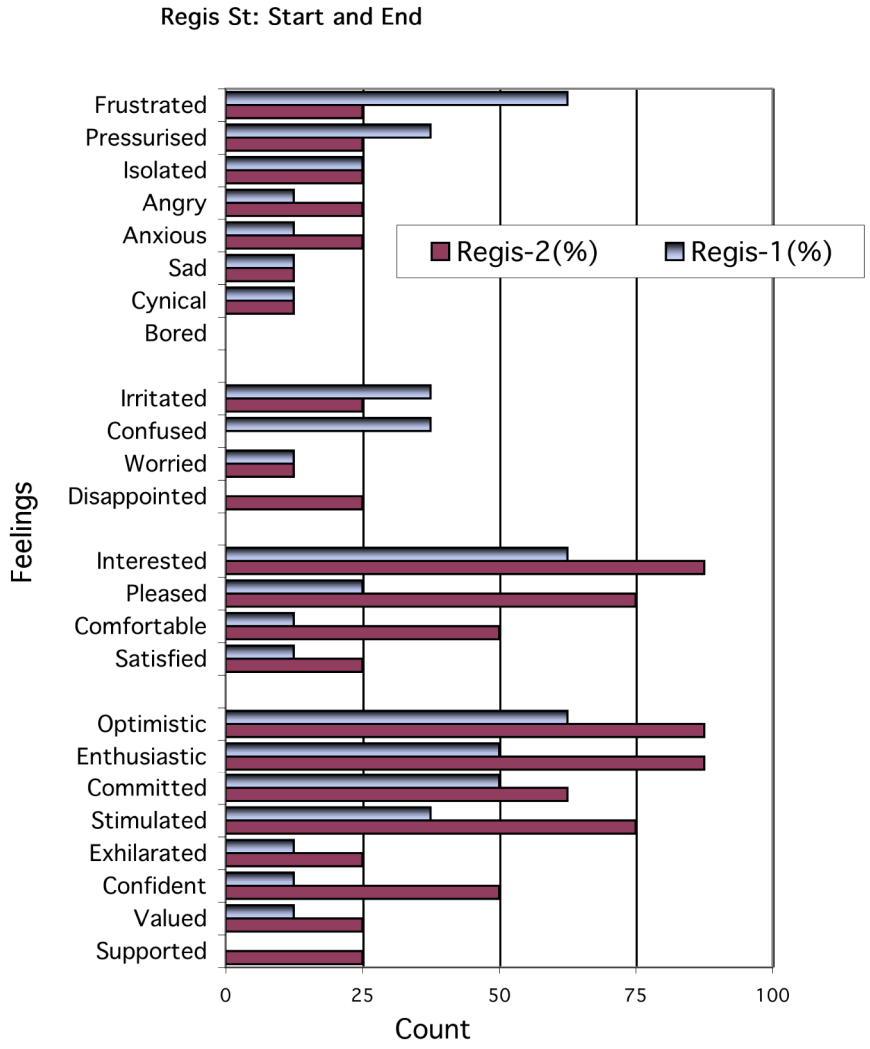


Figure 4-5: Comparison of initial and final EoC scores for RS school staff, sorted within the four groups on the initial scores.

The most obvious variations were the increase in reported positive emotions, especially the changes in Comfortable, Pleased and Interested as well as those feeling Stimulated, Enthusiastic and Optimistic. There was a drop in the number of those reporting negative feelings, especially Frustration and a greater consistency between teachers, for example at least 6 of the 8 respondents agreed on five positive feelings namely Interested, Pleased, Optimistic, Enthusiastic and Stimulated. An underlying level of negativity is evident but it is interesting to find that six of the entries are due to one person namely David.

4.8.1 Conclusion

Both qualitative and quantitative data have jointly contributed some rich descriptions of the participant teachers and their situations, and to an understanding of the settings in which these case teachers found themselves. At RS the atmosphere was a combination of positive and negative, with some corrosive relationships undermining much of the opportunity for collaboration and other activities which rely on goodwill. There were a number of staff willing to work together and support each other but they did so under occasionally frustrating conditions. The Principal therefore had a comparatively difficult challenge to encourage any teaming or collaborative approaches. His second role of ICT support was harder to implement in the circumstances and required that he provide firm direction and incisive decision-making at a time when he wanted to encourage warm and friendly support to his staff. At NW there was apparently more socialising and greater levels of interaction and sharing among the staff, and the ICT support roles were distributed across three other staff rather than the Principal. Although there was still wide variation in the level of ICT usage at NW, overall these factors meant that the Principal at NW could play a more supportive rather than a reactive leadership role.

The next three chapters build on this information to address the three research questions on collaboration, an outcomes orientation and an ICT uptake process.

CHAPTER FIVE

COLLABORATION AND ICT UPTAKE

Introduction

This chapter describes the various ways that collaboration was seen to support the adoption of ICT for the teachers in the study. The chapter aims to answer the first research question, namely 'How does collaborative activity support teachers' ICT uptake?' It begins by looking at factors that helped and hindered collaboration at the two case schools. Next the range of types of collaboration identified in the literature review are presented, contextualised and categorised.

The findings show how the various collaborative forms appeared to affect teachers' attitudes towards ICT, their teaching ideas and pedagogical approaches. From these findings a series of assertions is presented to help present the analysis for this dataset in a clear and realistic way. Finally, the chapter considers how these changes manifested themselves in changed uses of ICT in their classrooms.

The chapter closes with a summary and considers the ramifications of these changes for ICT coordinators and ICT support staff with ICT in schools and classrooms like those of these case studies.

5.1 Investigating collaboration and teaming

Many a drama student has been taught that 'you cannot *not* communicate'. Similarly collaboration was seen to have many shades in its practice. It is to be expected that teachers in a school could be collaborating on something much of the time. This research was more concerned with the variety of collaboration rather than its simple presence or absence.

Teachers are already busy, leading full and complicated lives, and although people may choose not to work together with someone else at one time, they may then work with them at others. Simply because they are not 'working with' does not mean they are 'working against' them. In this qualitative process, where it is hard and

sometimes less appropriate to differentiate absolutes, relative levels are arguably more useful. Collaboration is therefore regarded as ranging from minimal to maximal, rather than from some, perhaps arbitrary, null point representing no collaboration.

Other words often used to signify collaboration are teaming, collegiality and cooperating. Each of these has rich shades of meaning which overlap the meaning of collaboration, but do not replace it. For example teaming—meaning, according to the Merriam-Webster's Collegiate Dictionary (2001), *forming into an ordered group*—was proposed as a way to encourage teachers to work together in a more formal sharing environment, and one likely consequence was expected to be greater collaboration. Although this project encouraged teaming as a way to encourage collaboration, it seemed quite possible for a teacher to collaborate without being a formal member of a team, and equally that a teacher could be a team member without seriously collaborating.

5.1.1 The teams and their collaboration modes

The participants had indicated to the researcher their interest in ICT uptake. The conditions conducive to successful ICT uptake in this study (as deduced in Chapter 2) were described and they were encouraged to utilise them and adapt them to their circumstances. Multiple methods were used to encourage and support their progress, including: regular appearances by the researcher; references to their reflective journals; offers of help; answering questions; initiating and responding to questions on their progress; helping set up e-mail accounts; reminders of their progress; encouraging visits by and to other schools; ensuring they attended appropriate professional development courses and conferences; requests to attend their team meetings; encouraging the Principals to support PD; and discussions and help in corridors, staff rooms, classrooms and offices.

A key criterion was that they were to use collaboration as a method of easing the perceived difficulties of ICT uptake. It was to be expected therefore that multiple instances of collaborative activity should be identifiable in different forms and under a variety of circumstances. What is of interest is not the fact that collaborative activities were found, but the extent of their range, their variety and their consequences.

This project was concerned with encouraging participants to collaborate, and one obvious way to do so was to encourage the formation of teams. Collaboration however is not just being in a team, and the team membership is only a means to an end. Therefore it was important to note the development of both teams and individuals. For example, it may be that some individual's virtual, e-mail or Internet list collaboration could be identified which was as useful as any identified teaming. The participants at the two schools were grouped according to whether they were part of a team, or participated as an individual.

The forms of collaboration amongst the teachers were identified through an analysis of the content of the textual material from all the participants' records. These included transcribed interviews, journals, e-mails and notes. The notes—in the researcher's diaries— consisted of casual comments made to the researcher as a supportive observer, a familiar part of the environment in a school. As well as the textual interview material there were also records of staff room, playground and classroom observation, either made by the researcher or volunteered by other staff members, which were used to substantiate the expressed record with actual or reported observation. This does not mean that every instance was recorded but the provided range of observations and material offered sufficient data triangulation and conclusions are made based on such weight of evidence that the reader could make the same judgements as the researcher.

Table 5.1: RS & NW participant teachers and their teaming at start and end of the study

RS Teams	Teacher	Notes	Teaming at end?
RS-Team 1	Christine	Team never gelled as others withdrew, collaboration between them minimal; Christine later described as very helpful the support she received via an Internet Listserver	N
	Iain	withdrew immediately after starting	N
RS-team 2	Ann	Willing, but other team members sporadic; began 'Consulting-mentoring' collaboration with the researcher	Y
	Evelyn	Sporadic teaming with others, attended PD only; argued that she 'did not have enough time', and 'medical problems'	N
	David	David initially withdrew, but then continued to talk with Ann and participate occasionally	N
RS-Team 3	Gail	Tandem pair, who have shared Gail's job in various proportions for previous 3 years, very collaborative	Y
	Fiona		Y
NW Teams	**Teacher**	**Notes**	**Teaming at end?**
NW-Team 1	Paula	Third year of adjacent classes, started team teaching and leaving the room divider open two years before this research started	Y
	Nora		Y
NW-Team 2	Leanne	In a tandem, but also many NW staff were part of the IT committee 'team', described by Leanne as 'very collaborative group'	Y
	Wendy	Tandem pair—'Wendy 'tends to follow my lead'' said Leanne	Y

Table 5.1 above is a series of extracts from the descriptions of the teams and their component individuals recorded in Chapter 4. The table summarised the teams at each of the case schools, and whether they changed between the start and end of the research period. A similar table, Table 5.2 below, was comprised of all those who remained outside a team by the end of the research, including administration and leadership staff.

The final column of Table 5.1 indicates whether the team continued up to and beyond the end of the research period. It can be seen that there was a lot more stability at North Waygo, where no teams changed, than Regis Street, where every team except one (Gail & Fiona) changed in some way. Some reasons for this will become clear shortly.

Table 5.2: Case participants (both schools) not in teams at the end of study

School	Name	Notes
Regis Street		
RS-Indiv 1	Brenda	Participation minimal, handed in empty reflective journal at end
RS-indiv 2	Iain	After initial agreement to participate, withdrew completely
RS-Indiv 3	David	Continued to meet and share with Ann occasionally
RS-Indiv 4	Evelyn	Never met with Ann other than their PD sessions
Librarian-support	Heather	Willing to work and share but felt it was not given enough emphasis
Principal	Jerry	Supportive and very ICT aware, with relatively laissezfaire approach to professional development
North Waygo		
NW-Indiv 1	Olwyn	Part of the ICT committee, and therefore the whole team, nominally
ICT support (p/time)	Maya	Keen and competent ICT user who wanted all the other staff to use ICT well. Enthusiastic and even pushy support person
Principal	Ross	Highly supportive and collegial, but in Acting role only, so felt restricted

The teams: Regis Street

At Regis Street Elementary School a total of ten staff were initially involved. The three initial teams (recorded in Table 5.1) were

- Christine and Iain (RS-Team 1),
- Ann, Evelyn and David (RS-Team 2) and
- Gail and Fiona (RS-Team 3).

Christine nominated Brenda as well but she never formally teamed with anyone, although she was happy to be interviewed. These three teams comprise seven people, leaving three un-teamed individuals (see Table 5.2). They were Brenda; Heather the librarian/ICT support; and Jerry (the Principal). Because Iain withdrew almost immediately and would not be interviewed, a total of nine participants were recorded formally in the data collection for Regis Street (see the first half of Table 5.1 and Table 5.2).

Christine's team RS-Team 1 did not make progress as a team. Firstly, Iain withdrew, saying only he was too busy to participate. The staff generally saw Iain as a reasonably competent ICT user who provided some intermittent ICT support around the school, and he did continue to help some staff occasionally. After Iain's withdrawal, the researcher reminded Christine that she had written in her Clearance form that she was happy to team with anyone, and asked what she might do about making or joining another team. She said she would 'deal with Gail and Fiona

instead'. In their final interviews Gail and Fiona reported that nothing collaborative about either ICT or working on their skills with the DoE(WA) Outcomes initiative occurred with Christine.

Christine described the collaboration that eventuated in her 'team' as minimal. Her diary described forwarding some information about one of her Internet projects to Iain, and this relatively low-level act seemed to characterise her approach to collaboration, namely the process of either forwarding materials, or finding answers to her own problems. She later described the support she received via an Internet list (which she joined as a result of this project) called the 6-7 Nexus {a pseudonym}. The researcher engaged Christine in conversations about activities for her team and her students emailed her and her class a number of times and discussed with her the Team Ideas List (Appendix 4) but it appeared that no suggestions were ever taken up. She appeared to have definite ideas about what would work, and eventually selected two long-term activities that she learned of through one of her two Listserver memberships. One was an e-mail and postcard exchange program, the other was based around school e-pals idea called Friends and Flags, and she used them for the rest of the year. She later indicated that she found her Listserver memberships, 'very, very supportive'. Even though her observed level of collaboration was low, by the end of the research period she was obviously making significant use of her list for collaborative activities.

In team RS-Team 2, David withdrew formally, but continued to talk with Ann and even to walk to a nearby coffee shop for lunch and a chat, very occasionally. Evelyn's membership was almost unconnected; she talked occasionally in the staff room but never met with Ann other than at their chosen PD sessions. Later she agreed that she was not really part of the team, though she pointed out that Ann had been supportive and tried to engage her interest on multiple occasions. Ann on the other hand began what is described using the terms below as a consulting-mentoring collaboration with the researcher, which continued after the formal research period ended. Most weeks Ann would ask questions, seek clarifications or ask for help with the beginning of some new project that she was considering starting.

Gail and Fiona, in team RS-Team 3, were a tandem pair, who had shared Gail's job in various proportions for the previous three years. They talked on a very regular basis, and showed interest in using ICT in their class when they could. Fiona seemed

less pressured than Gail, partly as her children were much older, but both took responsibility for tasks at different times. For example Fiona was the teacher on duty the day the researcher arrived, and agreed, on Gail's behalf as well, to participate in the research—'She'll do what I say!', was her breezy conclusion. On the other hand it was Gail who instigated and demonstrated their first research booklet, so they seemed to share responsibility for their ICT activities.

They appeared to get on very well, and were even prepared to call the other from the staff room telephone to caucus on topics from student infractions to planning and teaching issues. Although they split the job hours equally, it was obvious that they also put in many hours on the preparation side, which suggested that they might be quick to collaborate on this research project. The researcher attended some of their weekly hand-over meetings, and their planning meetings on Saturday afternoons, and was invited to suggest appropriate ICT and outcomes-based activities for them to try. After some weeks of talking freely and meeting regularly, they initiated one long term project during the research period. It was a weather exploration booklet, based around some photocopiable resources Gail had bought a few weeks earlier. She had found it in the staff room whilst perusing a visiting bookseller's displays.

The teams: North Waygo

At North Waygo Elementary School, a total of seven staff were involved, two teams namely Leanne and Wendy (NW-Team 1) and Paula and Nora (team NW-Team 2), Olwyn (NW-indiv1) who was an interested member of the ICT committee, and Maya (ICT support) and Ross, the Acting Principal (see the second half of Table 5.1 and Table 5.2). Wendy was in a tandem arrangement with Leanne, but she was never introduced to the researcher and was never interviewed. The researcher was not made aware of Leanne's tandem partner until the end of the second interview. She was neither explicitly mentioned nor named at any time.

Paula and Nora (NW-Team 1) were in the middle of their third year teaching next to one another and were already learning to work together. Their collaborative activities were the most advanced of any individuals in the school, in the opinion of Leanne. They continued to develop over the research period, and were easily rated as two of the higher-level collaborators in the research study.

Leanne and Wendy (NW-Team 2) were in a tandem partnership, but Leanne never included Wendy in her conversations about staff using computers. When this was eventually drawn to her attention, Leanne said that Wendy 'tends to follow my lead'. She was not a formal member of the ICT team that Leanne introduced at the start of the research period. As a follower Wendy was probably not instigating any significant ICT activities and she was probably a minimal user or perhaps even an avoider of ICT. Tandems are encouraged to split the workload on a time basis rather than functional criteria, although they could be expected to allow their own specialisms to determine some of the subdivision of work. In general Wendy would not be a participant in any of Leanne's committees, as she would be 'off' on those days when Leanne was 'on', unless she chose to come in to school on her own time. Leanne, however, was not only ICT coordinator but also had an administrative allowance as a Level 3 teacher that she chose to put back to her school as ICT support. She chose to give much of her ICT support time to her own class on the days that she was doing support. These facts suggested that she was the specialist in that area for their tandem, and stronger than Wendy at integrating ICT into her class activities.

The Individual teachers and support staff

Not all the teams remained intact. However there was no evident 'falling out' or disagreements that caused their decline. Those who were not working regularly as part of a designated team were categorised as non-team members and are described in this section.

The non-teamed participants during the majority of the research were, at Regis Street, Brenda, Evelyn, David, Christine, Heather and Jerry (Principal); and at North Waygo, Olwn, Maya and Ross (acting Principal).

Brenda at Regis Street was prepared to be interviewed, and did this without difficulty, but did not participate in any of the proposed team activities. She handed her empty reflective journal back at the end, with a short note saying simply that she had not done it.

David's ambivalence towards ICT, his clear preference for some peer collaboration and at the same time his avoidance of any formal work with outsiders or parents seemed to drive his participation. He worked next door to Ann and apparently found

her easy to talk to, saying in interview, 'I've worked with Ann a bit this year, in various things.… sharing ideas… Oh definitely {useful}. Yeah.' Ann appeared to find him a supportive 'critical friend' during the research period, but she also commented on how their relationship was more talk than action.

Evelyn and Ann were an obvious pairing at RS as they taught the two junior grades. Both were older, experienced women. Geographically, however, they were the two most distant classrooms on the school grounds, and Evelyn argued that this was only one of the factors working against their collaborating:

> But because I'm down here, and Ann is over there; and when I'm on duty she's not; and so on. I wish we could have some time in our programme to get together and learn a bit more. (1:224)

Despite her wishes, Evelyn found no time other than the two formal PD sessions they had agreed to attend and some staff room talk, to do some of the getting together than she apparently craved. She alluded to personal health problems and extreme tiredness at the end of the day, which stopped her doing more. She began to avoid the researcher in the RS staff room rather than admit that she had not done any collaboration with her formal team members, or made any entries in her reflective journal. Later she explained that a medical condition, Late-Onset Diabetes, was the major cause of her tiredness. It seemed that she was part of the team in name alone, and it was difficult to rate her as collaborative.

Heather took some role in ICT support, as she had some computers in her library including one on the Internet. Because of some interpersonal differences, indicated in her vignette in Chapter 4, she was not likely to collaborate with all the staff, and so could not be rated as very successful in the breadth of her collaborative effort.

Jerry, although he had ICT as a priority, tended not to impose and argued that it was best to let teachers make their own way with classroom use of ICT. Nevertheless he was active in many ways around the school, dealt with many staff and was supportive of the collaborative activities proceeding in his school.

At North Waygo, Olwyn (NW-Indiv 1) was nominally part of the whole team, as Leanne nominated everyone on the ICT committee as a team member. Olwyn was certainly seen at both meetings that the researcher attended, but seemed reserved compared with the rest of the committee. She sat quietly, she contributed rarely to the discussions about ICT, and when she did her comments were those of a novice.

Reasons for this relative isolation included the facts that her career end was impending because of her age, she was in a position of power as a Deputy Principal and yet she was the most reliant upon Maya for her support during her ICT class time. Her comparatively traditional views about the use of computers in schools have already been described (see her vignette in Chapter 4).

It might seem unreasonable to classify Olwyn as an individual rather than in a team, since she was on Leanne's IT committee, but it would be just as inaccurate to say she was teaming. As a deputy she had some administrative release time of approximately a day and a half each week, when another teacher took her class, but she never mentioned how this helped her collaborative effort nor did Leanne. It was not evident that some regular pairing or structural arrangement provided on-going support for her increased adoption of ICT. She was not using the Internet in any significant way and certainly not for any collaborative opportunities (for example she never replied to an e-mail approach by Ann to talk about ICT in their classrooms and rebuffed Ann's phoned attempt, saying she was too busy) and therefore she contrasts with Nora and Paula who were observed teaming. Despite Leanne classifying her as a member of the ICT team, she could be classified as a team of one, and her contribution would have been the same.

Both Maya (part-time ICT support) and Ross (Principal) attempted to provide support across the staff, albeit for vastly different reasons, and they were regularly observed or reported by other staff as doing so. They made active contributions to both the IT and the Teaching & Learning committees, and showed their interest in staff progress with ICT.

5.1.2 Views on collaboration

The views on collaboration of every case participant were distilled into a table, and each was allocated an approximate subjective rating (Low, Medium, High) for the perceived amount of collaboration that person engaged in over the course of the research, either with other staff, the researcher or both. These views and their rating were recorded—in Table 5.3 below—for all participants. Although the rating was subjective it was based on factors like the representative comments of Table 5.3.

The table served two purposes. Firstly it showed that the levels of collaboration (indicated in the last column) varied across the teacher populations of the two case

schools, but it was also obvious that while the full range of levels occurred at RS, at NW all teachers rated as High except one—Olwyn—who rated Low. Secondly, it showed how very different their views about the collaborative nature of their school were. Referring to columns three and four, RS teachers showed much less accord about the collaborative nature of their school compared with NW teachers. Nearly all RS teachers rejected the suggestion that theirs was a collaborative school and none agreed with it. NW teachers were much more supportive of the suggestion, though their views included one No. Ironically this was from Paula who was rated as one of the most collaborative teachers in the school.

Table 5.3: Regis St and NW. case members views on and observed levels of collaboration (sorted on Level of Collaboration by school)

Regis St.	*Role*	*Is yours a Collab've. School?*	*Comment or quote extracted from interview*	*Observed Level of Collaboration*
Brenda	Teacher	No	Collaboration is only a new issue and, NO, we are not a collaborative school.. In fact this year we have probably collaborated less than normal. David's puppets were the only example she could think of.	Low
Evelyn	Teacher	No	collaborative work, which is what this is all about, is going to be one of the best things we can do. But because I'm down here, Ann's over there, etc, we can't do it	Low
David	Teacher	No	I'd say not	Low
Christine	Teacher	Somewhat	Iain and I would chat occasionally; more teaming would be a good idea, buddying may be as well.	Med-ium*
Ann	Teacher	No	not for want of trying	High
Fiona	Teacher	No	No, because I don't think we do a lot collaboratively... I don't think the others out there are anti, I just don't think it's come up much. No I'd say not.	High
Gail	Teacher	No	I think we are trying to be, but I don't really think that we are— No, not really.	High
Heather	Librarian	No	No, not in the sense that I'm used to	Medium
Jerry	Principal		*Lack of evidence, but attitude singular eg:* I decided to get myself really involved in that {the School Fair}	Medium
North Waygo.	*Role*	*Collab've. School?*	*Comment or quote extracted from interview*	*Observed Level of Collaboration*
Olwyn	Teacher	Yes	definitely	Low
Leanne	Teacher	Yes	working as a team has been a key. And this term, we have changed	High
Nora	Teacher	Somewhat	I already participate in teams	High
Paula	Teacher	No	we are not *allowed* to be a collaborative one	High
Maya	IT support	Somewhat	I did collaborate with people; but, whatever we discussed wasn't taken on. Like some adopted it, some didn't	High
Ross	Principal	Somewhat	we have some committee structures that can help; it is certainly important..	High

**observed rating was Low, but this failed to include her on-line collaboration with one of her listerver lists*

Assumptions about collaborating

This research argued that supporting the formation of teams was a viable way to help support collaboration with ICT uptake in a school. This presumed that teaming was likely to lead to collaboration; and that people already teaming in one area could be expected to use this existing goodwill to support ICT adoption. These presumptions, as well as the fact that not everyone wanted to collaborate, warrant further exploration. Also, noticeable differences were detected in staff attitudes between the two schools, as summarised earlier and in Table 5.3. These topics are investigated in the following sections, beginning with systemic factors and ending with specific differences between the two case schools.

Both schools were in the same school district and hence shared the same District Director. They had the same pressures and District Office expectations bearing upon them. The researcher saw the District Director at both schools making his presence known, and reviewing performance management data with both Principals. This suggested that many of the more important differences would have been detectable at the school level. The most noticeable systemic factors bearing on these differences between schools were:

- at Regis Street, a Principal whose concerns were to provide good technological resources for staff to use as they saw fit, but who wished to allow his staff the maximum control over their own classroom; the role of ICT coordinator was undertaken by the Principal; there were strong differences of opinion between the acting Deputy Principal and some staff—including the Principal—which appeared to have ramifications for many of the collaborative activities there; and
- at North Waygo, the role of ICT coordinator resided with a staff member other than the Principal. Also, the strength of their supportive culture was noticeable, fostered particularly by the ICT coordinator, the ICT support teacher, the acting Principal, and the committee structure at the school. Finally the acting Principal was relatively less comfortable with ICT.

The characteristics of schools are also determined to an important level by the interests and capacities of the staff working there. These differences, and their consequences on collaboration in each case school, are presented and discussed in the following sections.

Issues affecting collaboration at Regis Street

At RS, in response to the question, 'Is this a collaborative school?', Heather replied:

> HEATHER: collaborative school? No, no. Not in the sense that I'm used to…

Of the other interviewed staff at RS all but Christine gave similar negative comments on collaboration (see column 3 in Table 5.3). Some of them nevertheless supported the principle. For example Christine said, 'more teaming would be a good idea' and Evelyn argued that '{it} is going to be one of the best things we can do'. David was prepared to elaborate with his perceptions:

> DAVID: Hmmm I'd say not
>
> *And why is that, what evidence can you give me?
>
> DAVID: It's a gut reaction. My gut reaction is there are personality conflicts, there are people with immense insecurities who are undermining, pushing their own agendas, creating divisions within the school. (1:408)

It gradually became clear that there were indeed some serious divisions within Regis Street. Whether these could be attributed to one person seemed unlikely but later Fiona and Gail both argued this was the case. Rifts in the fabric of personal relations may be common in schools, but David, who had taught in many schools, implied that these were beyond the normal range. Nevertheless these divisions were never mentioned to the researcher by anyone in the initial phases, and the research was well underway before its consequences were evident. By this stage Evelyn, Ann, David, Gail and Fiona were all making some promising signs of progress and Jerry was supportive of the research topic, so it seemed reasonable to both observe and continue.

It was hard to believe that anyone could have been unaware of this divisiveness between Christine and other staff as some later reported it had been evident for at least 12 months. Perhaps it was felt that giving the main protagonist some extra responsibility might somehow reduce the incidents, as she was appointed acting Deputy Principal immediately before the start of this research. Although the divisions may not have seemed directly relevant to any collaborative activities that individuals undertook, nevertheless it was hard to believe that they did not have some consequences for the smooth running of the staff room and therefore this study. Since it was too late to discard the school and look for another, for this reason some aspects of the rifts are expounded in more detail.

One dispute, with initial incidents in 1998, was between Heather and Christine, and appeared to revolve around Christine's concern that i) Heather was not taking enough support classes; and ii) that she was sometimes failing in her professional duties. This culminated in some poorly researched accusations at a staff meeting that occurred during the project, and were reported to the researcher afterwards. Heather described them as 'viperous', and explained that they earned sympathy for her the next day—some cards, and in one case flowers— from other staff who had apparently been totally unaware of how difficult her relationship with Christine had become. Heather had apparently considered taking legal action, and was supported in this view by at least two other staff, and even reported this possibility to Jerry, the Principal. She had decided not to do so by the end of the research project.

A second dispute was between Christine, David and Ann, and was seen during and after one of the staff meetings the researcher attended. Ann had been asked to present during the meeting some options for a new reporting system being developed. She argued that there was a need to be mindful of the existing pressures on teachers and she suggested a principle that no-one should be asked to duplicate work they were already doing. She then presented three solutions from minimal to maximal detail for parents. In reply Christine insisted on making a point about the need for reporting to parents to take a professional stance. It was, she pointed out, a PR document with parents and therefore only the maximal solution was appropriate. She was immediately chided by David, saying he, 'resented her use of the word 'professional' in these circumstances'. He took the view that differences of opinion were unrelated to professional standards, which were definitely *not* under discussion.

Christine's apparent displeasure towards Ann continued after the meeting as well. When Ann had left, Christine announced that she could not stand teachers who, 'only wanted to do the minimum'. Perhaps this interpretation took into consideration the fact that Ann was the Union representative at the time.

This incident was apparently not unusual, and was one of a number reported to the researcher by Ann, Fiona, Gail, Heather and David. They included an attempt by Christine and Iain to corner Ann in her classroom after school one day, which was undercut by an observant Fiona; and Christine interrupting a meeting in Jerry's office between Ann and Jerry, to stand between Ann and Jerry, raise her voice at Ann and accuse her of unprofessional behaviour. Jerry took no action during or immediately

after this interchange, other than to express some embarrassment, which Ann found a rather surprising and reserved reaction. A few months after the research period ended, three of the staff reported that Jerry had arranged a professional conciliator, for a half-day conciliation meeting for all staff, during school PD time. It was to be run by the conciliator, and would attempt to address the issues of the apparently intractable staff disputes at RS.

The purpose of documenting this is not to pass judgement, as some of the incidents were only hearsay. Nevertheless they were real enough to the teachers reporting them, and a formal conciliation meeting is a relatively serious step, which would not be commonly needed in most schools. The significance is only to highlight the relative infertility of the ground at RS, supporting the view that any collegial activities would have been hard-pressed to exert supportive links given the existing tensions between some staff. Furthermore, with the extra stresses caused by such strained relations around a school, it was less likely that many staff would be in a sufficiently relaxed frame of mind to develop and address the changes implicit in a study such as this. This is one of the five key principles expounded by Carl Rogers in his conception of student-centred learning (Rogers, 1969), and it was argued in Chapter 2 that a relaxed frame of mind was just as relevant for teachers' learning as it was for their students.

Relations were so delicate during the research that even a suggestion of formal collaboration was attacked by some staff. Jerry seemed to take seriously the stimulus provided by this research to support staff collaboration. Thus he placed an agenda item for a staff meeting near the end of that year, that staff timetables should be reconstructed so that similar-year teachers could have their DOTT time rearranged so that they could collaborate. Unfortunately he met some stiff resistance. Heather made reference to this during an interview when she was asked about collaboration:

> *I guess {even without that} you could still be a collaborative school; do you have more evidence?
>
> HEATHER: Well, I've been given timetabling to do next year, so that staff of similar year levels can have their DOTT time together, so that they can collaborate. It is a good idea, but they don't like it.
>
> *Really? And why is that?
>
> HEATHER: They were not asked! They were told! It's not like you're being told that you *have* to collaborate, {but} it's just giving you that time option to do it! They are shooting me down, and I'm saying I'm just the organiser! It's not my idea! But

> technically, they should have time to collaborate; and with the librarian, and the art teacher, and so on. Really, everyone is working in isolation {here}.

Lack of time was a related defining issue that could have affected relations at RS. Heather later alluded to it when she pointed out that collaboration was harder without somehow making extra time available:

> HEATHER: I don't see collaboration at all, really. And no time allowances given, either.

Jerry, Principal at RS, blamed the time pressure as part of his rationale for not involving any of the staff in their school's ICT planning:

> JERRY: The staff felt perhaps that because I had more time to devote to thinking about this, they could see that Kris {part-time ICT support, RS} and I had some expertise and understanding about computers, they tended to leave things alone and let me go along with it.

One explanation for his decision was that he was a practical and realistic man, who realised that schools will never have enough time; another interpretation was that he was not sufficiently collaborative in his attitudes. He believed that he was supportive of staff; for example when talking about how teachers should feel during ICT adoption:

> JERRY: There are some {feelings} which are important for teachers to feel: confident, empowered, and to be left alone. To be left alone, to have a go, make mistakes, not be pressured.

Overall Jerry was more confident of his technological leadership than his curriculum leadership, though. For example talking about the curriculum area of Student Outcomes, he was prepared to acknowledge a 'slight' challenge:

> JERRY: I don't think EDWA has trained us well enough in… {this}. I have a slight concern that I need to up-skill myself in that area.

Ann described his willingness to 'leave teachers alone' and his consequent lack of intervention as understandable, given that most of his staff were older and experienced teachers:

> ANN: He basically leaves us alone to do our own things, and I like that—after all I have been teaching long enough and proved my self, I think.

Later she described his laissez faire leadership style as helpful:

> ANN: He was supportive during our recent Performance Management Review meetings. I believe that he said to everyone, 'How are you going and what can I do to help?' I thought that was a very positive approach.

> ANN: Jerry was very good at the beginning. He takes the view that he is there largely to protect teachers from the 'higher-ups' of EDWA.

She felt that he was much more forceful and decisive when it came to less people-oriented tasks, again allowing teachers individual control:

> ANN: Jerry went through the place like a dose of salts at the beginning. One example of many was the keys system when he arrived. It was a mess, and some staff could not even get into their own classes on weekends. He installed a master key system, which gave teachers more control and freedom to do what they wanted.

There was no doubt that Jerry as a leader was able to see what needed to be done and could often find solutions. He found this easier when the tasks did not overlap with individual teachers' responsibilities, and this was made more difficult in the current circumstances. The differences between teachers at RS appeared irreconcilable. They became so stultifying that Jerry was forced to arrange a conciliation day for all the staff to address this issue with an outside psychologist as facilitator.

In summary at RS, two factors have been identified which probably had pervasive effects on the collaboration opportunities at their school. These were the rifts between groups of staff that appeared to have ramifications for many of the collaborative activities there and a Principal whose provision of resources supported and encouraged staff, but who did not consult as much as they would have liked and preferred not to impose his views on staff. Although he wanted to support their collaboration, it is arguable that he allowed staff a significant measure of freedom and responsibility at a difficult time when more specific guidelines and explicit controls could have been instigated.

Issues affecting collaboration at North Waygo

At North Waygo, there were different feelings about collaboration. Firstly the range of comments included ones that were supportive of the collaborative nature of the school (See Table 5.3). Secondly some of the staff were quite determined and positive about possible solutions. Thirdly a number of key staff, including Leanne and Ross, provided their firm personal support towards a collaborative environment. Finally Ross the acting Principal believed that the committee structure, which was well ingrained in the school, was a potential force for supporting collaboration.

Predictably Olywn (NW), who appeared to say what she thought the interviewer wanted to hear—perhaps because of pressure of time in her interview—when asked if hers was a collaborative school, replied:

> OLWYN: yes, I'd say so, definitely.

More considered views came from Paula, whose complaint was about constraints on collaboration:

> PAULA: So that's that. We are not *allowed* to be a collaborative one!

Paula was also prepared to suggest some outlandish solutions to problems— some at a district level:

> …we should have a mass brainwashing; and find out who is doing what and how they're thinking. You can't operate on your own any more.

Moreover, she was prepared to be blunt at the school level, too:

> As a staff we haven't been given the opportunity {to be collaborative}. I went berserk a few months ago and told Ross {the Acting Principal} what I thought for 45 minutes. Then I gave him one minute to respond and then I went home. I said we do not get an opportunity to talk or plan, and what we do at staff meetings is an utter waste of time.

Paula did not feel that the problem was limited to her school:

> PAULA: I have been to visit the teachers at South Balgup, on {District Education Officer}'s recommendation. I went and saw Ken T and Annika K, and had a chat and saw what they were doing. And they felt the same way... it's just hard to find collaborative opportunities.

Another difference between RS and NW was the willingness of some NW staff to take some responsibility for their situation. Maya, technology support at NW, was pessimistic in her assessment, even though she admitted some successes. When she looked back on her efforts she was rather self-critical:

> MAYA: In my support role I did collaborate with people; but, whatever we discussed wasn't taken on. Like some adopted it, some didn't.

Maya described how difficult it was for even motivated teachers to find time to integrate ICT activities into their class programs, as there was no formal time given to such planning. She therefore suggested changes aimed at improving the collaboration:

> MAYA: I went to the point where... well, I had been saying that we need a day at the start of term where we collaborate and discuss your program {and help integrate the IT activities}. So eventually, after a lot of {pause} because of the resources and whatever, they could not give those teachers free time. At the end of the year it happened, I did get time to collaborate with the class teachers.

Ross (Acting Principal, NW) was quick to point out the serious time commitment that collaboration needed to be effective:

> ROSS: Look - schools have two staff meetings and four development days a year. This is not enough. This is half the time we need for participative activities.

Ross saw a challenge for his role as Acting Principal to help balance the need to provide occasional leadership roles for staff, and at the same time show his own lead to the staff. He was reasonably pleased that NW had a well-developed committee structure, which was able to encourage these leadership opportunities:

> This committee structure is sometimes divisive but generally helpful.

Nevertheless, it was also capable of stultifying progress if it was relied upon and otherwise keen people were ignored:

> ROSS: This complicates the Acting Principal role since leadership roles are encouraged by our committee structure. For example… commitment and problem ownership can require more involvement than just forming a committee needs. This is why the committee structure doesn't necessarily always help.

Leanne spoke very positively about the people she worked with, and took a supportive approach:

> LEANNE: But we have a very good team here—do you know Teresa?—she is a huge asset because of her technical knowledge. She can get us out of a lot of problems! … With Maya, and our technology committee, we have a very good team.

A recent initiative, apparently based on Maya's suggestion for joint planning sessions between ICT support person and the teacher, had proved successful. There were three purposes: to provide more of a learning focus to their computer lab use; to improve teacher confidence integrating ICT into their lessons; and to increase the commitment of the teaching staff to using ICT. Leanne described it in positive terms:

> LEANNE: What we have trialled this term is having planning days—Maya and I, with the teachers…. we will set funds aside next year to have {a day's} relief while we have planning sessions with teachers for an hour or so. …It's an I.T. planning session with teachers… It {The trial} really has been successful: What you are doing in the classroom, How can technology support you, and so on. Even the kids in a year 1/2 class—you were talking to Chris a moment ago in the staffroom, remember?—Well Chris came back saying some of the comments from her children were great. The reason was that the I.T. activity related to what they were doing in their classroom, and wasn't an isolated lesson. They—and she—were really excited!

This enthusiasm at NW translated into a special full-day event for all the staff, some months into the next year. Paula had persuaded Sam, the new Principal, to arrange a one day PD seminar on student-centred learning with a notable visiting speaker. The school met the teacher replacement costs, and invited some parents to attend. Sam,

Ross, Paula and Leanne were each positive about the value it had on the teachers' learning and ICT adoption.

This meant that both schools had a one day full staff activity to address big issues; other than normal staff meetings it was the only day-long one during or near the research period. The fact that the RS day was an extended conciliation process and the NW one was an ICT planning one was seen as indicative of the differences in collaborative activities between NW and RS.

5.1.3 Summary

It seemed clear that a different set of parameters drove the collaboration systems at Regis Street compared with North Waygo. In summary there were more staff at North Waygo who were more willing to make collaborative time available and there were some supportive staff in key leadership roles. Also the school structure was able to provide multi-faceted and active leadership from up to three staff to support their chosen collaborative opportunities. At Regis Street the ICT support structures were more limited, and it was arguable that Jerry was laissez faire at a time when leadership was called for because of difficult relations in the staff-room.

5.2 Findings: Forms of collaboration

5.2.1 Predicted forms of collaboration

Collaboration comes in many forms, as detailed in Chapter 2. Reviewing the range of collaborative types it was evident that Fishbaugh's (1997) set appeared to describe them well. Fishbaugh (1997, see Section 2.4), described three forms, namely *Consulting*, *Coaching* and *Teaming* collaboration. Her domain was the collaboration of special education staff supporting the integration of people with disabilities, but similar roles are identifiable wherever educators work together. The three processes of advising, supporting or teaming collaboration she identified are like the processes of collaboration observed during this study whilst teachers were learning to integrate ICT into a classroom environment. The distinction was that Consulting collaboration involved an unequal relationship but perhaps with a reciprocal or sharing nature still discernible. The common factor in the other two types of collaboration—Coaching

and Teaming—was the equality in the interrelationships involved. These three forms, repeated from an earlier chapter, are summarised in the Table 5.4.

Table 5.4: Forms of collaboration identified by Fishbaugh (1997)

Form of collaboration	Characteristics of Fishbaugh's types
Consulting	An unequal relationship but not necessarily dyadic; possibly with a reciprocal or sharing nature. She identified a range of types from **loose advising** to **mentoring**
Coaching	A sharing between people, characterised by parity in the relationship
Teaming	An even more interactive version characterised by active and shared ownership of their roles and outcomes

Examples of each of these forms of collaboration were evident during the research, and are presented in the following sections. What became obvious was that one of the cells,namely Consulting, could be further divided into two distinct sub-types. As a result four types of collaboration were identified, which then fell neatly into the 2x2 structure of Table 5.7.

5.2.2 Findings on collaboration

Consulting collaboration

It was evident that Fishbaugh's Consulting category was a broad one, and in this research study multiple examples of collaboration were identified under the Consulting banner. They ranged from a loose advisory or supportive form of collaboration to a more committed, mentoring form of consultation. Fishbaugh (1997) described three examples for the category of Consulting collaboration: inter-agency consultations; student support efforts; and mentors. The mentor model is more relevant for this research than her other two types, but their existence confirms the observation that a Mentoring type is only one of the possible Consulting types. Her definition distinguishes them from the outside or 'advisory' consultant:

> Mentors are not consultants in the traditional sense of an outside expert called in for technical assistance on a specific issue, at one point in time. Rather, mentors are consultants in the best sense. A mentor is a guide offering expert assistance and professional support over an extended period of time (p. 65).

Several of the 'consulting' opportunities which were observed in this research tended to be of the 'outside expert' mode providing specific support or technical advice, and the reciprocity was often low. These advice or support roles are given first, and the more mentor–like ones follow.

'Advising/supporting' collaboration within Consulting

Ann (RS) needed someone to help her get a new computer working so that the children could use it, so she asked parents if they could assist:

> ANN: I had no idea how to set it up. So I got parents to set it up for me, and then the children went ahead.

The collaboration was limited to support from someone more expert in the particular topic. In another example, Evelyn (RS) decided that she would use some of the ideas provided by the researcher in some initial consultations:

> EVELYN: I guess mostly {I'm looking at} my approach to the technology itself, and looking to some of the things you've told us, to see how I can transfer them into the classroom.

Her level of commitment may not have seemed very high, but she appeared to be reflecting upon ways to make use of the material suggested. This seemed like someone reviewing their progress on a specific issue and wondering whether to make a change or two. There was as much chance that this is a single incident as there was it would continue 'over an extended period of time'. Later she put one of the ideas into practice:

> EVELYN: We tried the farm thing {you suggested}. The idea was great and the kids were enthused, and it could have been very successful, apart from the fact that I just did not have the one-to-one time.

Again this appears to be more like a single change rather than part of an extended and planned progression. She is not saying, 'I began by trying the farm thing', nor 'we did the farm thing first'.

Heather (RS) passed a similar comment:

> It's nice to be able to feel that I can say 'Oh _ _ _ , how do I do this?', and then I know how to do this. That's the way I learn.

Even her admission that getting advice aurally suited her learning style seemed much more like access to a technical advice line than a mentoring relationship. The fact that her next sentence joked, 'If you were here on a full-time basis it would be very handy!', did not change the author's conclusion.

Christine in her journal mentioned 'discussing' her projects with other staff. Usually this meant the rather unilateral action of informing them of her progress with her Internet projects. For example an entry from her diary reported:

> We have received two postcards – students will send an e-mail and thank them… Discussed the project with Brenda.

She displayed a willingness to pass information on, for example, but there was little evidence that she received anything from them. Such collaboration also represented the low commitment, one-sided nature of Advising collaboration.

David mentioned his desire for support, but on his terms; he felt that DoE(WA) was putting too much pressure on teachers to use ICT, and he wanted an alternative:

> DAVID: Like, when I saw you and Ann doing the Bookmarks {activity} I said, 'that's fantastic, how do you do that?' I can see that if someone would just *show* me, I could do it, you know? Rather than the Department {of Education} saying, 'teach this child, teach them'. I mean, it's a nefarious statement.

Again, despite the strength of feeling apparent, a relatively low commitment level was evident in this Advising style of relationship. In David's case he argued that a personalised support system would help him along the path that he saw as very challenging. Perhaps the greater the pressure that these teachers felt to change, the more they went looking for outside support systems to help them. More likely was the fact that a perceived lack of outside support then became their reason for lack of progress with ICT. Although there were variations in the collaborations imputed above, there was more similarity between them than the differences, compared with the mentoring described next. A contrast is provided by those participants who start to make higher commitments to the mentoring collaborative relationship.

'Mentoring' collaboration within Consulting

The examples of collaboration above are characterised by the expert-novice imbalance in the relationship, but they do not represent the richness of relationship that Fishbaugh (1997) suggested would be evident in mentoring collaboration (as summarised in Table 5.4).

Mentoring collaboration could be expected to show more commitment than advising collaboration. One participant may show leadership or there may be evidence of some preceptor relationship. For example, Leanne introduced and guided a successful collaborative multi-grade project, beginning in the previous year. She had already shown herself to be quite collaborative, and was quick to acknowledge that the initial concept was not hers but derived from that of a teacher at another school. She sought help and advice from someone she clearly respected:

> LEANNE: But our collaborative project model actually came from Geoff {computer coordinator at} Beda primary school…. I was having a bit of a low ebb at one stage last year {1998}, so I met Geoff up at Beda. He was telling me about the collaborative project that they had done.

Although the mentoring relationship may appear to be relatively short-lived, it is evident that some significant interaction occurred. Furthermore, she then took his design and adapted it to suit her needs and her school situation, with Geoff's encouragement.

Mentoring support may be more sustained, and for someone engaging change and looking for support and encouragement, a more sustained relationship may be important:

> ANN (RS): that's where you have been so helpful to me as well. I can talk to you and get that support. *That* sort of person is *essential* {her emphases}.

And later she reiterated this need for sustained support:

> ANN: But I also had the back up confidence of knowing you were going to see me sometime {this week}, and I was going to ask you. Now if I didn't have you, that {ICT adoption} would then be something that I would just drop, because I didn't have support. All the time, it keeps coming back, you need that collaborative bit, someone you can speak to, to help you with it.

The need for ongoing support was paramount for Ann who seemed to sense that a longer-term development cycle was required as she made her journey of ICT adoption. At the end of the research period she commented:

> ANN: As soon as you came on the scene, I realised that here was someone I could say 'Okay…, what do I do here'… If there had been another teacher on the staff {with ICT expertise}, I would have done the same.

Her final comment indicated that she was prepared to engage with help at any level. She showed willingness to make a commitment to any collaborative arrangement that would provide support. If the level of support were the same, it seems probable that a peer collaborative relationship with a local staff member may have supplied the equivalent support she seemed to need.

These quotes demonstrated that the consulting form of collaboration was broader than was initially obvious from Fishbaugh's grouping. Not only does consulting collaboration describe a uni-directional relationship; it can be represented by both simple advisory roles, and richer, more multi-faceted mentoring relationships, which can cover a longer term as well. The range of types of consulting collaboration demonstrates how a variety of supports can be provided by willing and helpful non-

peers in the uptake process. The Consulting form is therefore represented by two distinctive sub-types in Table 5.5 below.

Table 5.5: The two types of Fishbaugh's Consulting collaboration identified in the study

Divisions in Fishbaugh's Consulting collaboration	Distinguishing features
Advising or supporting	Low level of commitment; specific support or technical advice; provided by an outside expert or supporter; possibly short-term or informal
Mentoring	A more sustained relationship with much greater commitment by both parties, but an imbalance is evident also; expected to be longer term collaboration

Coaching collaboration

The second of Fishbaugh's (1997) forms of collaboration was Coaching collaboration. It was characterised by parity in the relationship. If there were two people involved, for example, then she would describe a relationship where one peer was reliant on another to provide stimulus or direction. Potentially this leadership, although relatively weak and lacking commitment, could change as needs changed. It described a relation between peers, but this did not necessarily seem a defining characteristic, for reasons that will become clear shortly. The important feature according to Fishbaugh was that, 'participants take turns owning or assisting with the problem'(p. 102). On the surface this appeared not very different from her Teaming collaboration--her third type. In fact, it may appear easy to miscast a relationship because of its initial similarity to Teaming. It is suggested that the identifying symptom here is less 'ownership' and more 'assisting', in other words a 'willingness to give and receive assistance'. The flip-flop of roles and the concept of coaching was quite an accurate representation. To distinguish these two types of collaboration, they are compared in a table, namely Table 5.6.

Table 5.6: Distinguishing features of the latter two of Fishbaugh (1997)'s forms of collaboration

Sharing-types of collaboration	Distinguishing features
Fishbaugh's Coaching	Peers take turns assisting with the problem; willing to give and receive assistance; a low level of ownership or commitment required
Fishbaugh's Teaming	Also a peer-type relationship, but a parity in relations evident, as well as a much more interactive, sustained sharing of ownership for the purpose and outcomes of their collaborative efforts. A much greater commitment by both parties manifest

David, Christine and Nora provided examples of the sharing types of collaboration called Coaching collaboration.

David (RS) described some sharing he had done:

> David: I've worked with Ann a bit this year, in various things.… sharing ideas. I got one or two good ideas from Ann.

His use of the words 'sharing' and 'worked with' was not reminiscent of a Consulting relationship but was also missing the active interrelations and shared ownership of the Teaming style. Overall it seemed that he implied a relatively low level of commitment. In a similar way, Christine (RS) described the interactions with some peers:

> *How has your teaming or collaborating gone so far?
>
> CHRISTINE: The collaborating happened only informally, for example, Iain and I would chat occasionally.

Again the relationship suggested sharing, but not commitment. Thus these examples were classified as Coaching-type interactions. Such interactions did not always occur between peers. For example when their students knew more than they did on some subjects, it was tempting to broaden the definition of 'peers.' An observer to Nora's class at RS would probably have seen students coaching each other, and their teacher:

> NORA: I let kids teach me, too. If I don't have the answer, I'll ask another child to come and sort something out.

One could probably even impute a more egalitarian set of relationships in classrooms that engaged in sharing such as this. Although they may not be peers in a traditional sense, Nora clearly saw them as peers when technical and support skills using a computer were involved.

Particularly important for Nora, and a number of other participants, was another example of Coaching collaboration, namely the opportunity to seek help from close family:

> *What has been particularly helpful for you, adopting ICT?
>
> NORA: First of all, I think having the kids at home helping me. They don't help me all the time but I'm able to ask them questions.

Evelyn acknowledged that the family option was not always useful, when her husband expected her to fix their home computer:

> He {my husband} doesn't really understand it {our home computer}, and just calls me. Blind leading the blind there, I can tell you!

Her comment identified a potential problem that Coaching (and also Teaming) collaboration could suffer from, namely the lack of direction, if the peers involved did not immediately have the answers they wanted. On the other hand the very process of collaborating has already been shown to be a powerful learning stimulus and one which social constructivists, as described in Chapter 2, have argued can encourage participants to extend their skills as they support each other in problem-solving activities.

Leanne and Wendy, her tandem partner, would best be classified under Coaching or Teaming, when considering ICT support. Wendy took her lead from Leanne, and she appeared to defer to Leanne for ICT support in class, and used her tandem relationship to seek support from Leanne. Given Leanne's peer-based leadership style (elaborated in the next section), a coaching style was more likely than an advising role. But since she was relatively invisible, it would suggest that the relationship was not as strong as a teaming one. However Leanne's major role was ICT coordinator and in her role of supporting other staff, she utilised more Coaching collaboration, and for similar reasons, those staff who did not need such help would not have sought coaching support either.

The examples of Coaching collaboration illustrate the principles of relatively weak leadership, probably between peers, where each person is potentially able to take control of the Coaching relationship. The peers may need to be more broadly defined to include one's students, as Nora illustrated.

Teaming collaboration

Teaming collaboration represents the third type, a richer, higher commitment and more interactive version of Coaching collaboration. As well as parity of relations, Teaming collaboration is identifiable when, 'members of an interactive team share ownership of the purpose and outcomes of their collaborative efforts.' (Fishbaugh, 1997, p.102). An observer would often notice easy and relaxed interactions between people who are teaming on a regular basis, and the lead role would change in an interactive fashion. Two examples of this are Fiona and Gail, and Nora and Paula.

Fiona and Gail had worked together at RS for over three years. They constantly supported one another professionally and used a Teaming style to do so. In their interviews they each reported how well they worked together:

> GAIL: It's like a marriage really. We call each other 'our other other half,' and that's how we are really.
>
> FIONA: I have to work with Gail but that's easy, it's like working with myself, it's really not a good comparison! {Laughs}

Gail coined the joint name *Mrs Blackmoore* for the tandem, partly to reduce parent difficulties when writing to them, which was a combination of their two surnames *Blackwood* and *Moore*. This too suggested a close, easy working relationship between the two teachers, well characterised by the Teaming form of collaboration.

At North Waygo, Leanne was equally at home with teaming. She described the success of their half-year multi-grade multiple teacher project at her school:

> LEANNE: Working as a team has been a key.

The style of leadership she displays is not dominating; Leanne described her leadership approach as making an environment enticing rather than increasing the pressures on fellow teachers. She seemed to take the distinction between the 'carrot or the stick' styles seriously. She described how her multimedia class activities attracted fellow teachers:

> LEANNE: People saw it working, and so instead of trying to tell them to use it, they said, 'I really like what's happening here, I can't believe Year Threes are doing it—can you show me how it works?'

Equally instructive was her description of her own leadership style. When asked to compare herself with Geoff, the ICT coordinator from Beda, whose school project had inspired hers:

> LEANNE: {laughs}... well, … I'm not a demanding kind of person—not that Geoff is! I prefer, if people want to do it, I'd rather they do it because they are motivated to do it, rather than have someone {chasing them}. But then, if you're doing something that big, you need to have some kind of {pause} leadership, I guess. Someone to say, this has to be done by this point, and make points along the way, which I have learnt to do.
>
> *But you have your persuasive ways?
>
> LEANNE: oh, yes, yes. I am a much more team person. Doing that conference presentation {by myself} was probably {pause} I like to do it with people, rather than be the sole focus. That was very hard for me.… I find it very difficult.

Leanne used her abilities to encourage teachers to use ICT as an integrated tool in their classrooms. Her Teaming approach was a good model for Nora and Paula (NW) as well.

Nora and Paula were teaching in adjacent classes, and had begun leaving the dividing wall between their classes open all the time. They had also begun to share their students around, including doing some team teaching, suggesting that they were not having difficulty collaborating at a high level:

> NORA: The fours in my class went with Paula, and {did} a lot of the science and social studies with Paula's class.

These examples of Teaming illustrated the principles of greater equality of relationships compared to Coaching collaboration. They illustrated the extent and the nature of dynamic and flexible leadership evident in the range of provided examples of Teaming collaboration.

5.2.3 Refining the types of collaboration

Both coaching and teaming collaboration involve some type of sharing. Each is different from consulting, in that both deal with peer relations whilst consulting collaboration assumes expert-novice or perhaps non-peer relations. If coaching and teaming collaborations are grouped as a *sharing* type, then in essence the *consulting* class of collaboration appears to be qualitatively different from the *sharing* style of collaboration, as described by both the coaching collaboration and teaming collaboration examples above.

All three forms of collaboration identified, Consulting, Coaching and Sharing collaboration, were evident at both schools. The Consulting collaboration form was distinguished as two categories above, suggesting four types altogether. In an attempt to give an insight into the most prevalent types of collaboration and their associated schools, the examples already quoted above—originally selected simply as examples of the complete dataset—were collected into the four categories already identified, and presented as a two by two figure (Figure 5-1 below). This is only an impressionistic reflection but it is not discordant with the researcher's assessment derived from working with the teams and individuals at each school over an extended period. The figure is an approximate representation of the relative proportion of the team and individual's collaborative activity at the two case schools. Since these

teachers collaborated in a variety of ways during their recorded efforts, their names or their team names may appear in more than one cell. The numbers in braces indicate the number of quotes provided in the text, simply to provide an impression of the text's coverage.

Consulting	Sharing
Advising *(low commitment)* Ann(RS) Christine (RS) David (RS) Evelyn (RS) {x 2} Heather (RS) Leanne(NW)	**Coaching** *(low commitment)* Christine (RS) David (RS) Evelyn (RS) Nora (NW) NW-Team 2 (Leanne, Wendy)
Mentoring *(high commitment)* Ann(RS) {x 3} Leanne(NW)	**Teaming** *(high commitment)* Gail (RS) Fiona (RS) Leanne (NW) Nora (NW) {x 4} Paula (NW) RS-Team 3(Gail, Fiona) NW-Team 1(Paula, Nora)

Figure 5-1: Categorising the collaboration of teams and individuals at case schools

From Figure 5-1 it is possible to make an observation and draw two conclusions. Firstly it is interesting to note that Leanne, the ICT coordinator at NW, is represented in all four cells (including Coaching in her team NW-Team 2), suggesting a person with a flexible collaborative style. Secondly it would appear that more examples of consulting (ie advising and mentoring) collaboration were quoted at RS, whilst more sharing (ie coaching and teaming) collaboration was found at NW. This could be explained as an artefact of the more regular attendance of the researcher at RS, which might make consulting a more visible activity. Finally that the level of collaboration at RS was usually the low commitment type—ie advising and coaching collaboration; whereas collaboration noted at NW tended to be the higher commitment type—ie the mentoring and teaming types of collaboration.

5.2.4 Underlying factors determining type of collaboration

It is instructive to look at the different factors which helped differentiate the types of collaboration and to look for connections with feelings, understandings and the rate of ICT uptake.

Two factors are Commitment and Equality in relationship, identified in Table 5.7.

The four types of collaboration are numbered for convenience and are utilised as the chief organiser of the next section of this chapter.

Table 5.7: Four asserted types of collaboration evident from the dataset and the factors which determine them

Relationship / Commitment	Inequality/Non-peers (Consulting)	Equality/Peers (Sharing)
Low	Type1: Consulting- Advising	Type3: Coaching
High	Type2: Consulting -Mentoring	Type4: Teaming

This set of types of collaboration would need to be validated with further research to ascertain its wider applicability.

5.2.5 Summary—Forms of Collaboration

The types of collaboration noted by Fishbaugh (1997) and detailed above were identified in the case schools. It appeared that the types of collaboration demanding lower levels of commitment (Consulting-advising, Coaching) were more obvious at Regis Street Elementary School, and those demanding higher commitment levels (Consulting-mentoring and Teaming) were slightly more obvious at North Waygo Elementary School. Interestingly neither school had a monopoly on any one type, despite their significant differences in support systems, and most types of collaboration were identified at both schools. Also evident was the greater stability of the teams at North Waygo, which may have been associated with the higher levels of commitment. This alone was not a satisfactory indicator of the views and willingness of the teachers involved, as there was ample evidence that a number of the Regis Street teachers were committed to greater ICT uptake, but that the systemic structures and social disharmony around them appeared to conspire against their efforts.

5.3 How different collaboration types affected ICT uptake

Having identified four different forms of collaborative activity, the rest of the chapter addresses the following research sub-questions:

What effects did these identified collaborative forms have on teachers':

2 willingness towards and views about ICT usage?

3 teaching ideas/pedagogies?

And finally

- how were these changes manifested in ICT usage?

These are summarised as Views, Pedagogy and Usage in the rest of this chapter.

Rather than isolate the patterns in each topic by looking at all the participants for each sub question (eg attitudes to ICT for each type of collaboration), it is more logical to address the sequence of sub-questions for each participant or team. Thus, for each of the four collaboration types (eg Teaming) the collaboration of those teachers will be examined and the consequences for their Views, Pedagogy and Usage of ICT addressed.

After some introductory material on the types of collaboration used by each case participant, there are sections for findings on each of the types of collaboration identified, namely Consulting-Advising, Consulting-mentoring, followed by Coaching and then Teaming. After this set of findings the data will be analysed by presenting and arguing for a series of assertions.

5.3.1 Findings

The tables below (Table 5.8 and Table 5.9) summarised the collaborative efforts of the participants at the two case schools, and each was sorted by the level of collaboration. Each table records their name, the stability of each individual's team, their observed level of collaboration and most prevalent style of collaboration used. Some also have an explanatory note. Choosing a prevalent rating risks masking the variety of collaboration styles each person may have used. Such variety was already evident in the duplication of teachers in multiple cells of Figure 5-1. For example Maya, in her dealings with many types of staff during their ICT sessions, would have faced different levels of commitment to ICT and willingness to work with a peer, and may well have covered all of the types already described. Nevertheless, because of their dominant role as teachers and potential collaborators, it was decided that it would be more useful than misleading to provide such a measure. However in the case of the Principals in the two schools, there was little value in attempting to classify their prevalent collaborative type as they had other significant

responsibilities, which would cloud their rating here. Equally difficult was the rating of staff whose collaboration was classified as low, and they are included in the tables for completeness, but omitted from the discussions that follow.

Table 5.8: Collaboration at Regis Street and participants' most common collaborative style

Name	Teaming Changed?	Level of Collaboration	Most prevalent collaborative style	Notes
Ann	Y	High	Consulting-mentoring	with researcher
Fiona	N	High	Teaming	
Gail	N	High	Teaming	
Christine	Y	Medium	Consulting-advising	on Listserver
David	Y	Low-Medium	Coaching	with Ann occasionally
Evelyn	Y	Low	none	
Brenda		Low	none	
Iain	Y	withdrew		
Heather	n.a.(support)	Medium	Consulting-advising	(lib/support person)

n.a.=not applicable

Table 5.9: Collaboration at North Waygo and participants' most common collaborative style

Name	Teaming Changed?	Level of Collaboration	Most prevalent collaborative style	Notes
Leanne	N	High	Coaching	also Teaming eg Nora
Maya	n.a.-support	High	Consulting-advising	also Teaming eg Paula
Nora	N	High	Teaming	
Paula	N	High	Teaming	
Olwyn	N	Low		
Wendy	N		n/a	

n/a= not available

5.3.2 FINDINGS: Views, pedagogy and uptake and usage of ICT

The teachers are considered in four groups, namely Consulting-advising, Consulting-mentoring, Coaching and Teaming. Only one or two examples of teachers were considered necessary to be used each time, to illustrate that the categorisations were realistic. Further supporting and unsupportive evidence will be considered later in the analysis section of this chapter.

Following the structure of Table 5.7, the following teachers, identified in Table 5.10, will be described:

Table 5.10: Selected teachers for discussion of their prevalent collaborative style

Commitment \ Relationship	Inequality (Consulting)	Equality (Sharing)
Low	Type1: Advising **Christine(RS)**	Type3: Coaching **David(RS)**
High	Type2: Mentoring **Ann(RS)**	Type4: Teaming **Nora & Paula (NW)**

A number of participants were recorded using a Consulting style of collaboration, including Christine (type 1, Advising) and Ann (type 2, Mentoring). They are described in the next two sub-sections. Those who used a peer-based relationship and are documented next were David (type 3) and Nora and Paula (type 4). These sections show how that collaboration had effects on their views about ICT, their pedagogy and ultimately their ICT usage.

5.3.3 The first two types of collaboration: Advising and Mentoring

The researcher attempted some collaboration with Christine, whose initial team never coalesced. She also joined a Listserver called *6-7 Nexus*, which appeared to provide collaborative opportunities. A different type of consulting was undertaken by Ann. Initially she attempted to work with David and Evelyn and was disappointed when they did not gel as a team. She also asked the researcher for support on a regular basis, and then began to use her available computers much more, and for a wider range of activities than before. She described this relationship afterwards as involving both 'mentoring, and also sharing.' These are the two people presented in the next section on Advising and Mentoring collaboration types.

Type 1: Consulting-advising collaboration—example: Christine

Christine was a strong example of the Consulting-advising collaboration. This section considers how her collaborative approach affected her views, her pedagogy and then the consequences for these on her discernible ICT usage and uptake.

Views: Effect on attitudes to ICT of Consulting-advising collaboration

Christine's collaboration was classified as oriented towards the Consulting-advising and Coaching paradigms. Over the research period the Coaching style decreased markedly, suggesting that she had difficulty sustaining it. She began by occasionally collaborating with the researcher, including chatting, sending ideas via e-mail, and encouraging a few class visits. Over the period of the research she found an Internet list that provided some support for her. She also agreed to two interviews where she talked about herself and her development. It was evident later that she used the Internet list for collaborative purposes as she described it as, 'of enormous benefit'. Since her diary described her forwarding information on to others rather than sharing information with them, and she described the list as 'full of beaut ideas and I have used some…', it appeared that she took the relatively uncommitted approach to sharing inherent in the Consulting-advising and Coaching collaboration styles. Her list may have had even more input to her development as well. For example Christine raised the issue of 'lowering of standards', which is a typical issue a list manager would raise to stir interest and discussion, possibly suggesting that her collaborative list had foregrounded the idea for her.

Her collaborative style is less peer-oriented than other people, and in fact it seemed that she may have been a difficult person for peers to share with, given the findings presented so far, and the further evidence presented below. Christine had made up her mind about her ICT skills, and appeared determined to use them to help the school. Her willingness to use ICT in her class was never in doubt, but she felt this led naturally on to the skills of using ICT as an appropriate learning tool:

> *INT: Does that mean you are willing adopter of things like IT?
>
> CHRISTINE: Yes. I'd very much like to be the curriculum person for IT next year. That's something I'd like to put up my hand for. (1:298)

Presumably she had confidence that she was using computers well as a learning tool, and felt she could impart this to the rest of the staff. Given her evidence of stalled collaboration even with chosen peers, this seemed an unlikely event across the whole staff. Another reason for her offer may have been that she was unhappy with the current approach to ICT usage being promulgated by the Principal, Jerry, and she wanted to change it. This led her to use some extreme language, as she described the ease of e-mail at home compared with school:

> CHRISTINE: And then I'd get very frustrated at school. That was a cause of great frustration, because it was much more simple at home, using e-mail, than it was here.
>
> *INT: And why was that?
>
> CHRISTINE: well it seemed much more simple, because we didn't have Jerry f___ing around changing things. You can delete that. (1:106)

This obvious frustration was mirrored in many of her descriptions of other staff at RS, and was so woven into many of her answers that it coloured her thinking. Consider for example, a rather open-ended question about change—which she took rather literally—and then instead of reflecting on her own classroom, she addressed her comments to other people's usage:

> *INT: What's changed in your classroom over the project?
>
> CHRISTINE: I have one more computer. There are now two Pentiums, one on the Internet, both with Windows 95 on them. Lots of things we could do with our IT funds, but we agreed the money would do the networking in Years One, Two, Three, the library, music, and the Pre-Primary. As a result we are missing out on other resources. It would be a shame {to spend all this money} if they're not planning to use their networked computers. This seemed like a lack of careful planning or lack of any planning. (2:46)

Christine broadened the question about her class to her unease about others. She was apparently concerned with other teachers not making good use of the resources of 'her school'. It was evident that she found frustrating the ICT planning going on in the school around her. Jerry kept it well documented in the school's ICT plan, and he had offered to show it to the researcher on more than one occasion, so the issue was not its secrecy.

As well as her frustrations, she seemed a little less tolerant of others sometimes. Another interaction with Jerry led her to a rather paradoxical description of herself as an impatient person but who likes things planned:

> CHRISTINE: I have bought CDs of software eg maths, Olympic maths, Aspire, a low-level reading program for Jacinta, {and} some writing ones. I bought them with my own money; Jerry has told me that I can't use them in the school as they are not 'licensed', but I am using them anyway. I am a very impatient person, I like it now, and I like it planned. It's easier to have it in class {rather than picking CDs up from the library each time}. (2:21)

As well as showing a growing interest in ICT and a certainty in her correctness, this impatience and her concern for 'her school' seemed to colour all of her thinking and direct her school activities. As an aside it may begin to explain her philosophy and provide her justification for getting upset with other staff, described in her vignette in

Chapter 4. As explained, she was quick to make judgements, even if they were later going to be changed:

> CHRISTINE: For example I can't see how digital cameras will help learning. But I can imagine this international project {she was involved in}, we could be putting pics on the web site. Perhaps we need a scanner? (1:361)

This material on Christine also demonstrated that her collaboration was likely to be a one-way process. She appeared determined that she was right and most others were wrong, and so it seemed unlikely that her sustained collaborative style could have been anything but advisory in nature.

Nevertheless, over the semester her views about ICT began to change gradually. Towards the end of the project she described some changed feelings:

> CHRISTINE: I'm not so hung up about kids at the computer….
>
> I am finding the computers increasingly frustrating, partly because I have more planned now and partly because the machine or the Internet is still slow…
>
> I am not sure how networks work…
>
> I'm more comfortable with {the software called} Carmen San Diego. (2:24)

These comments initially suggested a thawing in attitude, and the last three were more specific observations regarded as typical of the attitude of a slightly more knowledgeable ICT user, compared with the diffuse and generalised observations of a novice.

Christine self-rated the quality of her ICT usage at 7/10 at the start and 8/10 at the end and also indicated a confident and improving attitude to ICT over the period. The fact that the researcher regarded these figures as exaggerations will be addressed later, and will recur in Chapter 7 as an issue. Here their value is to show that she felt that she was making progress with ICT, even if the visible evidence was not as supportive.

Changes in her attitudes to ICT usage may have been evident, and her excerpts have described greater usage of ICT. At same time she was grappling with rationale for changes, eg issues like 'lowering of standards' probably came from her list, so the contribution of her collaborative list to her development was thus imputed.

Pedagogy: Effects on pedagogy of Consulting-advising collaboration

Christine attributed to the list much of the collaboration and support she felt—eg

> CHRISTINE: Its name is the '6-7 Nexus', there are lots of sharing activities. I find it a very supportive, helpful list - very, very supportive. It is full of beaut ideas and I have used some ideas in cooperative learning. (2:33)

At the same time, she attributed none to the school:

> CHRISTINE: Nothing you do here is valued. (2:79)

At the start of the research she was rated as strongly teacher-centred, because of her preference for control over student time and her view that getting through the curriculum was all-important:

> CHRISTINE: I didn't give them many opportunities to do very much searching at school, because it was extremely time- consuming, it was non-profit time.
>
> *INT: Now some people would argue that that's Learning. That learning to distil information, trying to see the dross and discount it, is also important?
>
> CHRISTINE: Yep, that's probably fine. But we were still doing a unit within a certain time, and if they wanted to play at home and have a look then that was fine.(1:134)

Initially she had indicated that she was not prepared to let go of the idea that she was in charge. She seemed to feel a huge responsibility to put the best information in front of her charges, suggesting she was driven by a less 'unfolding' or interactive teaching philosophy. By the end of the year small changes were evident. Towards the end of the year she reported being less 'hung up' about students being rostered at the computers when she was trying to teach, but even at the start of the semester she claimed that she was better this year than last. Consider for example the very next sentence after the quote above, where she appeared to change tack, but described very little that was student-centred either:

> *: And other people would argue that if you don't stand back and give them the chances to discover for themselves, to take your hands off, then you're taking away learning opportunities?
>
> CHRISTINE: Well I'm very different now. Compared with last year. Now it is very different. Now I'm more 'this is the topic, go for it'. This is the program you're using, on CD-ROM, now go and work. (1:140)

A small transition may have been evident, but there were conflicts. Initially she talked of 'the traditional teacher in me':

> CHRISTINE: The groups {at the computer} are done so that there is one who knows what's happening, so a lot of peer tutoring goes on.
>
> *: Perhaps you'll have to say a 'the next lesson is on percentages, and you'd better do some peer tutoring {on maths as well} down there'?
>
> CHRISTINE: well, we fiddle faddle with their maths now, and if they can do it, they can do it; if they can't they come to me. But I still feel quite uneasy, and that's probably me, the traditional teacher side of me, that if there is explicit teaching, then

> it concerns me. I think I'm quite happy with kids learning themselves, and I think I can conduct the open-ended and collaborative type.. you know, that sort of stuff, but I still have this {pause} thing {pause} and also fitting in sufficient time (1:179)

Apparently 'fiddle-faddling' was a pseudonym for peer tutoring, suggesting a belittling of their efforts. Her final sentence uses the protective 'I think' twice when she describes children learning by themselves. Overall her ill-ease at the transition was clear:

> CHRISTINE: And I'm still very uneasy when we're having explicit teaching, and there are three kids sitting at the computer, doing something else. I still can't sort that out in my mind. (1:153)

Even by the end of the year her thinking was still uncommitted to ICT. She was asked to imagine extending what she was doing with computers in her class:

> CHRISTINE: Would I be happy with the 20 computers in my class? I don't know. I still feel a lot of time is wasted with computers. I don't know how much learning is really going on. (2:39)

Nevertheless, even in the beginning she used phrases like 'starting to move':

> CHRISTINE: I'm getting lots of WebQuests, where the kids have a topic and go searching. … I'm starting now to move towards them. (1:211)

However she always protected herself with some 'but on the other hand' thinking:

> CHRISTINE: I still think there should be a reason for what they do in school - there's a difference between ' a change of thinking' versus 'a lowering of standards' when it comes to using a computer. (2:26)

Christine was in transition with her pedagogy and the use of ICT, as her attempts at allowing students some control over their environment, and her plans to use more WebQuests indicate. Her collaborating, especially using the 6-7 Nexus list had been helpful for her, but she had not made much change to her pedagogy. Her head knew why she should be changing but her heart was still unconvinced. Her words at the start of the project (part of the 'nothing's changed' speech) still seemed true, namely that it was not HER but her MIND that was having a problem:

> *: On the other hand you mentioned some of the huge changes you are going through....
>
> CHRISTINE: my mind is going through, yes. The difference is that instead of teaching children, I'm teaching children to learn. Instead of me teaching fact and content, I'm now teaching children how to learn…. and totally loving what I doing. I just love teaching. (1:246)

Christine's focus is still herself and her pedagogy. Her Internet list has obviously helped in her transition, but so far the moving appears to be mainly in her language, and not so much in her performance. She was clearly in a state of flux about

computers as a learning tool. On the one hand she was offering to be the ICT coordinator for the next year; on the other she was uneasy about students missing out on her formal teaching. It was arguable that there were no real changes evident yet in her ways of understanding ICT as a learning tool.

Usage: Effect on ICT usage

Some of the changes Christine noted were due to other factors than collaboration. The appearance of a new computer in class was less attributable to collaborative action than the way she chose to re-arrange her teaching plans for the next year. All the same she was determined that the Internet list had been useful for her.

> CHRISTINE: …I am going through a transition, incorporating the use of technology into my teaching. I'm going through a big transition there….
>
> So, I would say, for me at the moment, the ideas I'm getting from other teachers, from the Internet, are of enormous benefit to me. (1:210)

A clear change was her transition of views about the digital camera from dubious to supportive, by the end of the year:

> CHRISTINE: I have bought software this year; bought a tape recorder from a garage sale and have been using the {school's new} digital camera. (2:58)

From allowing her pupils 'little plays on the Internet' in her previous year, to planning to use on-line activities like WebQuests in her next year suggests some improvement in usage of ICT. From dismissing digital cameras to using them was a forward step as well. As long as these changes fell within her comfort zone she proved willing to use them, even when she dismissed them initially, but there was little evidence that she has changed her pedagogy in anything but the smallest ways to maximise the capabilities of the ICT gradually pervading her classroom. Although there was little indicating that an increased use of ICT would contribute to a change in Christine's pedagogy, the fact that small changes in both were occurring was suggestive of joint progress.

Type 2: Consulting-mentoring—example: Ann

Ann was an equally clear example of the Consulting-mentoring type of collaboration. This section addressed how her collaborative approach affected her views, her pedagogies and then the consequences for these on her discernible ICT usage and uptake.

Views: Effect on attitudes to ICT of Consulting-mentoring collaboration

Ann appeared to learn a lot about ICT from the Consulting-mentoring experience. Evidence of this development was provided by her comments, covering a 6-month period, some of which are quoted below.

Initially Ann was conscious that her lack of understanding meant that she was too intimidated to let parents in on her weakness, but her confidence rose noticeably:

> ANN: Just at the beginning {a year before}, I just had a {single old} computer at the back of my room -- I was interested... I wanted to give it a go, I was prepared to step out. But I had no idea of what to do, so if something went wrong—not confused, uncertain. Willing, yes, I was willing to give it a go. A couple of times I said to a student, 'Dan, do you know what to do?' I didn't feel threatened with any of that, but I would have if there had been a parent there; I would have thought, 'hey I should know what I'm doing here, but'…
>
> *: So, it was potentially quite threatening for you?
>
> ANN: *If* I had parent there; but with children it was fine. Because I didn't have a clue what it was about. (1:126)

This reservation, caused less by a specific terror of something unknown rather than a generalised insecurity, was not a problem when dealing with her students, but the thought of involving parents at that early stage was daunting, rather than threatening:

> *: …but you *were* able to keep parents away, were you not?
>
> ANN: no, no, no! {ie., yes!}, I didn't want to say to parents, I don't know what to do. But if I had a parent I knew, or got to know, I would say 'I don't know what to do here', like I do all the time here now. And I've realised that parents have different levels of knowledge as well (1:139)

Gradually her reservations were allayed, and she began to feel more courageous in her use of ICT, knowing that there was 'someone to help':

> ANN: Now, I even read the error messages when something goes wrong and try to follow them! Before I would totally freeze and fear of the unknown meant I would become unable to do anything without help. You have given me the confidence to not panic but to try and solve the problem and sometimes I do! Also, I know now there is someone who could help. That is a wonderful blessing for a busy teacher to have! (2:32)
>
> *: How did collaboration affect your willingness to use ICT?
>
> ANN: It gave me courage to use the technology, and you also provided resources for us ; sometimes general and broad ones, and sometimes very pointed or specific ones. (2:42)

She had used the phrase 'fear of the unknown', but her reservations about ICT were not based purely on fear, rather they were examples of lack of knowledge, she argued:

> ANN: But, I'm prepared to say that now, I wasn't prepared to say that then. So insecure was a good word. I knew I lacked understanding and information {about ICT}. (1:145)

> ANN: Now if I didn't have you {to collaborate with}, that would then be something that I would just drop, because I didn't have support. All the time, it keeps coming back, you need that collaborative bit, someone you can speak to, to help you with it. (1:168)

> ANN: I can't believe the change in my attitude towards computers as such. As I said to you, I'm now prepared to give it a try. (1:173)

These extracts document the attitudinal changes Ann passed through at the time of the consulting process she referred to above.

Pedagogy: Effects on pedagogy of Consulting-mentoring collaboration

It was evident that Ann was already utilising a child-centred approach in her teaching, and was aware of the value of making learning active and hands-on. This probably made it easier for her to consider using computers in her room, as teaching and learning tools. For example she saw parallels between what ICT trainers were offering her at in-service courses, and what she ought to be doing with her students. One trainer arranged a touch-free session she found lacking in value:

> ANN: {He made us look over his shoulder and listen} I had… {hardly} even seen a computer at that time. I need to be sitting down at a computer. That's a totally different thing, you have to *do* things, which is what you have to keep reminding yourself all the time with children in the classroom—you have to do things when you're learning. It's no good listening. (1:114)

She modelled her words as well. For example, her classroom was set out in a less traditional manner, arranged so that her students' desks were grouped, and not all faced the front. Her perfect school mirrored the idea that collaboration was important to her:

> ANN: Hmm, the best possible school? Teachers sharing with each other, parents supporting, umm, bright open spaces and quiet spaces, so you can have a bit of both. Do you want obvious things like comfortable furniture and equipment? (1:178)

In this case it appeared that collaborative activities supported and reinforced her current teaching style, which lined up with appropriate usage of ICT as well. Since collaboration does not occur in a vacuum, but is the result of people interacting, then in this case the talk about collaboration and learning was apparently consistent with Ann's own teaching philosophies. Hence it would be understandable if she felt the types of conversations she willingly engaged in during the collaborative activities she referred to above had reinforced her pedagogical style. One of those conversations

was about her use of Outcomes (quoted again in Chapter 6), how it had begun to affect her teaching, and allowed her to take on a different role:

> ANN: …I am rediscovering my joy of teaching {thanks to outcomes}. I am seeing so much more in the kids. Before there were lots of cute little kids, we did the activities and we moved on. Now, everything we do, I can see how an outcome is being met. I find I'm taking on a different role now. Before, I would have looked around during a group activity and asked myself, 'Are they doing the activity?'. Now, I look at the processes they are engaged in, whether they are on-task or not (are they problem solving, developing as independent learners, working collaboratively, displaying desired values, etc)….
>
> I'm enjoying the freedom I now have, to allow them to explore. I can say, 'good, find out'; 'I wonder what will happen if you now .. ..'; or my favourite, 'that's a challenge, now it is up to you to find the answer'. (2:56)

Both a) the gradual change in orientation and b) the change of focus in her classroom with well-used computers in it, suggested a person whose pedagogy was changing. In fact the changes seem consistent with a person whose student-centred style was reinforced by her collaborative activities, as she made increasing use of ICT in her teaching and learning.

Usage: Effect on ICT usage

A number of relatively significant changes can be identified in Ann's usage of ICT over the half year, which incidentally have continued since. These include her starting to use e-mail on a regular basis; her increasing usage of two loan computers and the educational activities she used them for; and the new focus of her classroom towards the computers at the back of the room.

E-mail: During the project, Ann decided to connect herself to the Internet from home.

> ANN: you know I was exhilarated when I {laughs} did that bit about linking myself up to—what was it called?—the e-mail. That really gave me a buzz. I know anyone else might say, 'so what', but to me that was a big deal! (1:176)

She quickly became confident enough with her e-mail that it became a regular part of her working week, and it developed into a regular activity with sometimes-daily usage, both at home and at work. Within a short period her usage of e-mail became such a sufficiently familiar part of her day that she realised that she would be able to answer a question by using it as a reference source:

> It will be in my e-mail, let me look it up and get back to you. Whatever it was, they all widened my understanding of ways to achieve those outcomes. (2:71)

Another example of her change in pedagogy as well as usage was her observation about the structural changes in classroom usage:

> ANN: Before, *that* was the front of the room (points to blackboard); now, this (points to the computers at the back) is one of the most used areas of the room. (2:43)

Ann expressed interest in using Concept Keyboards with her students, and she was lent two second-hand machines by the University each with a Concept Keyboard for the duration of the research project. Each machine had a wide range of appropriate software. As they were initially not networked, and the borrowed printer-sharer serviced only two of her four classroom computers, she learned to use floppy discs to transfer students' writing between the different-format word processors that each type of computer used. In typical fashion, the first thing she did was to appoint some computer monitors and had them learn to do this as well, so that they could help others independently.

Ann was more interested in the activities than the machines themselves. As one of her first e-mails explained:

> I'm so keen and am willing to try and juggle it all so I can fit it all in! I need lots of practice with e-mail. … I also want to find out how to make good educational use of the computers I have in the classroom. There is just so much to learn, and I don't really know what questions to ask yet, but I am very willing to learn. (e-mail 13ix99)

With the researcher's support she undertook three projects. The first was learning to use e-mail; the second was to assemble some evaluation templates using the Concept Keyboards in order that students could print up their own general purpose feedback and evaluation forms; and the final one was a series of personalised bookmarks where each student wrote a little about themselves into a word processor and added it to a bookmark with their digital photo. There were other ICT activities that occurred as a result of the use of these computers, including the class learning about e-mail in order that they could all communicate with one student's grandfather who went to Antarctica and proposed the idea. Ann also taught all her students to take digital photos, and taught them to use the speech tool in the word processor, which in particular gave some independence to a student with weak reading skills.

The bookmark activity took many weeks and was well received. It involved all the students and two of the computer monitors especially. In the end it was used by the children as a Christmas present to parents, and attracted much interest from other teachers. For example, Christine constructed a highly simplified form of this activity

for the official opening of the new library, long after Ann's initial project. It taught Ann's students (and Ann) about colour printing, digital manipulation software, and getting high quality pictures from cheap digital cameras by using coated paper, and it led to some laminating activity with Heather on the library's new laminator. For Ann it was a Technology and Enterprise activity with both Materials and Systems outcomes. Ann described the activity as useful:

> ANN: …because it was my 'first effort' at this activity I was overwhelmed with the computer/technology aspect of it - that was a steep learning curve for me, lots of 'firsts' that blinded me as to the child outcomes orientation of the project…. When it was all over I realised the richness of such an activity using technology and had every intention of repeating the exercise this year with Janine (student teacher) - only time restraints and her own practice timetable stopped us. (2:55)

Summary

Under the circumstances it seemed understandable that Ann's classroom would acquire a new focus towards the computers at the back of her classroom. Ann was demonstrating a willingness to use ICT which was unexpectedly rapid. She mentioned lack of time at the beginning as a possible problem, but made time despite some medical problems, stresses at work, and time off for a family sickness. Likely reasons, related to collaboration, for her successful ICT usage rate included her willingness to collaborate, preparedness to teach the students as she was learning so that skills were not lost (also collaboration); and her willingness to share and talk with other staff members which probably helped her to consolidate her new skills. She was quick to see educational purpose in many of the ICT activities she saw, and this appeared to help her make progress.

Perhaps Ann did not repeat the 'bookmark' activity as she now felt it was rather shallow and skills-based compared with other ICT opportunities that were opening up for her as she gained confidence. In the circumstances, and given the range of other ICT activities which she had actively engaged in, it seemed unreasonable to look for sinister reasons beyond her proffered explanations. It seemed that she used her collaborative environment to the fullest, and indeed changed her ICT usage as a result of her collaborative activities.

5.3.4 The final two types of collaboration: Coaching and Teaming

These examples of coaching collaboration are relatively brief as their intention was to show only that there were examples of all types of collaboration in the case schools.

Type 3: Coaching collaboration—example: David

David provided an interesting example of the Coaching collaboration process. Already the quotes and observations about him indicated that he was feeling pressured and frustrated when it came to classroom ICT usage. His apparent level of commitment was classed as medium-low, however, and yet he seemed to understand that ICT was a potential force for good in his classroom. This section looks at its effects on his views, pedagogy and his rate of ICT uptake.

Views: Effect on attitudes to ICT of Coaching collaboration

David initially participated then withdrew from his team. He was later persuaded by Ann to change his mind. As a result they continued to talk, albeit at a low level, and continued to provide support for each other. Ann described the relationship as two-way, since he occasionally helped with technical problems while she tried to excite him with descriptions of the things that she felt he could do with his class computers. This suggested a coaching rather than an advising relationship, as they appeared to be taking a leadership role on a shared basis. It seemed that he wanted to try her ideas, but always found a problem or reason not to in the end. At the same time there were no indications that David felt or wanted a higher level of commitment than he already had.

Pedagogy: Effects on pedagogy of Coaching collaboration

David apparently had less concern sharing with his peers, like Ann, and more concern when an outsider came in to help him with ICT. For example a willing parent had offered to help him once a week, and was now attending on Fridays:

> DAVID: yes, but, I can see in his eyes, that he knows I don't know what the hell I'm doing. He's done extra things like buying a set of headphones, brought in a few CDs. And every Friday morning I wonder what the hell am I going to get Jacques to do on computers. So I feel pressurised there, I feel anxious and worried. (1:291)

It seemed that David felt the need to provide *all* the direction for the use of ICT. It was likely that this 'feeling pressurised' would remain with him given that he had already shown that he felt ICT was a subject to be taught not a tool to be used.

Usage: Effect on ICT usage

On numerous occasions David made it clear that he was anxious, irritable or frustrated by ICT. Although Ann tried hard, there was no evidence that she had any effect on his ICT understanding or ICT usage. The evidence was that he was so stable that nothing significant had changed 18 months later when David's *before* and *after* ICT usage charts were collected as part of a validation process in Chapter 7 (and are provided in Appendix 8).

Summary

It seemed that low levels of Coaching collaboration had very little effect for this person. It appeared that either David's fear prevented him making any useful decisions about ICT or that he had made the decision to keep his commitment low. Perhaps it was a combination of these factors, but as a result the consequence was clear for his ICT uptake.

Type 4: Teaming collaboration—example: Nora (and Paula)

Nora and Paula had begun to work together in the two years before this research began. This section explores Nora's collaboration, and how she interacted with Paula. It shows why she was classified as using teaming collaboration, and the consequences for this collaboration on her views, pedagogy and ICT uptake.

Views: Effect on attitudes to ICT of Teaming collaboration

Nora appeared to have no great fear of ICT, nor letting people know when she needed help. Her willingness to regard her students as peers when it came to fixing technical problems was illustrated earlier and showed that her teaming style of collaboration, involving an equality of relations and a sharing of leadership roles, was not hard for her to accept. Her attitudes to ICT were already such that she could describe her own development without any feelings of guilt or defensiveness:

> NORA: Do you remember I was saying {that} in '96 I wasn't ready to do this child centred stuff that Leanne was doing? Well, now this year I have started being very child centred. So looking at what Paula has been doing, a lot of putting the

> responsibility on the kids. If they want to learn, they have to be responsible for it. A lot of open-ended tasks, a lot of goal setting with the kids. (1:328)

She showed a relaxed and positive attitude to ICT usage in her class and was apparently becoming increasingly comfortable and confident with them.

She was also feeling confident enough about herself and her teaching that she agreed to act as one of the Deputy Principals for a semester, when Ross moved to acting Principal. She had wanted to 'know what it was like', and after the semester, decided that she was happier as a classroom teacher. When asked later about her role as Acting Deputy Principal:

> NORA: No, it's not for me! My kids missed me, I missed the kids too. I'm a classroom person. A Level Three classroom teacher, fine, but not admin, no way! (2:49)

It appeared that she had felt that she had established a comfortable teaming collaboration with both her students and her fellow team teacher, Paula.

Pedagogy: Effects on pedagogy of Teaming collaboration

Nora seemed to enjoy focussing on her classroom teaching and the way she was changing it. The professional development courses that she had been on and the study she had done had provided some of the stimulus for her to change her approaches to teaching, but they were only part of it. She enjoyed working with her students too. She was now more concerned about students taking some responsibility for their own learning, and learning to work together just as she was with Paula. In some ways her teaching had not changed, but in others it had:

> NORA: lot of explicit teaching still, but a lot of working together to solve problems, too. You know, two brains are better than one...

It also appeared that the collaboration with Paula was a critical component in her change as she now had someone she could 'open the door' with and share ideas. She was very pleased with the changes in her pedagogy, too:

> NORA: absolutely! {We opened the divider} two years ago—I don't like claustrophobic sort of stuff, and I like to see what other people are doing, pick up ideas and so on. (1:477)

Usage: Effect on ICT usage

Nora's enthusiasm was infectious, and it would be understandable for someone who had only just met her to wonder whether this level of description was just her way of self-aggrandisement, and ask whether nothing had really changed in the last few

years at all. Both Paula and Leanne would counter that the changes were real and had indeed taken place only recently, and that ICT seemed to have a large measure to play in her change. For example, it was her team-teaching collaboration with Paula that was a factor in her change:

> NORA: Yes, so I had a change of partner there. I was next to Paula, we started using the computer more as a tool… (1:82)

And it had some consequences, in her opinion. The research happened to coincide with the end of her second year with Paula which had been a very satisfying year for her and her teaching. She had enjoyed this year:

> NORA: It was just great with the kids because they really worked as a team. The cohesiveness of the class was great, there wasn't anybody who missed out. The feel of the class was very different to the other {previous} years. (1:383)

Nora's development had not been at Paula's expense; they had been working together and collaborating for a significant period of time. Nora was finding that her teaching approach was becoming more like Paula's, but her development has not been based on a one-sided relationship—both she and Paula had been changing together. When the researcher asked Paula about her own changes, she was just as motivated as Nora to change, albeit for different reasons:

> *: When did these changes in thinking begin occurring for you?
>
> PAULA: probably in the last couple of years. I was really disenchanted with standing in front of the class and telling them what I knew. Suddenly what I did know was irrelevant, and I felt I knew nothing about the present world, and what I used to do as a teacher did not make sense. (1:287)

Each had taken the principles they now espoused about child-centredness and so on, and made them fit into their own style. Nora knew that they worked differently, but that they also worked together:

> *: Has Paula changed in the same way that you have?
>
> NORA: Oh, she has changed even more radically than I have. She has gone totally child centred. She doesn't do much explicit teaching any more. (1:553)

Nevertheless, it was clear that they were both finding it very satisfying as well:

> NORA: Paula came to me the other day, and said 'It's easy isn't it?'. But this *was* at fourth term! {taps the desk in emphasis}. At the start of the year, it was, 'boy, we'll have to kick some of this out of them', because they were waiting to be spoon fed; whereas at the end of this year it was very different. I was tidying up, and I remember at the same time last year, I couldn't do that because I had so many kids hanging around like bad smells asking 'What can we do now?' and so on! (1:418)

It was early in the research that Paula and Nora complained to Leanne (ICT coordinator) and Ross (acting Principal) that some of the new computers, allocated to other classes as they had all agreed, were not being as well used as they might. As a result they were allocated another classroom computer, which gave them full-time access to seven computers (in their two classes) as well as the weekly lab bookings. Such a move presumably happened because both Leanne and Ross were persuaded that they would be better utilised in the new location. Both Nora and Paula described a wide range of activities that took place on their computers, from using word processing to spreadsheets, tutorial software and slide presentations. The computers were always on and being used whenever the researcher passed their classes.

Summary

Nora used a range of collaborative and sharing activities both with Paula and with her students, suggesting that she was interested in teaming. Her interactions with Paula appeared to be based on an equal rather than an unequal relationship and there appeared to be a dynamic and flexible development going on. The recent past appeared to have been part of an intensely satisfying development for Nora, with both her teaching and her pedagogy.

5.3.5 Signs of change in usage

One of the questionnaire sections asked about their use of various software applications like e-mail, word processing and Internet research. The before and after data are presented for the same teachers as were recorded in the earlier tables, Table 5.8 and Table 5.9 and in the same order (which was 'level of collaboration'). Table 5.11 and Table 5.12 describe RS teachers, and Table 5.13 and Table 5.14 describe the NW staff.

The purpose in displaying these data was to identify any changes which were consistent with the changed collaborative practices of those teachers.

Table 5.11: RS teachers at start—their software usage and their most commonly used software

Name	S'ware applic'n / Most used application	Word processing	Spread sheet	Ed s'ware	Inet rsrch	Inet bank	Inet game	e-mail	web site dsgn
Ann	Ed s'ware	2	n	3	n	n	n	n	n
Fiona	Inet rsrch	3	n	3	4	0	n	2	n
Gail	Inet rsrch	4	1	4	5	n	n	0	1
Christine	Ed s'ware	4	0	5	4	n	n	4	n
David	Ed s'ware	2	1	3	1	n	1	2	1
Evelyn	Ed s'ware	0	0	5	n	n	n	0	n
Iain	Ed s'ware,e-mail	0	0	4	3	0	0	4	0

UsageKey : 5: daily, 4:weekly, 3:monthly, 2:termly use, 1:not trained, 0:no access, n:Not appropriate.

Table 5.12: RS teachers at end—their software usage and their most commonly used software

Name	S'ware applic'n / Most used application	Word processing	Spread sheet	Ed s'ware	Inet rsrch	Inet bank	Inet game	e-mail	web site dsgn
Ann	Ed s'ware	4	0	5	3	n	n	4	n
Fiona	Inet rsrch	3	n	3	4	n	n	2	n
Gail	wp, ed s'ware etc	4	1	4	4	0	n	0	1
Christine	Ed s'ware	4	0	5	4	n	n	4	n
David	Ed s'ware	2	n	3	0	n	1	0	0
Evelyn	Ed s'ware	1	1	4	0	0	0	0	0
Iain	e-mail	3	n	4	3	n	0	5	n

UsageKey: 5: daily, 4:weekly, 3:monthly, 2:termly use, 1:not trained, 0:no access, n:Not appropriate.

Each table lists the teachers from each school down the left (in the same order as the tables on collaboration) and the software application that they report they used most in the semester just passed. This application is simply the highest scoring application of all their choices in their row to the right. The scores are based on a usage key provided at the bottom of each table, from high usage which rated '5' and low usage which rated '2'. '1' meant not trained, '0' meant no access and 'n' was rated by them as not appropriate for their grade. There were eight application choices namely word processing, spreadsheeting, educational software, using the Internet for research, using it for banking, using it for games, using it for e-mail and web-site designing. Note that any ratings of '5' are highlighted with a box to help identify patterns.

Comparing the before and after tables for RS teachers (Table 5.11 and Table 5.12) it is evident that all but one of those in the lower half of the tables had minor or no

changes. Iain is the only 'lower-half' person who changed noticeably in his ICT usage based on two scores namely word processing—from no access to monthly usage—and e-mail—from weekly to daily use. In the upper group of three Fiona and Gail changed little except that Gail's internet research usage fell a little, whereas Ann's usage increased noticeably on e-mail, Internet research, educational software and word processing compared with almost all the others. Given that she was rated as one of the most collaborative teachers this seemed a supportive connection.

It is noticeable that the largest proportion of case teachers at Regis Street used educational software applications the most. Jerry and Heather both encouraged staff to use this style of software on their computers in class. Although there were individual variations, the proportions remained unchanged over the period. The most obvious changes were in Iain and Ann's behaviour. On the one hand Iain appears to have made some progress but as he chose not to 'actively participate' his level of collaboration was unknown; Ann on the other hand was seen to change her collaboration levels rather dramatically, and her range of usage had broadened too.

Overall the usage of educational software at RS was high and unchanged over the period, even though Fiona, Gail and Iain began using more generic tools like e-mail more often. This contrasted with the data from NW case teachers.

Considering the case teachers at NW, as represented by Table 5.13 and Table 5.14, it was immediately evident that they did not change much over the time, implying perhaps a stable level of collaboration was already in existence. Also there was more apparent commonality in usage and perhaps opinions of appropriate software, for example there was good agreement on applications that were not appropriate (that is rated an 'n'). This was in contrast to the RS opinions which were more disparate. It was evident that the NW teachers overall usage was higher than the RS teachers, for example there were proportionally more 4s and 5s in the NW tables.

Table 5.13: NW teachers at start—their software usage and their most commonly used software

Name	S'ware applic'n / Most used application	Word processing	Spread sheet	Ed s'ware	Inet rsrch	Inet bank	Inet games	e-mail	web site dsgn
Leanne	word processing	5	3	4	4	n	n	3	4
Maya	Word processing	5	3	3	3	n	n	0	3
Nora	wp, ed s'ware	5	3	5	4	n	0	4	2
Paula	word processing	4	3	4	3	n	n	2	0
Olwyn	ed s'ware	3	2	4	2	n	n	1	n
Wendy									

5: daily, 4:weekly, 3:monthly, 2:termly use, 1:not trained, 0:no access, n:Not UsageKey: appropriate.

Table 5.14: NW teachers at end—their software usage and their most commonly used software

Name	S'ware applic'n / Most used application	Word processing	Spread sheet	Ed s'ware	Inet rsrch	Inet bank	Inet games	e-mail	web site dsgn
Leanne	word processing	5	3	4	4	n	n	3	4
Maya	wp + ed s'ware	5	4	5	4	n	n	2	3
Nora	word processing	5	3	4	4	n	0	4	2
Paula	word processing	4	1	3	3	n	n	2	2
Olwyn	ed s'ware	3	2	4	0	n	n	1	n
Wendy									

5: daily, 4:weekly, 3:monthly, 2:termly use, 1:not trained, 0:no access, n:Not UsageKey: appropriate.

Even more interesting was the most common choice of application. At NW word processing was the most frequently used application, and Maya also rated educational software equally highly. Olwyn identifying educational software as her most used application but her usage—at 4—was lower. As the part time support person for ICT, Maya's usage would have been at least partly determined by the teachers she was supporting that term, so her choice is less of a personal preference than Olwyn's choice was. In fact Olwyn stands out for her differences. As well as being the lowest collaborator in the group (since she is at the bottom of the table) she also had the lowest usage of any of the respondents at her school and was the only one to place an 'n' for not appropriate against the use of web site design. These factors and her preferred software choice aligned her more with the RS teachers than the NW ones with whom she taught.

In summary some clear differences in usage were identified within and between the two school groups of teachers. Not only were their levels of collaboration apparently significant but the different forms appeared relevant also.

The preceding sections have illustrated that there was indeed a range of collaborative forms used in the case schools during this research. The forms fell into four types—two groups of two—each distinguished by variation in two orthogonal factors. One of the groupings of collaboration varied in the amount of commitment they required, and the other grouping was notable by whether there was equality in the relationships or not. These two underlying factors could be used to tease out further relationships between the data in these cases.

Some of the important relationships in the data will be examined in the next Analysis section. The focus will be on the value of collaboration as a helpful factor in ICT uptake, and whether the distinctions into types of collaboration can also contribute to the process of ICT uptake.

5.4 Analysis of RQ 1–How collaboration supports teachers' ICT uptake

The research question at the heart of this chapter was concerned with collaboration and its value in the process of ICT uptake. The data from the two schools are now summarised and examined using a series of assertions. Each assertion will be justified with evidence, and any countervailing examples will be presented to allow a more complete picture.

There are many observations and conclusions that could be made based on the data presented already in this chapter, from the obvious to the counterintuitive. It was evident for example that those teachers whose commitment was higher seemed to make more progress with ICT, but this is a rather self-evident observation and hardly warrants examination. More interesting was the effect of the different support structures in the two schools, which seemed important, and is investigated by one of the assertions. The remarkable ability of some teachers to make progress despite apparently unsupportive circumstances also warranted investigation. A natural question to ask is whether the division into types of collaboration was decisive in

contributing some insight into the connection between collaboration and ICT adoption. Some light is shed on this question by the assertions.

Each assertion, derived inductively from the dataset, will be argued to show its contribution to the research question. Altogether three assertions were used to summarize and analyse the data. They are collected first into a table, given as Figure 5-3:

Assertion ID	Assertion
5.1 Multiple collaboration types needed	Teachers using a combination of types of collaboration demonstrate significantly better ICT uptake
5.2 Formal teams may be counter-productive	Formalised teams were seen to be pushing previously planned goals, often impeding new ones
5.3 Teachers can progress despite school settings	Teachers can make progress with ICT uptake regardless of collaboration or systemic support within their school

Figure 5-3: Assertions on collaboration and ICT uptake

In the following sections each of these assertions will be examined in order to substantiate their veracity based on a series of observations which together provide supporting evidence for each one.

5.4.1 Assertion 5.1:

Teachers using a combination of types of collaboration demonstrate significantly better ICT uptake

It was shown that four types of collaboration were identifiable in the collaborative efforts at the case schools. It was apparent that it was more than just levels of collaboration that seemed to contribute to sustained ICT uptake, and that the different types identified had a contribution as well. In particular, those who used both peer and non-peer collaboration seemed best placed to continue their ICT uptake. There were three sources for evidence that appeared to support this assertion.

1. Sustained ICT uptake was identified for only those teachers who used both peer and non-peer collaboration.
2. teachers often described how multi-faceted support was relevant in their view—implying that different types of collaboration could be relevant for other teachers as well.

3. Those using a single type of collaboration were associated with low progress levels with ICT.

Each of these items of evidence supporting the assertion is presented below, along with the discussion.

1: Sustained ICT uptake was identified for only those teachers who used both peer and non-peer collaboration.

ICT uptake is desirable but only a part of any teacher professional development plan; most would then argue that sustained ICT uptake was even more important. Such development was manifest in the case of Nora and Paula at NW. They had systemic levels of support from the Principal and multiple ICT support staff; they also had formed a tandem teaching pair and were able to observe each other, talk and plan together and had done so for over two years.

The level of change observed around Nora and Paula was significant—probably the most significant of any participants. Not only had it taken place over some years, but personal and professional development was still occurring, according to Nora. It is interesting to identify the variety of types of collaboration involved. They were engaging in Teaming collaboration with each other; it was indicated that there was Advising and Mentoring collaboration with both Leanne (ICT coordinator) and Ross (acting Principal). Coaching was probably evident with Maya (ICT support).

This range of forms of collaboration and the extended period—it had occurred over two years or more—seemed to contribute to the apt descriptor of sustained development with ICT usage for these two teachers.

2: Teachers often described how multi-faceted support was relevant in their view—implying that different types of collaboration could be relevant for other teachers as well.

Although all of them talked about the value of collaboration, two teachers described without prompting the multi-faceted ways in which teachers can support each other. This was seen as implicit support for the necessity of a multifaceted support system, which is the nub of this assertion.

Olwyn offered her views about teams, sharing and support, by identifying dual motivations for teachers to participate:

> OLWYN: People often don't want to become a member of a team until they can offer something to it, do they? They tend to stand back until they feel a little bit more confident, and know something about it. Then there's the other side of the coin, where someone who knows nothing about it may want to become a team member to learn. They don't understand, so they become a team member to see if they can learn from each other. (1:186)

She has suggested that two different motivations are possible when people are considering working together. She begins with those who want to contribute, and ends, in the last sentence, with the teachers who 'know nothing' that 'learn from each other'. She was giving her own views and it was apparent she was probably talking about her own motivations, implying that both types of learning support were relevant for her.

Ann commented on the need for breadth when she suggested that one type of collaboration was not enough for good development:

> ANN: …if I consider my own knowledge and use of computers twelve months ago, with my use now, I am amazed at how much I have changed and learned. Why? Obviously, collaboration - but that wouldn't work without some knowledge that becomes a basis for sharing and talking with others. …
>
> By Jerry giving us 2 computers in each room it becomes impossible to not pick up more and more - just by osmosis, and propinquity! Also sharing with a 'learned one' broadens the horizons. (e-mail 14sep2000)

This suggested that both a sharing collaboration (with supportive peers) as well as a mentoring collaboration (with knowledgeable support staff) may be necessary to meet the needs of people like her. An obvious conclusion was that both a sharing collaboration (with equality in the relationship) as well as a consulting collaboration (with inequality in the relationship) may be a significant factor in the process of successfully contributing to many teachers' ICT uptake.

Both teachers' comments were regarded as evidence for the view that multifaceted support may be more effective than just a single type when ICT uptake is concerned.

3: Those using a single type of collaboration were associated with low progress levels with ICT.

There were three teachers rated as 'low' in the collaboration tables (Table 5.8 and Table 5.9), and it was hard to determine any most prevalent collaborative style, which is why their entries are blank in that column of the tables. Each of Evelyn, David and Olwyn was most likely utilising only a Coaching type of collaboration, if any.

They also rated themselves as making relatively low progress (Evelyn and David a '2', Olwyn a '3') which concurred with their software applications usage in the same questionnaire and given in Table 5.12 and Table 5.14. Evelyn and David were rated as very low and Olwyn as low.

Evelyn admitted that she had been part of a team in name only, and her personal health problems had contributed significantly to her reduced performance. David was not only rated as low at the end of the research, but during some member checking 18 months later he argued that not only did he have no-one to collaborate with at his school, but that he had made no progress since that time. He wondered aloud how he could be of any use to the research.

Fiona and Gail were an example of teachers enjoying slightly more support and slightly more progress. Although they were rated with a high level of collaboration, they were evidently only using teaming with each other as their collaborative style. In line with the assertion, their level of applications usage was still low. Lower for example than all but Olwyn at the other case school. They were very supportive of each other in their tandem, but this was only local level support. More consultative support (say from leadership or support staff), was not apparent. We already know that they made limited progress, so its lack was therefore associated with their single type of collaboration.

Conclusion: assertion 5.1

It was apparent that the restriction of collaboration to the use of single types of collaborative support were associated with more limited progress in ICT uptake in this research. It seemed possible that this experience would be borne out by others in similar situations.

In summary there was a range of evidence that the more forms of collaboration that teachers were involved in, then the greater was the strength of ICT uptake. This conclusion held true across both schools and many of the teachers. Such a conclusion is not inconsistent with the expectation that those who do more collaboration could be expected to make more progress with ICT uptake; the detail is that the measure of 'more collaboration' covers, according to this assertion, the use of different types of collaboration. Obviously teachers engaged in a variety of types of collaboration are likely to be also collaborating more than teachers who are not collaborating in multiple ways. This assertion highlights the connection between better ICT uptake of those who collaborate more by identifying the multiple types of collaboration–specifically simultaneous peer and non-peer types of collaboration–as a key measure of that greater collaboration.

5.4.2 Assertion 5.2:

Formalised teams were seen to be pushing previously planned goals, often impeding new ones.

This rather counterintuitive and even ironic observation was grounded in the various forms of teaming and cooperating that were discernible amongst the case teachers. It became obvious that simply being a member of a pre-existing formal grouping or tandem was insufficient to encourage noticeable ICT adoption. Tandems describe two teachers who share one full time position, and who need to meet and build overlapping structures to provide continuity for their class of students. The teamwork that results from such pairings can be very impressive and appears to represent a collaborative relationship, although it is tightly targeted to meet their aims.

This assertion argues that formalised teams, specifically tandem pairs, do not appear to fit within two obvious patterns that were already operating in the case schools. The first obvious pattern already at work was that the more collaborative groups appeared to engender more progress with ICT uptake. The second pattern was that the more collaborative school environments appeared to encourage greater ICT adoption, but again tandem pairs seemed to be independent of this.

Although it is based on a limited set of data, it seemed so distinct as to warrant recording. Arguably this is not such a superficial assertion, as the natural expectation for most school staff may well be to assume that the teaming that seems to occur in

many tandems would be the life-blood of a supportive collaborative arrangement supporting ICT uptake.

First a figure describing the pre-existing formal groupings is given. Then the three items of evidence that appeared to provide support for this assertion are listed.

School	Type	Teachers	Note
RS	Tandem	Fiona & Gail	Sharing a single teaching position
NW	Tandem	Leanne & Wendy	Sharing a single teaching position
NW	Team teaching	Nora & Paula	Teaming within two teaching positions

Figure 5-5: Pre-existing groupings and their nature

1. Collaborative activities were seen to support ICT uptake and formalised teams could be expected to support this.
2. Tandem pairs could be expected to reflect the collaborative performance of their school and yet did not.
3. Teachers in formalised teams appeared to make significantly less progress than others did.

Each item is addressed and argued for in order below.

1 Collaborative activities were seen to support ICT uptake and formalised teams could be expected to support this.

Assertion 1 showed that highly collaborative groupings of teachers were likely to be more successful in their ICT uptake, and the corollary was that low levels of collaboration were generally associated with poor ICT uptake. Tandem teams—pairs of teachers who worked together to plan and execute the weekly workload of a single teacher—could be expected to be collaborative, and as an example both Fiona and Gail described their tandem relationship that way.

This suggested that such groupings would fall within the pattern established by Assertion 1 and any tandems could be expected to make reasonable progress with ICT as a consequence. The extent to which any tandems failed to make ICT progress bolstered this assertion about tandems being unexpectedly unsupportive groupings for teachers concerned about ICT uptake.

2 Tandem pairs could be expected to reflect the collaborative performance of their school and yet did not.

The two case school environments have already been shown to be different. The environment at RS may have been unusual with the severely strained relations between some of the staff, but there was otherwise little unusual compared with many other similar-sized schools, with a helpful Principal taking the role of ICT support and ICT maintenance being contracted out. It was evident however that the better support systems at NW helped the general processes of collaboration between staff. The support systems included an active and supportive Principal, multiple ICT support staff and regular staff socialising activities.

All of the NW teams observed during this research were obviously self-sustaining. All the RS teams collapsed by the end of the research except Gail and Fiona, who were a pre-existing tandem pair. It was therefore surprising but predictable, according to this assertion, to find that the NW tandem of Leanne and Wendy was not involved in any ICT development together, and that Wendy was a silent partner when their ICT uptake was concerned.

Leanne hardly ever mentioned Wendy when it came to any ICT activities, and never named her during the period of the research. It was presumed that Wendy took all her ICT guidance from her tandem partner. Leanne explained that Wendy tended to leave all their class planning about ICT activities to her. It was possible that Wendy simply left ICT activities as they were, let Leanne take responsibility for the students' ICT development and ignored her own. In this case it seemed that the tandem pair supported the status quo of ICT progress rather than providing support for their personal and professional development.

Overall it seemed that the tandem pair of Leanne and Wendy may not have helped Wendy make any progress at all. Although Leanne was the ICT coordinator at their school and was making her own progress and supporting many other staff around her with theirs, it seemed that she and Wendy spent all their time working on their students and none on their own or specifically Wendy's development.

3 Teachers in formalised teams appeared to make significantly less progress than others did.

Gail and Fiona worked together very well, but their sharing seemed to be totally focussed on supporting their current practices. They regularly expressed interest in ICT and despite their class usage of ICT they made relatively little progress. According to their responses (Appendix 5b) their software usage fell slightly over the research period when most others rose at the same school. They both reported making a range of uses with ICT which put their usage towards the middle of the group at RS, and they preferred open-ended application tools rather than simply dedicated teaching software. This type of usage was more typical of the NW case teachers and suggested that they were different to the other teachers at RS. However their overall software usage was lower than all but the lowest-scoring NW teacher and the researcher's evaluation of their ICT development—which was rated as improving a little—remained low.

Although Fiona and Gail appeared to be very collaborative in their tandem arrangement, the grouping appeared to be a stable one rather than a dynamic one in that it had difficulty accommodating change. Their apparent willingness to look at their ICT usage was not matched by any improvements over the research, and as a result it appeared that the level of collaboration which they engaged in had no significant effect on changes in their levels of ICT usage.

Again the issue of level of collaboration was not associated with a concomitant level of ICT uptake, and this suggested that the tandem pairings which were part of the research were not nearly as supportive of ICT uptake, despite their apparent levels of collaboration.

Conclusion: Assertion 5.2

In a supportive environment, the tandem of Leanne and Wendy appeared stable but relatively unhelpful as a support for ICT uptake for Wendy. This suggested that being in supportive or encouraging teams, even self-selected ones, were not successful strategies by themselves. In a less supportive environment, the RS tandem of Gail and Fiona were rated as highly collaborative because they teamed together well. Nevertheless their ICT uptake performance was insubstantial, and more

representative of the surrounding school environment than of their own apparent willingness. Their tandem pairing seemed unable to accommodate the extra needs for the same two people to collaborate over the issue of ICT adoption.

If these two tandems are typical then it seemed unlikely that tandem teams, regardless of the amount of energy they involve, would actively contribute to collaborative activities by themselves, since neither tandem in two different school environments made progress for both parties. This contrasted dramatically with the team-teaching pairing of Nora and Paula.

This simple but counterintuitive observation was potentially highly significant. It may be that it was an extension of Assertion 5.1. This assertion supports Assertion 5.1 if tandems can be shown to support or reinforce only one type of collaboration by the participants.

Formalised teams such as tandems appear to support the status quo. Perhaps tandems are so tightly structured and restrictively targeted to their own purpose that they may be unsupportive as a development vehicle for other purposes. The assertion described the inability of teaming alone, as occurred in tandem pairs, to deliver ICT uptake improvements at either of the case schools. It would seem that simple teaming was not in itself an important characteristic of a successful ICT uptake process. A corollary was the fact that some who did not team rated their ICT uptake progress higher than others who did team (see the next assertion) further supporting the assertion that just being in a structured team was not alone a significant contributor.

5.4.3 Assertion 5.3:

Teachers can make progress with ICT uptake regardless of collaboration or systemic support within their school

Although the research suggests that the school environment is very important as a guide to the levels of collaboration likely to be found there, the connection is only an imperfect relationship. All the teachers in any school can vary considerably, and this variability can confound the rules. Even in apparently cheerless schools it is possible to find a cheery soul, and the same appears true with ICT adoption. In the case schools three sources for evidence appeared to support this assertion:

1. The level of systemic support did not seem to parallel teachers' ICT uptake

2. Most teachers appeared to place great importance on their need for professional development irrespective of their situation
3. Teachers were influenced in their professional development participation by personal as well as school factors

Just because school or systemic support was not good enough did not stop some teachers determined to make progress. Each of these sources is argued in the next three sections.

1 The level of systemic support did not seem to parallel teachers' ICT uptake

Two teachers at Regis Street provided the first significant evidence supporting the assertion. Despite their imperfect school environment both Ann and Christine gave themselves a '4' (the maximum) for their estimate of progress in the six months up to the final survey (see Table 5.15). Ann had already been rated as a high collaborator, and Christine as Medium-Low, and yet they both felt positive about their development.

Consider the case of Ann. She showed willing development with ICT even though part of her environment was positively hostile, she was battling medical problems and was unable to consolidate a team to work with, either at her school or outside it.

In her favour were her attitude and her reflective ability. Elements of a student-centric approach were already evident in her work; there was mentor availability and a somewhat supportive Principal. Against her prospects for ICT uptake was a very negative relationship at school, apparently directed at least in part at her. Then consider the limited elements of support available for Ann: There was a lack of formal technical maintenance and support and relatively weak administrative support for ICT use (no equivalents to a roster to use the labs and no dedicated support staff to help); there was no outcomes orientation philosophy in school and no committees supporting or encouraging staff interest in the topic; few existing teams in the school, no collaborative activities being undertaken; résistance at a staff meeting to formally imposed collaborative structures and feelings of lack of time further undermining teaming efforts.

It was perhaps surprising that any development occurred at all at RS given the relatively unforgiving environment in which Ann found herself. Table 5.15

shows all of the RS case teachers' self-ratings of progress before (Initial survey) and during (Final survey) the research project. Both were rated as collaborating, but neither was, by the end, in a formal team at her school.

Ann was rated as high because of the range of collaboration she instigated on her own including with the researcher and with other staff. As well as trying to encourage David and Evelyn, nominally part of her original team, she also worked with the pre-primary teacher and looked for teachers at other schools to collaborate with. Her rating concurred with the rating she earned based on observation and reports from others including David, Robyn and Jerry. The documented lack of collaboration was not ascribable to her lack of effort. Her previous rating of '1' (the lowest) suggested that the research period represented a time of significant change for her.

Table 5.15: Extract from the RS surveys, Q.15. Personal estimates of previous and recent progress with ICT ie. before and after the research period. Scale 1(lowest) to 4(highest). Only Ann and Christine rate themselves the highest on recent progress.

Estimate of previous progress / Teacher	Initial survey	Final survey
Ann	1	4
Fiona	3	3
Gail	3	3
Christine	4	4
David	2	2
Evelyn	3	2
Iain	4	3

Christine was rated as a relatively low collaborator since her 'team' never gelled; she privately was reportedly vindictive towards multiple other teachers on the same staff and yet never mentioned this as a concern in interviews or any other time; and she actively attacked staff publicly without attempting to resolve the issues raised by talk or other communication. On the other hand she reported how helpful two List-servers were for her during her ICT and teaching development so it was decided that she was achieving some collaboration through her membership of these lists. This explained her Medium-Low rating. Interestingly Christine also rated herself as a '4' in the period before the research, which accorded with neither her interview data nor her observed level of skills with

word processing. This suggested that she had over-rated her early progress and pointed to the likelihood of some overestimate of her abilities as well.

Two members of the teaching staff at one school and therefore in similar environments have been shown to be making some progress with ICT despite their differences in levels and forms of collaboration. In summary it seemed that, although some collaboration was identified as important to ICT uptake it was not totally consistent. It was clear that collaboration or systemic support was not a single predictor of ICT uptake but one of a series of factors.

2 Most teachers appeared to place great importance on their need for professional development irrespective of their situation

A second factor supporting the assertion that some teachers will make progress regardless of their circumstances was dependent upon rather personal characteristics. There were a number of staff at RS and NW either already putting in extra time or who showed a willingness to start. Their interest in joining this research was seen as evidence of this interest.

Leanne pointed out that their various committees had met 'about ten times' in the semester, always after school in their own time. Something made all these teachers feel that it was worthwhile to invest their personal time, and this willingness has already been attributed to the supportive atmosphere that the Principal, key teachers and support staff had built and maintained. At RS in a completely different atmosphere there were also teachers who were attending out-of-hours professional development activities. One perspective that these teachers may have is that they are professionals and this is an appropriate issue even if the school is not yet supporting it. To put it another way they may argue that, '"As long as its Department policy, then stuff the Principal!" There are many examples of DoE teachers taking this approach.' (personal communication, Paul C. Dench, 23xi2001).

This view may not have been prevalent at RS but there was no doubt that Christine for example felt that she was making good progress and was not going to be stopped by a Principal who in her eyes was not able to do as good a job as she could. Jerry described the staff at RS as progressive and willing, when he

pointed to four-fifths of them attending some In-service or other professional development opportunity during the last term of the research.

Overall it was obvious that there were keen and professionally aware teachers at both case schools and that they would take opportunities to improve their ICT uptake. It seemed that they would do this regardless of the level of support at their school.

3 Teachers were influenced in their professional development participation by personal as well as school factors

One of the arguments supporting the assertion that teachers can always make progress came from their interviews. They described significant issues like ICT uptake and student-centredness with such determination and clarity that it was clear that they involved heartfelt personal decisions. Consider Paula's (NW) revelation about the way she used to teach:

> Paula: I was really disenchanted with standing in front of the class and telling them what I knew. Suddenly what I did know was irrelevant, and I felt I knew nothing about the present world, and what I used to do as a teacher did not make sense.(1:287)

Reading her story it was decidedly a personal interpretation that led her to make the changes that started with views like this. It was hard to accept that teachers like her would not have come to the same decisions regardless of the schools at which they found themselves. This lends weight to the argument that teachers will vary over all schools and not just at those with supportive school environments. Whether this natural variability will be well utilised by Principals and support staff who recognise a readiness in their staff is another matter, however.

There is a useful corollary to this assertion as well, since it explains the natural variability of schools and teachers. This leads to an important principle as it suggests that any ICT coordinator in even the most unfavourable school setting should always have a keen soul or two to provide some initial stimulus for their efforts. Their job is then not just to work with 'ready' teachers but also to improve the environmental settings so that it becomes easier and easier for other teachers to make similar commitments.

5.5 Conclusion: Collaboration and ICT uptake

The process of collaboration was identified as a important factor in the process of ICT adoption, in the case study schools. Collaboration was easily identified, and it was then classified according to a typology and shown to be a significant contributor as people formed their opinions, views, pedagogies and made use of ICT in their classrooms.

During the course of describing the classes of collaboration a schema for describing collaboration on a 2x2 matrix was proposed. Through this schema it was noted that the uptake of ICT appeared more successful and sustained when it involved both peer (or sharing) and systemic support (or consulting) types of collaboration were present. Predictably the types of collaboration which involve greater commitment were associated with greater progress in ICT uptake. Greater commitment has always been associated with greater progress, but the significance in this setting is that the process of collaboration acts as a support—in other words it can 'grease the track'. This is a reminder that collaboration is not a subject but a process rooted in the willing communication between people with a shared purpose. If for example those involved in support are able to use collaborative means to provide that support then an improvement in ICT uptake could be predicted.

The two different types of collaboration apparently needed for sustained ICT uptake have consequences for friends and peers involved in the ICT support process, who would need to be conscious that say a level of technical support skills may be very important, so that queries can be answered as well as support needs met. Similarly support staff may need to become involved at a more personal or peer-based level to increase the chance of peer-based sharing as well as consulting type relations being developed.

It was argued in two assertions that simple teaming was not in itself an approach which necessarily led to success; and that some individuals can make progress regardless of the environment in which they find themselves, a reminder that these are general guidelines rather than exact rules of engagement. These two assertions were potential guidelines for ICT staff, in that they are reminders that even in the bleakest of schools there may be teachers ready to make progress with ICT with the smallest of support. At the same time not all of the ways of working together may

prove useful. Although this issue has not been investigated thoroughly in this context, it seems that some teaming, for example tandem pairs, may be antithetic to ICT uptake and that ICT support staff may need to be aware of this prospect.

In summary collaboration was shown to be a significant contributor to ICT uptake. The division of collaboration into four types based on equality of relations and level of commitment was useful in teasing out some of the factors important in supporting ICT uptake. It was proposed that both a consulting type and a sharing type of collaboration were associated with higher adoption success, and for sustained ICT usage high levels of commitment and support were evident as well. Finally it was evident that not all sharing and collaborating was necessarily supportive for teachers seeking to improve their ICT uptake, and some awareness of this issue could be important to ICT staff and coordinators in schools.

CHAPTER SIX

LEARNING ORIENTATION AND ICT UPTAKE

Introduction

ICT adoption was shown in Chapter 2 to be a slow process for schools and their teachers. The thesis of this study was that the two factors of Collaboration (Chapter 5) and an Outcomes Orientation (here in Chapter 6) would provide support for the case study teachers undergoing the trauma or the pleasure of ICT uptake whilst teaching. Each of these factors, it was argued, provided support in their own way for the process of ICT adoption, and hence would improve their ICT usage.

This chapter makes use of the model of outcomes orientation by Costa & Garmston (1998), first introduced in Chapter 2. It identifies an outcomes orientation for each case participant, and analyses how the various outcomes orientations affected each one's ICT uptake in this study. The model argued that all the participants had an outcomes orientation of some sort—their model described a five level hierarchy—but it is shown here that these can alternatively be divided into two groups. Some of the outcomes were more content-based, and the rest were more process-based. These two orientations are shown to be approximately parallel to the traditional content-centred and the more constructivist student-centred approaches.

An outcomes orientation in the context of this research is thus clarified as both a process-outcomes orientation and a more student-centred approach, compared with the more content-oriented or traditional curriculum-led educational style. Using this dichotomy, some participants fell into each camp, and others straddled both. Then the research shows how this categorisation was decisive in predicting their rate of uptake of ICT.

The following analyses are focussed on the class teachers. Support staff and Principals are excluded from all the tables, as they are rarely directly involved in the ICT uptake process in individual classrooms. Nevertheless they still have views and sometimes critical roles to play and are mentioned whenever appropriate.

6.1 The relevance of outcomes orientation to this study

An outcomes approach was perceived to address a challenge peculiar to the teaching role. Essentially an outcomes orientation focuses on the learners and the outcomes they achieved (referred to in Chapter 2 as 'them' knowledge), and not the teacher and the work they put in (described as 'me' knowledge). But because the focus was now on the students and their outcomes, there was less expectation of the teachers to show their competence or otherwise with ICT.

It was hypothesised that focussing on the educational outcomes of an activity using ICT, rather than the ICT itself, would reduce the stresses that were often associated with the need to learn how to use some ICT at the same time as teaching about it. The principle was not simply to distract teachers from the stresses they felt, which were real enough and were not to be trivialised. Rather the principle was to remind them, as educators, of the goals that they would want for any similar activity, even when one happened to use ICT as a means to reach that goal.

An important implication is that student learning could still be measured, in theory, regardless of the quality of instruction that preceded it. So it was hypothesised that teachers who could reframe the stress they felt—because they no longer needed to feel like it was them under scrutiny but their students—would not only find the process of ICT uptake easier, but would also become better users of ICT.

The use of an outcomes orientation in this study was a chance to piggy-back on the same skills which teachers were already being asked to start addressing because of the DoE(WA) Outcomes initiative. In fact the mental model underlying the Outcomes initiative and the outcomes orientation of this study were intended to be the same. Therefore the identification of outcomes-oriented activities by teachers could be simplified by reference to more general outcomes-oriented materials from the Outcomes initiative.

6.1.1 Measuring an outcomes orientation

As a result of Costa & Garmston's work (1998) on teachers' outcomes orientation, it has been shown (and reported in Chapter 2) that an outcomes orientation corresponds to a willingness to focus on process-centric outcomes. This corresponded to people who rated in levels 3 to 5 of their five level hierarchy (Table 6.1), for whom process-

oriented outcomes were important. Teachers in levels 1 and 2 were characterised as seeking outcomes which were much more content-oriented.

Table 6.1: (Copy of Table 2.6) A hierarchy of Outcomes, from Costa & Garmston (1998)

1	outcomes as activities
2	outcomes as content
3	outcomes as processes
4	outcomes as dispositions
5	outcomes as mind states.

A similar distinction was made by Dwyer et al (1991) in one of their tables reflecting on their ACOT research—shown as Table 6.2—when they showed how many of their teachers gradually changed from their familiar instructional teaching approach towards an extended approach they called 'knowledge construction'. For example they progressed from an emphasis on facts and recitation towards relationships and enquiry; and from teacher-centred and didactic instructional modes towards more learner-centred and interactive modes. Thus it was concluded that, since much of the Outcomes initiative is concerned with teaching process outcomes, there seemed to be a strong association between a (process) outcomes orientation and the extended approaches to teaching and learning which use student-centred and interactive activities as a norm.

Table 6.2: Gradual shift from traditional conceptions of learning reported for ACOT teachers (Apple Computer Corporation, 1995, p. 2)

Attributes Of Learning	**Traditional (instruction)**	**Extended (knowledge construction)**
Teacher role	Fact teller and expert	Collaborator and sometimes learner
Student role	Listener and learner	Collaborator and sometimes expert
Assessment	Norm-referenced and multiple guess	Criterion-referenced and performance portfolios
Technology use	Seat work	Communication, collaboration, information access and expression
Learning emphasis	Facts and recitation	Relationships and enquiry
Activity	Teacher-centred and didactic	Learner-centred and interactive
Concept of knowledge	Accumulation	Transformation
Demonstration of success	Quantity	Quality

According to the long-term ACOT study, many teachers who started with a content focus when using ICT in their classes, gradually become more concerned with processes and knowledge construction, which is described by a move from the activities on the left of the Table 6.2 to those on the right. The change was not linear but depended on conditions, the novelty of the work, their confidence in that week and so on. For example the addition of a new ICT component into a class activity may be the cause for a return to a more instructional mode for some teachers. The clear implication is that a teacher, who may have already developed to be somewhat learner and process-centred in their normal class work, may revert to more content-oriented style because of the extra cognitive load induced by ICT adoption during the early adoption phases. It is therefore important not to classify any teacher based on a single observation or a single criterion.

Given the huge time-span differences between the multi-year ACOT research and this study over less than 12 months, it would be understandable if very little change were detected in this study. On the other hand there was now more certainty about 'what to look for', and there was much more systemic pressure on teachers to make use of ICT in their schools. Although the progression may be small for most teachers, and would not be expected to be exactly consistent and linear, some general patterns were expected to illustrate their progress, no matter how limited or variable.

Vacillations between traditional instructional and knowledge-construction learning activities were indeed evident for some of the participants at the case schools. For example Fiona demonstrated some content-centric behaviours in the usage and support of ICT with her students, even though some of her other teaching and learning activities were obviously more process-centred.

Hence the ACOT table suggested some criteria to permit the identification of factors contributing to an outcomes orientation. The two columns and a range of attributes were the basis of an observation tool. From these attributes it is possible to identify examples of activities and observations which show polarity on these outcomes orientation characteristics.

Such a table, to illustrate pairs of different student activities, one from the traditional, or content-oriented perspective and one from an outcomes-oriented perspective is given as Table 6.3, which gives some hypothetical examples of the different roles,

assessments and ICT use that might result under each approach. Each pair of activities is attempting to address learning in the same or a similar area.

Table 6.3: Hypothetical examples for identifying outcomes orientation

Description of student activity	Content-oriented perspective	Outcomes-oriented perspective
Role	Students listening quietly to a video presentation on a topic ie Listener	Students planning a project together on the same topic ie Collaborator
Role	Learner describing a web site's content and extracting the relevant parts for a research essay	Learner and partner analysing whether a particular data source is good for the purpose, eg a research essay
Assessment	Normative eg Each student given a work-sheet on digital cameras and given a score for it	Criterion referenced eg Every student successfully stored two of their digital photos on their personal disk
ICT use	Researching eg looking for answers from a provided site	Communicating eg Using e-mail facilities to ask their own question of a remote expert

It is acknowledged that it may be artificial to force a comparison between two potentially unalike structures, since arguably the purposes of each teaching approach tend to be quite different; but the examples are illustrative, and useful to that extent. It is important that observations are substantial. After all a single event may not be enough evidence of a teacher's outcomes orientation, as the wider purpose of say a six-week teaching and learning activity may not be apparent from even multiple observations if the time-period is too short-term. Nevertheless the intent of the table is honourable. Thus, although care must be exercised if this table were used as an observation tool, it addresses the intent of the study in a practical way and therefore is presented as another format to amass evidence contributing to a teacher's outcomes orientation.

6.1.2 Identifying evidence for a (process-) outcomes orientation

The following two column table, Table 6.4, lists some example activities and observations, and the attribute for learning of which the item is evidence. These were derived from the previous ACOT table, Table 6.2. Such criteria were used to help classify teachers during the course of the study.

Table 6.4: Sample criteria used for assessing evidence of outcomes orientation

Example of evidence for an outcomes orientation	Attribute
Expects students to show mastery of ICT independently of (and perhaps before) their own skills, e.g., the use of a web search tool)	Role
Willingly asks students for advice or support when a problem occurs during say a web searching activity.	Role
Prefers to suspend judgement on a recommended ICT tool until they have experienced its use with children	Role
Observes likely process outcomes possible from a computer-based activity.	Role
Chooses collaborative internet activities over parallel worksheets (ie students complete identical ones).	Assessment
Describes a criterion for student performance when the class uses ICT, eg storing a digital photo on their disc.	Assessment
Re-arranges student computer rosters for value not time (eg more time for those who have not achieved some standard)	Assessment
Can take some technology and use it with students before feeling confident about its detailed use.	ICT use
Uses generic tool software (eg a spreadsheet, a presentation or a multimedia tool) rather than single subject software or a preferred CD of subject software.	ICT use
Joins a listserver that arranges outcomes-oriented activities rather than just support.	Emphasis
Prefers to talk with students of the educational outcomes of ICT-based activities rather than the tools themselves.	Emphasis
Uses ICT with teams and themes in an across-the-curriculum way	Activity

The purpose of Tables Table 6.3 and Table 6.4 (derived from Table 6.2), was to illustrate that a teacher's outcomes orientation could be ascertained by careful collection of sufficient evidence. This included observation of their classes, questioning, listening to their philosophical observations, viewing the type of assessments they chose, recording the software being used (if any) each time the researcher visited the class, reading their diaries and watching their personal and their students' type and scope of ICT usage.

Given the relatively short timeline of the study, it was possible that some of the teachers might not change their outcomes orientation significantly. But just as the journey of a thousand miles starts with a single step, so changes would still be expected and were indeed identified. They tended to be gradual, in subtle ways or part of a variation in other factors that could be seen to be contributing to general progress. As an example, even though all the indicators for most staff showed that they were stable or increasing their ICT usage, it was evident that Evelyn's personal

and family difficulties were beginning to take their toll and she was moving backwards in her ICT attitudes and ICT use.

Classifying all the case teachers by their outcomes orientation produced earlier versions of Table 6.10 and Table 6.11. They were then cross-checked with at least one critical staff in each of the schools, who provided substantiating or non-substantiating evidence and helped fine-tune individual classifications. As a result of these corroborations, and after further verifying data was reviewed, only one teacher classification was changed across the two schools and no teacher was rated as changing their basic outcomes orientation over the period.

The introduction to this chapter has re-addressed the purpose of an outcomes orientation. The critical characteristic was that it was intended to help reduce stress in teachers' lives. Firstly an outcomes orientation was meant to prove that the teacher's skills with ICT were secondary to the learning activities which their students could do with ICT, and therefore that teachers could lessen their focus on an item which they often identified as a source of stress. Secondly it was designed to integrate with EdWA's existing and high profile Outcomes initiative, and thus potentially reduce the workload of those participating by giving them further opportunities to learn about a topic which was already likely to be 'on their agenda', but which many of them had not yet seriously begun to incorporate into their thinking, professional development or class ICT activities.

These were seen as powerful reasons to incorporate an outcomes orientation into research on teachers considering ICT uptake, and there was generally strong support from the case teachers as they learned about the suggested approaches of the research. The following sections detail exactly how the theoretical model was incorporated into their activities, attitudes and approaches. The findings section considers the research questions and presents the data collected by looking at the forms of outcomes oriented activities identified over the study and presenting the evidence for it. It begins with a review of the types of software which case teachers used, and the apparent connection between the type of software and the type of outcomes that teachers can achieve with them.

The chapter concludes with an analysis section, which is presented through a series of assertions, which summarise the research results specifically on the current topic of outcomes orientation.

6.2 Findings on teachers' outcomes orientations

This chapter presents data that shows how the teachers at the two case schools were described, in terms of outcomes orientation. They were divided under this bi-modal classification of either a more content-centred or a more process-centred orientation, and the connection between these categories and their attitudes, their pedagogy, their level of ICT usage and how it was changing. The teachers were classified based on their espoused and implied philosophy deduced from surveys and interviews, journals, school newsletters and associated publications, observations by the researcher and evaluative comments from other teachers.

Compared with the collaborative material described in the previous chapter, the data on an outcomes orientation tended to be more implicit, and often embedded in other content. For example Gail's initial attempts at designing an Internet activity for her students illustrated her preference for worksheets—something she must have had lots of experience with and obviously felt quite confident about producing—to cover a web-based topic she felt less confidence in. She then chose a pre-written worksheet structure by photocopying some purchased masters, and had all the class do the same worksheet which she then chose to mark at about the same time. For these reasons it was then concluded that she was probably using more content-centred approaches as she began addressing this ICT topic. This is an example of how the data were isolated and used to determine an outcomes orientation for the teachers in the study.

All of these interactions could not happen without software. Software is usually at the human-computer interface, it is the glue between the physical technology and the students who use it, and the type of software determines the types of interactions that are possible. The patterns of choices that teachers make about the software they use can speak loudly about their underlying teaching intentions and abilities, and this issue is addressed next.

6.2.1 The role of software

Most of a teacher's interaction with a computer is via the software interface. Different teachers chose to use many different types of software, sometimes in patterned ways, and much of it appeared related to their outcomes orientation. Therefore before looking at the types of software used by the case teachers, it is important to delineate these types properly. These are presented below. Also further

useful data were evident in the results of the two ICT surveys undertaken during the formal intervention period, and relevant highlights from these data are summarised next.

Categorising the software used in schools

This section suggests some useful categorising of software and the next section shows the teachers' software usage with their students, and suggests some possible connections with different outcomes orientations. This is a precursor to showing the basic findings on the various teachers' outcomes orientations in this study.

There have been many attempts to classify software, including exhaustive lists and typologies. An example of an exhaustive list, described by the Open Learning Technology Corporation Limited (1996), listed Applications, Drill and Practice, Hypertext, Interactive Multimedia, Internet, Logo, Modelling, Simulation, Telecommunications and Virtual Reality. This is only one way to classify software, they point out, indicating that other ways include by subject, by software type, by educational paradigm, by use, and by impulses to learn. Taylor (1980) suggested a well known typology by software type, namely Computer as tutor, Computer as tool, Computer as tutee.

Another classification is by scope—Granville (1999) identifies two types of software application, based on scope: classware and worldware.

> If classware is discipline-specific, or at least *content* driven, 'worldware' is just the opposite. It is software that can be applied to many purposes, to many ends. The most important and familiar worldware includes
>
> - electronic mail
> - the World Wide Web
> - on-line discussion groups
> - file servers
>
> Some would also add word processing, spreadsheets, and other 'generic' applications to this list. Not surprisingly, these are services of value across campus, and as such they are acquired and maintained by the central support departments at the Computing Centre. (Granville, 1999)

This categorisation distinguishes the 'content' level of the software as a criterion, for whether they should be maintained by a central body or by individual departments. OLTC point out that much discipline-specific classware was of the tutorial or drill and practice type which, especially the latter, were easy for teachers to use:

> Drill and practice represents a major use of computers in classrooms—teachers finding that this type of software requires little supervision, preparation or guidance, whilst providing for valuable learning for a range of students. (OLTC, 1996)

Such software not only freed the teacher from the need for planning, but it also reduced the need for preparation or even the need for knowledge about the detail of the software.

At the other end of the scale is software that either provided its users with high levels of control, eg. modelling software like a spreadsheet; or was able to alter the mix of student workload, and keep the focus on more authentic tasks.

> Two types of labour in learning are distinguished in this context; authentic labour and inauthentic labour. The former is labour that is integral to the learning process; the latter is labour which is not central, but may be an accessory to the learning process. (OLTC, 1996)

Software like a database or a word processor were examples of the labour saving software which entrusted greater autonomy to the user of the software.

Different opinions are implied by a typology in Fox (1998)'s Type I and Type II software (1999). Again the author distinguished the level of control as important. This time however, Type I software covered a wide range of material, 'that requires little active participation and manipulation from the user, requiring the user to respond in predetermined ways.' Not only did this typology cover drill and practice and tutorial packages, but unusually it covered some traditionally open-ended tools:

> Type I software, however, encompasses a much wider variety of software. Such applications as Excel, Power Point, and Word Perfect are also Type I. You say to yourself, 'But I actively manipulate information in Power Point to design unique presentations!' This is true, but the software still 'controls' you, rather than you controlling it. (Fox, 1998)

At the other extreme her Type II software lets the user do the 'controlling'. It included, in her description, more interactive and more visual applications:

> Type II software allows the user to 'control' the software, allowing the user to make decisions, manipulate activities, change direction or create something new. Some examples of Type II software include: Sim City, Hyper Studio, Oregon Trail, and Risk, just to name a few. These examples are all highly interactive and visual. (Fox, 1998)

Even though there were differences between the authors quoted above, the commonly identified issue of user control was identified as salient for teachers in this study also. Another issue beyond 'control' was the way that some software permits

the user, in this case the teacher, to use it more widely in classroom activities than for a single purpose.

Often, software with a strong content orientation is only appropriate at specific times in a course. For example, some tutorial software teaching about, say, ant colonies would have limited applicability elsewhere in a course. On the other hand, the simulation software *Sim-Ant*□ could also be used, in the hands of an interested teacher, to lead students to learn about communities, or natural ecologies, or how ants attempt to manage themselves in the face of natural disasters, or how individual instinctive actions amalgamate to apparently intelligent group behaviour. An interested teacher may see an opportunity to broaden the topic to one of social adaptation under duress, leading to a history lesson, or about teenagers following the crowd in a health and personal development topic. Because of the reduced focus on content and content outcomes, there is a heightened likelihood that process outcomes could be addressed, as a result of using less 'restrictive' software such as this. Clearly the teacher has a major opportunity to direct the learning after the stimulus of the software-driven activity, if they choose.

Software with almost no content, like a spreadsheet or a word processor, should be useable in an even greater variety of learning situations. As an example a word processor can be used equally in a creative writing activity or for an analysis of a social policy.

A related issue is the 'cost' of learning to use the software. Simpler software—often the strongly content-focussed—must tend to take less learning time than more complex software, like a spreadsheet, for example. However the software which took longer to learn was probably going to be more useful in a wider range of learning situations, and this could be an important trade-off for many novice teachers.

Not only is the level of user control and involvement important, but also the opportunity to use the software in a wider range of circumstances and in other learning topics would be one way to justify the learning costs. Thus drill and practice and tutorial software was seen as less easily applied in a variety of situations, especially those addressing more process level outcomes. Teachers would have very little opportunity to make decisions about the wider applicability of most content-rich

software. On the other hand software which allowed greater teacher decision-making in its use was, it was felt, likely to be useable in a wider array of circumstances.

Consequently, software was classified on two parallel criteria, namely the extent to which it allowed user control (that is, a level of self-directed participation was supported), and how it afforded the teacher flexibility to apply it broadly in their classroom. These are summarised as whether it was largely content oriented or process oriented software. Table 6.5 illustrates this classification.

Table 6.5: Examples of software ranging from low user control/content-rich to high user control/process-rich

Restricted user control			**Unrestricted user control**
content-rich ◄——————► ***process-rich***			
minimal teacher decision-making			**maximal teacher flexibility**
Drill & Practice Tutorial Eg THRASS CD Eg Math Games CD	Internet worksheets avoiding Searching, Restricted WebQuests, Simple simulation software	Book raps, Travel buddies and tailored e-mail tasks, Extended simulation software, Open-ended WebQuests, Simplified programming environments eg Turtle	Word processing, spreadsheets, e-mail, Internet research, PowerPoint designing, Full programming environments eg Logo
Strongly content-focussed software	*Less content-centric or reduced/tailored tools access*	*Specific tasks using tools*	*Open access to tools*

The table is less a formal continuum, than simply representative of the graduation of ways that software tends to be used by teachers. The gradation covers four steps from strongly content-focussed software, minimal levels of teacher decision-making and restricted user control on the left side, through less content-centric or reduced/tailored tools access and specific tasks using tools to open access to tools software, maximal levels of teacher flexibility of usage and the minimal restrictions on user control.

The division on content vs. process grounds (suggested by the vertical bar in the middle) is not inconsistent with previous classifications, and in this study it drew attention to the differential needs of the teachers with different levels of confidence and skill with ICT, and outcomes. Novice teachers would presumably have less difficulty starting with the content-rich software which required less skill and planning on their behalf; more confident ones would be more willing to use a greater range of software types, especially as they became aware that the process-rich

software was better able to help them address process-outcomes needs in their learning plans.

For simplicity, the left two columns are classified as more content-centric activities, and the right two columns are classified as more process-centric activities. This division is accepted in the survey results presented in the next section.

Software usage with students and its relationship to outcomes orientation

Teachers completed two ICT surveys during the study, on their attitudes towards ICT and their personal and student levels of usage (Appendix 5c). In this context their responses about most used software and types used with students were of interest. Their answers were given a number from 1 to 5 to quantify their response. Big users described daily usage, regular users described weekly usage, and lower scores were allocated for teachers who described only monthly or termly usage. In order, these were scored with a 5, 4, 3 and 2. A rating of No usage was scored as 1 and not counted in any of these figures. It was decided that an acceptable way to represent such ordinal data in a summary form was by adding together these scores greater than 1. arguably these are limited qualitative self-perceptions. On the other hand they are easy-to-recall data and represent the case teachers' genuine beliefs or performances, and they always married with observation over the research period. As long as they are treated as ordinal data then it seems likely that they can reveal simple trends when interpreted carefully.

For example Christine described her class as big users of educational software—scoring a 5—and regular users of Internet research word processing and e-mail but no user of spreadsheets, scoring three 4s and a zero (5+4+4+4+0 = 17) for a total class use score of 17. At the same time she described herself as a regular user—rating a 4—for all three of educational software, researching via the Internet and word processing (so far 4+4+4 = 12) but a big user of e-mail (scoring 5) and occasional user of spreadsheets (scoring 3), making a total of 20 (12+5+3=20). Although these categories are only ordinal, the simple addition of these scores is an indication of their overall level of usage; hence it is possible to see from her quantifications in the previous paragraph that Christine is using these tools slightly less with her class (5+4+4+4) than personally (4+4+4+5+3), and the ascribed scores of 17 compared with 20 summarise this in a reasonably meaningful way. Given the

lack of linearity of the data it would be statistically problematic to attempt deeper comparisons of his ordinal data using any more sophisticated descriptive statistics.

An extract from Christine's questionnaire answers is provided in Table 6.6 to show how her class use score was calculated, and to identify her highest scoring item (in this case a 5, emboldened). This method was used with all the teachers' data.

Table 6.6: Extract from questionnaire data showing how Christine's 'Overall Class Use' and her ' software most used with students' are calculated (see Appendix 5b).

	Most used s'ware	WP	Spread-sheet	Ed sw	Inet rsrch	Inet bank	Inet game	e-mail	web site dsgn	Overall class use score
Christine	Ed sw	4	0	**5**	4	n	n	4	n	17

Adding each teacher's class software usage which they rated with a 2 or better in all the software categories from the survey, gave a score that is called *overall class use score* (last column). Then noting each person's highest individual score produced a *most used software* category (second column). Both these figures can be calculated for each case teacher at the start and end of the research period.

These two items are placed side-by-side, using the two survey results to show trends over the study period. This produced one table for each of the two schools, which are labelled as Table 6.7 and Table 6.8. The columns show the items at the start and end of research period, for example *NW (start)* is column of data from the first ICT survey of NW, and *NW (end)* is from the second one. A third item and the final column of the pair of tables compared their personal use with their classroom use during and near the end of the research. In Christine's case her Personal usage score exceeded her Class use score (20 to 17) and this is summarised with a *Yes* in Table 6.8.

Table 6.7: Software type most used at NW with students at the start and end of the study, sorted by final class use score.

North Waygo	NW (start)		NW (end)		
	Most used in class	Score	Most used in class	Score	Was personal > class use?
Leanne	word processing	23	word processing	23	no
Maya	word processing	17	word processing	23	yes
Nora	word processing	23	word processing	22	no
Paula	word processing	16	word processing	12	yes
Olwyn	Educational software	11	Educational software	9	yes
Ross(a/P)	word processing	10	None	0	yes

Table 6.8: Software type most used at RS with students at the start and end of the study, sorted by final class use score.

Regis St	RS (start)		RS (end)		Was personal
	Most used	Score	Most used	Score	> class use?
Christine	Educational software	17	Educational software	17	yes
Ann	Educational software	5	Educational software	16	no
Iain	Educational software	11	e-mail	15	yes
Gail	Internet research	13	multiple *	12	yes
Fiona	Internet research	12	Internet research	12	yes
David	Educational software	7	Educational software	5	yes
Evelyn	Educational software	5	Educational software	4	yes
Jerry(P)	none	0	none	0	yes

* word processing, educational. software, and Internet research all equal. See the text for further explanation of the data.

It was evident by reviewing the two tables that there were significant differences between the two schools in the level and types of software teachers chose to use with their class. The observations can be grouped into summary observations and individual observations.

Firstly the total scores tended to be higher at NW, which simply confirmed the greater overall ICT usage already observed at that school. Secondly at NW the most common software was a standard—process-centric—tool, word processing. The only exception was Olwyn, who used CDs of educational software more. At RS there was a contrast with NW, as educational software was their most common item, initially

preferred by five of the seven teachers, and hardly changing by the end of the study. At RS, where Jerry was Principal and the support person, there was much less emphasis on using more tool software, suggesting a more content-centric approach to learning was emphasised overall.

A number of individual observations are also relevant. Maya showed a noticeable increase in her overall score, but her most common software was still word processing. This was consistent with the researcher's observations, and reflected the greater emphasis that Leanne as ICT coordinator and Maya and Teresa as support staff put on standard tools like word processing and interactive multimedia software. Note that Ross' usage dropped away as he moved from Deputy to Principal during the study.

At RS both Iain and Ann made noticeable gains in their usage, and Iain was the one teacher whose usage apparently moved from content-centric (educational software) to more process-centric software (e-mail). Over the same time Iain had also moved from 4th on the list to 2nd in usage. It was a shame that he chose not to be interviewed as his change appeared to be a significant one. Despite the researcher's regular assertion that more use of tool software was appropriate, these tables show that teachers at NW were already converts to the cause, and those at RS were not apparently changing significantly. The interesting exceptions were the tandem pair of Gail and Fiona, who were not only making reasonable use of tools, but their sound overall score suggested that perhaps, compared with most other RS staff, they were taking a more even-handed approach to the range of software that was available to them. Certainly whenever the researcher visited their class, a variety of software types were being used, but there was no doubt that the most common item filling their screen was a web browser, usually at a site of interest to the students.

Unfortunately the simple classification of Gail and Fiona as users of process-centric tools is not that clear-cut, either. After all, as Table 6.5 points out, highly strictured, controlled or invariant uses of some tools may be focussing attention on content at the expense of process, and could even be regarded as rather content-centric uses of a tool. Iain may be in the same category, if for example his use of e-mail with his class was to address a repetitive and simplistic task. As he chose not to be interviewed or observed, it is not possible to make further conclusions in his case. Gail and Fiona, on the other hand, were seen to be using the software under the tightly controlled

conditions already described, which suggested that they were not freely planning to integrate their web use into their class activities, and were in fact making less process-centric progress than was originally evident from the questionnaire data.

As already identified in Chapter 5, this disparity in software type used by teachers at the two schools was paralleled by very different levels of local support which were available to the teachers in the two schools. Even more relevant for this chapter was Leanne's pre-existing firm support for the Outcomes initiative, as described in her vignette in Chapter 4. Also, the differences identified by the survey were associated with her learner-centred approach to ICT support where she helped teachers specify what outcomes they sought by using ICT in their own class. No equivalent support was evident at RS before the researcher's study began. In fact the Principal, who chose to be the ICT support person at RS, had argued that he and other Principals like him needed better support and more skills with the Outcomes initiative, at a time when Leanne at NW was chairing meetings of interested staff talking about their use of outcomes.

It is relatively easy to argue then that the clear differences in types of software chosen by the teachers at the two schools were mirrored by equally striking differences in support facilities, as well as by differences in outcomes orientation by the support staff at each school. Here then was some initial evidence that there was a relationship between the outcomes orientation of the teachers and the types of software that they choose to use. This will be elaborated further in the rest of this chapter. The next section shows how the teachers fell into the categories of outcomes orientation already defined; and the final section will use a series of assertions to help distil pertinent factors which are justified by reference to the case teachers and the case schools.

6.2.2 Forms of outcomes-oriented activities identified

Two types of outcomes orientation were predicted, namely content-centric and process-centric, and indeed case teachers were identified in both categories. In addition, several of the participants appeared to be in a transition period between process and content-centred styles. These people showed evidence of process-centred activities in their non-ICT work, but they were apparently not using a process-outcomes orientation on a consistent basis in their ICT work. They are identified as

an in-between state called Student/Content and are initially treated as another category. These three categories are called Types A, B and C in the following sections.

Type A: Teachers exhibiting a content-centric outcomes orientation

Three teachers, Christine and David from RS and Olwyn from NW, showed clear evidence of a content-centric approach with their views on ICT. David was one of three males but the only male classroom teacher in the study; and both Christine and Olwyn were Deputy Principals. Olwyn had been deputy at NW for many years. In Christine's case she was acting in the role for the six months. A fourth teacher, Brenda, was included but with much less evidence, for reasons that are explained at the end of this section. Evidence included signs of a traditional approach to learning, with an emphasis on a subject rather than an enquiry approach; a focus on teacher-centred activities; designing activities around the accumulation of knowledge idea; and using ICT as seat work rather than a collaborative and expressive environment.

In different ways, they all saw ICT less as a tool, and more as a subject, with all the implications for its teaching. Their categorisation as content-thinkers is illustrated by their perception that ICT was a 'subject', and it had 'curriculum' to be taught, even though the researcher during the study had regularly asserted that ICT was only part of the means to an end. Faced with the same machinery, more process-oriented thinkers seemed to see a tool which could help them with the processes of teaching and learning. Christine treated ICT as a subject rather than a process when she argued that time spent by her students searching on the Internet was a waste, rather than contributing to a process skill. Similarly David felt ICT was something he had to know enough about to 'teach':

> DAVID: I'm mean, I see it as being expected to teach something I have no idea to teach. This sounds predictable I suppose, but, yeah, I have really no idea. (1:83)

He followed this immediately with a comment on his own feelings about computers:

> DAVID: I feel irritated as far as computers... as far as educating children how to use computers in the classroom. Irritation is... yeah. (1:86)

His own frustration clearly had a bearing on his views about computers. but it seemed to revolve around his need to be competent in their use, before he could have

his students use them. In a similar way Olwyn argued that since ICT is without a curriculum it is a 'subject' in need of help:

> OLWYN: There hasn't been a set program for schools to follow. There is no curriculum, there is nothing really, it's all ad hoc stuff. The department {ie DoEWA} can say you can develop your own programs, but we haven't had any guidance. We are all running around in circles taking a bit from this school, and a bit from that school, and using our own ideas. (1:58)

One could imagine that the support staff at her school, Leanne and Maya, could have taken umbrage with this description. Nevertheless, they would be sympathetic towards such teachers and the lack of progress they had made.

How they understood the whole Outcomes approach was also instructive in this context. Christine for example accepted that an Outcomes approach 'required a change in thinking', but typically, she apparently was concerned that *other* people using a computer could somehow just be letting their standards fall:

> CHRISTINE: I still think there should be a reason for what they do in school - there's a difference between ' a change of thinking' versus 'a lowering of standards' when it comes to using a computer, you know. (2:28)

She went further in her first interview. In describing her knowledge about outcomes-based education in general, she provided only a superficial differentiation between an outcomes approach and the 'traditional' one when it came to describing how she was going to arrange things differently:

> CHRISTINE: I mean, kids still have to learn the same facts about things, don't they. But I'm not going to teach it. I'm going to guide them so they'll have opportunities to learn. Say, if we going to do ancient civilisations—which I like to start Year Seven with—instead of me saying 'the pyramids were this, and the pyramids was that', we may have a topic of the 'The Pyramids', and they are going to find out all they can about them. It's still the same, because they are still going to learn about the pyramids, the whys, the hows, the where's, the whens and all that. But I'm not going to be standing there, and then I'm not going to be writing it out {on a blackboard}, or filling in little bits. (1:280)

The idea that the teachable content—in this case, the Pyramids—was only a means to identify their progress on some outcome, perhaps their understanding about religiosity, deities, or how different societies face the issue of death, or even how membership of different societal groups can influence the identity of individuals (Western Australia Curriculum Council, 1998a, p. 269) seems rather distant from her version of an Outcomes approach to education.

On the other hand Christine encouraged usage of a wide range of software in her class, and had begun to use e-mail and word processing almost as much as she used

educational software. Her self-reported usage was almost consistent with the teachers who were more process-centric and if this usage had been the only criteria it would have been hard to distinguish her views from theirs.

David and Olwyn were less active users, as their overall usage score attested, but equally 'passive' in the type of software they chose. Although they expressed interest in more activities, they were not seen to actually do anything about it. David relied upon the support of a parent helper for all his ICT class work, for example. Olwyn's observation that 'the kids know more than we do' belied the progressiveness that her attendance at Leanne's Outcomes committee meetings implied.

David appeared to the researcher to be more than a little stressed by the extra work he felt was being imposed on him. Perhaps the stresses had prevented the 'computer as a tool' metaphor registering with him. Although the SpokesTeam's criteria had remained on display in the staff room for all of term three, reinforcing the principle that ICT was to be seen as a tool for teaching other topics, the 'tool' concept was apparently discordant with his own perceptions:

> DAVID: I really did like your goals there, though {the three spokes}. So, {pause} I personally haven't done much of that at all. {pause} and this is the Outcomes {indicating the spoke}, I really don't have any idea what the outcomes are in terms of learning technology. (1:383)

As well as feeling confused about ICT, David had no confidence in his own ability simply to use it in class until he knew more about it.

Olwyn reflected the frustration that David apparently felt. She appeared to speak with some exasperation when she talked about educational computing in schools:

> OLWYN: well, most of us are starting with zero knowledge, and we are trying to teach children something that a lot of the children know more about then we do. (1:29)

She believed that the solution was better teacher training. Further, she felt confident that this belief was very common:

> OLWYN: There has never ever been any teacher training as such, or not something that the department has instigated. We have all done PD and the rest of it, but the department when they introduce new curriculum, for instance, pour millions of dollars into training teachers. And they've done nothing as far as teacher training {with ICT}. You have probably found that with everyone else saying the same thing. There has been no teacher training whatsoever. (1:41)

Although all three regarded ICT as a frustrating subject rather than a tool to help them meet some educational outcomes, both David and Christine showed some positive feelings in its utilisation. For example she use phrases like, 'the next exciting

step was getting on the Internet'. David wanted to do better, but felt that the department was responsible:

> DAVID: like when I saw you and Ann doing the bookmarks I said 'that's fantastic, how do you do that?' I can see that if someone would just *show* me, I could do it, you know? Rather than the department saying teach this child, teach them. I mean, it's a nefarious statement. (1:175)

Like David, Christine felt that her views about ICT were ambivalent. On the one hand she argued that her ICT skills meant that she had the capabilities to be the school's ICT curriculum person, saying 'next year—that's something I'd like to put up my hand for.' On the other hand one of the challenges she felt that she faced for the next year was a negative one about computers:

> Christine: Challenges? Next year? Well, letting kids get on with their work {on computer}, and getting rid of the 'working on computers is bad' attitude. (2:367)

She continued her 'content' thinking when she argued that searching on the Internet was 'waste of time' and she took steps to minimise her students' search time. This was a laudable approach, but risked leaving students always on the receiving end of her good intentions, and undermined the need to allow them to practise making value decisions of their own.

As a group all three expressed some relatively negative personal views towards ICT. Such attitudes were in common with participants in other categories who felt that they were not making enough progress with ICT, whether for personal reasons (eg Evelyn) or systemic reasons (eg Paula).

Interestingly the ICT survey summary questions (given in Appendix 5c) did not seem to tap their reservations that were described above. For example in the question 'my personal use of ICT is changing my assessment practices', Christine strongly agreed (scoring it '4'), Olwyn agreed ('3'), and David strongly disagreed ('1'). Nevertheless these were the only three participants whose behaviours and language showed that they took the content-centric view about ICT, namely that it was more of a subject than a tool, with common underlying conceptions of knowledge and ICT use, and that their role was connected to information transmission rather than information transformation.

There were two more teachers from RS who should be mentioned, namely Brenda and Iain. Neither was a full participant in the study, having 'withdrawn' at different times; but both were prepared to have some data recorded. Brenda completed the

opening questionnaire and agreed to an interview, and Iain completed both questionnaire forms willingly.

There was little data on Iain, except that he was prepared to complete the two forms at the beginning and end of the study; and he too was prepared sometimes to support Christine; and provide occasional ICT support for her. He was also quite helpful to some of the other staff, including those who participated in this study, although his skills appeared more those of a keen novice rather than an expert. Iain's outcomes orientation was not determined.

Brenda's comments and those of others in the school suggested that she was easily classified as content-centric in her outcomes orientation as well. Brenda had spent some time on stress leave, and took some months off after the study period was formally finished at Regis Street. She was antipathetic towards the Principal, and had some significant disagreements with at least one other staff member in the previous 12 months. She was one of the few people who supported Christine whenever she wanted support at a staff meeting or similar times. This discussion was important only to show that there were very few other teachers in the school who were process-centric and even likely to provide an appropriate model for any other staff, even if they had been willing to do so.

Overall there was a range of evidence which helped classify four of the eleven participant teachers from the two schools, Christine, Brenda and David from RS and Olwyn from NW, as showing a content-centric outcomes orientation.

Type B: Teachers exhibiting a mixed Student/Content outcomes orientation

The tandem pair of Fiona and Gail (RS) showed a mix of content-centric and process-centric views. They regarded their pairing as very collegial, and expressed very similar ways of thinking, so it was tempting to presume that comments by one could be reasonably representative of the pair's views. Certainly there was remarkable agreement in the feelings they recorded in the Experience of Change instruments (see the summary Table 6.9; and Appendix 5a for the scores of all case teachers), which they completed independently. In EoC1, they had noticeable differences on just five of the 24 items, which were enough to give them scores of +7 and +3 respectively. Noticeable differences were that in EoC1, Gail was much more

irritated (A to D), felt noticeably less valued (C to A), sometimes angry (B to D) and slightly less committed (B to A). At the end of the year Gail's EoC2 scores had risen dramatically to 15 and Fiona's had risen to 18. Again there were obvious patterns to their responses, with only four of 24 categories varying markedly. In EoC2 Gail was much more anxious (A to D), sometimes frustrated (B to D), still noticeably more irritated (B to D) and still slightly less committed (B to A). In all other items their scores were close or identical. Based on this instrument, as well as the observations already made, there appeared to be more similarities than differences between them.

Table 6.9: Experience of Change scores for RS staff Fiona and Gail. Letters in cells represent ratings from A-always to D-discard. The scores are in Appendix 5a.

Experience of Change Scores				
	EOC1		**EOC2**	
	Fiona	**Gail**	**Fiona**	**Gail**
Committed	A	B	A	B
Enthusiastic	A	A	A	A
Exhilarated	B	B	A	B
Optimistic	A	A	A	A
Confident	B	B	B	A
Stimulated	A	A	A	A
Supported	B	B	A	A
Valued	A	C	A	A
Comfortable	D	B	A	A
Pleased	A	B	A	A
Interested	A	A	A	A
Satisfied	D	B	A	B
Worried	B	B	B	C
Confused	A	A	B	B
Disappointed	C	B	B	A
Irritated	D	A	D	B
Anxious	B	C	D	A
Bored	D	C	C	D
Cynical	C	C	B	C
Sad	D	C	C	D
Angry	D	B	C	D
Frustrated	A	A	D	B
Isolated	D	C	C	D
Pressurised	A	B	C	D
Score	**+7**	**+3**	**+18**	**+15**

They worked with their students in a similar way. For example their students, whose desks were grouped, were always busy and usually working in groups whenever the researcher walked by or visited. No matter which of them was working, their class

environment was relaxed and casual with students interacting as they needed. The room was decorated as an undersea aquarium for the period of the study, including shiny strips hanging everywhere like seaweed, but not quite low enough to hit one's head on. They talked of designing activities that suited the students, and having them determine their own pace of delivery. Another staff member described them as 'liberal' in their teaching approach.

They were flexible in their use of roles, especially when it came to getting help with the computers. Neither of them had any hesitation, they claimed, in asking students for help when something went awry; for example Gail said:

> GAIL: I'm one of the first ones, the kids are on the Internet, one gets stuck, so I say who knows how to do this? Good, come and show them, and let me look too! (Laughs). Kids quite like that actually, where you say 'I don't know, I don't know how to do it'. (1:566)

Their ICT usage, although it covered a range, appeared to the researcher to encompass a lot of repetitive and 'busy' work as well as some authentic individual research and expression. So overall there was some variety to their ICT use; there was evidence that the two of them were making use of some extended styles of learning activities; that they did not stick to a single didactic teacher role but encouraged a variety of roles for both teacher and student, and that their learning emphasis was not only on facts and repetition but expression, interaction and collaboration. For these reasons they were initially seen as rather more process-oriented than some of the other teachers. There were also a number of elements which indicated that they were rather more content-centred, however.

Gail was the less adventurous of the two when it came to using ICT, for example she rarely used e-mail either personally and at school, whereas Fiona did. She was also the more pressured of the tandem pair. In fact Gail's already documented frustration, irritation and slightly reduced commitment to work was understandable since she had two young children. She was after all sharing the job for five days in ten. At the same time she had a stronger background in educational computing than Fiona, and probably felt that she would be able to catch up when circumstances allowed it. Her home situation was not conducive to any increased work effort at that time, though. Fiona was unable to persuade Gail to install e-mail at home, as Fiona herself had done, partly because she was concerned about upgrading their home ('the deck, I'm going to get that deck—if I have to do it myself!'), and even though she laughed

about it, Gail also argued that her husband might have found another reason to spend more time on the home computer playing games, had she agreed to get an e-mail connection.

She attended one of the timetabled in-service activities, but did not seem to follow it through as a classroom activity. Although she admitted that Outcomes was a priority of the study and the school, she rarely tried any of the suggested ICT activities, and dropped activities that would take extra time. For example at the end of the formal study she and Fiona asked for one of the study's flat keyboard Concept Keyboard computers, as they changed at the end of the school year from their Year 6 to a Year 3 class next to Ann. Yet in the subsequent six months it was never seen being used by any children, or even turned on, except at small in-services and demonstrations for them by the researcher.

The students had a roster for using computers, based on four students a day, which Fiona described as necessary, so it gave less assertive students an equal chance. Although commendable, this seemed not to accommodate the variety of student needs, since some students already had a computer at home and some did not, and others would have needed more time than the rest for educational reasons. They never mentioned these differential needs of students when they talked of their computer roster, suggesting it was not seen as a critical learning tool in their eyes.

Fiona used the software facilities slightly less but used e-mail occasionally with the class, where Gail did not. This suggested that Fiona saw some more interactive opportunities than Gail in the ICT tools in their class, and although it could mean she held more process-centric teaching views, it seemed more likely that it could be attributed to her less stressed home situation as well.

When starting to integrate ICT into their classwork, it was Gail who took the initiative and designed a small booklet of worksheets in using the Internet. She then gave the students the same time period in which to complete them, and marked them on a relative scale. She described afterwards the relative performances of the students, but not any standard they may have achieved, which suggested to the researcher that she had less of an outcomes oriented (or knowledge construction) perspective. In all these facets it seemed that they were showing some student-centred approaches, but overall they were rather more content-centric in their views about student outcomes.

In fact they both readily admitted that they had made very little progress with Outcomes as a topic or as a process. This was reinforced in a conversation after the formal data collection period, on the outcomes resources. They were critical of the indices in the resource materials. It came to light that they wanted to continue their classwork on handwriting but when they looked they could find no reference to it—because the skill of handwriting is not regarded as an end product in DoE(WA)'s Curriculum Framework. Most teachers who have had any introduction to Outcomes come across this fact this quite early. Effectively, handwriting has become a side issue for a teacher to resolve so that students can get on with the real reason they need to write, namely to express themselves with reasonable legibility and neatness. Only teachers who have done very little with Outcomes would not know this.

In summary the two have chosen to work together so well that it appeared that they were making similar progress, despite any underlying differences that existed in their teaching and learning styles. Although they showed a range of more process-centric characteristics, including student grouping, the range of software used, and encouraging student contributions to the learning, they have not yet addressed a number of other significant factors, like their assessment strategies when using ICT, their rostering to provide access to ICT or their curriculum material and why they are teaching it. Gail made an evaluative comment suggesting that things were going to improve:

> GAIL : Of course the baby has been {ie made it} very difficult. I *have* come in {for weekend meetings}, and we *have* got together, but its dropped in priority! (Laughs). … I sometimes think we're a bit slack, but we look at what other people are doing, and go, 'it's not too bad'. (1:274)

In conclusion it seemed that that they were both in early transition between the two styles. It was possible that they were choosing to do more content-centric activities whilst they 'found their feet', and may well adapt towards more process-centric materials as they progress with their knowledge of outcomes, and ICT.

Type C: Teachers with a process-centric outcomes orientation

A total of five teachers could be classified as process-centric in their outcomes orientation. Three were from NW, namely Leanne, Nora, Paula; two were from RS, namely Ann and Evelyn. It was interesting to note that the NW teachers were all strongly oriented towards tool software use, as Table 6.7 showed, while Table 6.8

showed that even the process-centric RS teachers were apparently content-software users. Furthermore the NW teachers were far greater users of ICT overall.

Even though at RS Ann and Evelyn appeared to use educational software more than any other option, nevertheless both showed their philosophical stance on enough of the key attributes indicated as important in Table 6.4 that their process-centric classification was defensible.

Both encouraged activities that were more learner-centred and encouraged collaborative roles. For example Evelyn had her students arranged in groups, not only as a desk arrangement but also for many of the learning activities. The researcher regularly observed her students quietly helping each other and sharing together to solve a challenge, while Evelyn worked with some other student or group. Sometimes these were simply a common worksheet they were all doing, but her comments usually implied some mastery skills were being encouraged rather than just busy work being done. Evelyn described rotational activities she would run whenever she could get a parent helper in—usually weekly—with students in cooperative groups, teaching each other the activities as they passed through them with the aid of herself and the parent helper. Her writings to parents in the school newsletters as well as her comments to the researcher suggested her major concern was directed towards individual students' mastery of the basic intellectual activities which parents expected of their year 1 children. It was concluded that she could be classified as a relatively process-centric type of teacher.

Ann was equally prepared to support collaboration and sharing. Her students' desks were grouped, and they shared responsibility in their groups as well. As an example, when her extra computers were installed, she asked the class how they would like to handle the learning with these new machines. They negotiated an arrangement where two students (Nick and Trisha) would be tutored by the researcher initially, and they would gradually teach the rest of the class these new skills. The arrangement seemed to work well, and the students as well as Ann herself were clearly happy with it. The students always made the researcher feel welcome, often showed their work or talked about their progress. Many of them even dragged a parent into the class after school to show the new machines off, implying that they were enjoying the responsibilities they were taking with them.

Both Ann and Evelyn regarded themselves as learners as well as teachers. Both described seeking answers from their students when things went wrong on a computer, as though it was a natural part of any classroom to have students as experts. Ann even described an incident in her reflective journal after one of these tutorial sessions:

> Well it went really well, and the next day Trisha and Nick taught a fellow student. They only asked me one question, and surprise! I could answer it!

It appeared that she readily shared the roles of collaborator and expert with her students.

Evelyn was quick to see ways to use suggestions about outcomes orientation and ICT, presumably because they fitted with her already apparently student-centred approach, as she described early in her journal. Towards the end of the year she was frustrated by health and family issues, and she began to avoid the researcher in the staff room. Her reflective journal entries dried up and a drop in software usage over period was noticed (Appendix 5b, from which Table 6.8 was taken).

Ann was shown a digital camera one day, and she recorded in her journal:

> B showed me the digital camera today. It would have been great to have it when we were doing our media unit in class. I can think of lots of uses for it. Maybe we will borrow it sometime. (Journal:Jul28)

Her propensity to see uses for it as a learning tool suggested a learning emphasis that was aligned towards student development processes rather than factual recall activities. About seven weeks later she did borrow it, and wrote:

> It really is easy (once I got over my nervousness about someone else's expensive equipment!) I tried it with the class. They found the digital camera easy to use. When I immediately showed the pictures on the computer, after a little modelling from me, I noticed that they came up with some excellent comments re composition of picture, background, grouping, light etc ('Viewing' Outcome strand) and great little comments praising the efforts or original ideas of each photographer ('Health' strand). So it was a very worthwhile activity. (Journal:Sep17)

Not only was it clear that Ann had started to learn the language of the Outcomes initiative; she seemed to naturally notice opportunities to satisfy Outcomes, as the quote above suggested. She then went on to describe the assessment of her digital camera activity as rather criterion-referenced—each student was to assemble two different photos and move them from the camera to their own disc. Ann's use of Outcomes language was becoming part of her natural perceptions. She described in her second interview how it was almost second nature for her:

> Before there were lots of cute little kids, we did the activities and we moved on. Now, everything we do I can see how an outcome is being met. I find I'm taking on a different role now. Before, I would have looked around during a group activity and asked myself 'Are they doing the activity?'. Now, I look at the processes they are engaged in, whether they are on-task or not (are they problem solving, developing as independent learners, working collaboratively, displaying desired values, etc). Before, I felt a responsibility to impart information to them, to give them something. Now, it is totally different. I have a responsibility to encourage them, to mentor them to their own discoveries. (2:103)

It was felt that Evelyn and Ann were displaying or expressing some satisfactory attributes of process-centric learning in their classrooms. Evelyn, as a grade 1 teacher, could arguably be expected to use more CDs of software aimed at specific skills, compared with older classes; but her use of tools like the flat keyboard and the speech word processor was expected to grow, until her personal problems intervened and her development with Outcomes then stalled. Ann was adapting to use the word processing software with speech synthesis, the flat keyboard, digital cameras, and image manipulation software. At one stage Ann commented that she was not an ICT expert, simply reliant on ICT support so that she could continue to arrange educational activities, and this was consistent with her growth in ICT use.

Ann continued to seek support from the researcher long after the formal intervention period and, had she completed a third survey, would most certainly have made more use of tools than content software. Even from survey 1 to 2 her response to the questions like 'It is important that ICT is a regular part of the way students learn', changed from 'disagree' to 'strongly agree', and thus became more consistent with other RS staff (See Table 6.8).

On one question Evelyn was less enthusiastic than all the other staff, namely 'My attitude towards ICT is:', and she recorded 'tentative' on both occasions. One likely explanation was that she actually improved after the study began, but them fell back again as she lost enthusiasm and energy towards the end of what, for her, was a very bad year.

Both these RS teachers relied upon collaboration activities with their students; they seemed to have a well developed sharing of roles with their students; a strong belief in their own role as a learner; and tended to naturally use criterion-based rather than relative assessments; and they appeared to believe that their children's' education was a process of transformation rather than accumulation. For these reasons they were rated as process-centric in their outcomes orientation.

Three teachers from NW—Paula, Nora and Leanne—were classified as process-centric, using the identified attributes. Predictably, like many primary school teachers, the activities that took place in their classes tended to be cross-curricular, often based on themes rather than syllabus content. In fact Paula completely discounted the importance of outside syllabi when she was concerned with her students' mastery of skills and processes:

> PAULA: I don't care about that one. Curriculum, yeah, but not what other people impose on me. I don't care. (1:469)

Each rated themselves as quite learner-centred (see Table 6.15); on a scale of 1 to 10, Paula gave herself 10, Nora chose 7 and Leanne chose 8. Paula was extreme in other ways as well, but it was difficult to disagree with her rating after watching her in class, or listening to Nora's rating of her, since she worked next door with the never-closed room divider. Paula would argue that they all had changed roles, in that her students had genuinely begun to take responsibility for their own learning:

> PAULA: In my class there was a handful who were experts at taking photos, printing and down-loading. Another little kid decided he was interested in scanning. Now I haven't got a clue how to do those... I know they're not hard... but why should I bother? So I handed over to them. It's more of, me standing back, getting time to understand and observe {while they do the work}. The kids know that I can't down-load pictures. It might take me just five minutes to learn, but it's not as important to me as it is to them. When I get my own digital camera then it will be. So the kids don't come along {to school} to watch me work, instead I stand back and watch them. They are more in control of what they do. (1:212)

Nora was equally assertive when she described the new roles and argued that her students were taking responsibility for their own development:

> *: now there appears to be an irony between on the one hand giving the kids individual responsibility, but simultaneously requiring that they work together. How do you address this?
>
> NORA: Oh yes! But they have to be responsible for their own learning. When they are in groups, they have to stay on task, so that is their responsibility as well. But when you work together, and two brains are better than one, you have to be sharing rather than mucking around. And they know that now. So that if you were to walk into the room, and they were working in pairs, they'd all be working at solving the problem rather than, 'What did you do on the weekend?', or throwing blocks around. They would know they were {individually} accountable at the end of the day. (1:447)

Although she had agreed to be acting Deputy Principal for some of the study period, Nora was ready to return to her students:

> NORA: …*this* acting Deputy Principal won't continue next year. … My kids miss me, I missed the kids too. I'm a classroom person (1:762)

Leanne, the ICT coordinator, was so pro-learning that she was almost anti-technology. She explicitly defined herself as a student-centred type of teacher. Her use of interactive multimedia software as a key tool for her school wide project 'North Waygo Story' was an example of her tool approach. As ICT coordinator she encouraged other staff to use tools rather than the 'mindless software games' on CD, which in her mind were often touted inappropriately. Both Paula and Maya felt that she was not always a helpful model to the rest of the staff, for example by avoiding e-mail. She had tried to use e-mail once but had a very unfortunate first experience, and then argued that phone and fax was enough for her.

More frustration boiled over one day when Leanne's lack of ICT skills become apparent. Teresa described her storming out of the computer lab after the network was upgraded but before it was finally repaired, reporting, 'these damned networks are nothing but trouble'.

Leanne did not feel that her ICT skills were a problem for her. She took the view that, 'I'll learn it when I need it', and in the meantime they could always get good technical help, but getting good educational help was much harder. Maya was not happy with this, and felt it was a 'cop-out'—'We all need to know what ICT can do', Maya argued, so staff could not afford *not* to learn about the basics of computers and basic computer tools like e-mail and the Internet, in her opinion. The inherent conflict here may have contributed to Maya's leaving the next year for a less frustrating job as Year 7 teacher in another school, where she could put all her hopes and plans into action, instead of having to rely on or support others.

Overall the three of them appeared to give students the prime importance in their classrooms. They were willing to share and develop with them, and encouraged a wide range of tool software to help them meet their needs. Their ICT usage tended to be based around students' performances not their own, and they encouraged their classes to extend their own skills and abilities rather than just learn standard items.

It has been possible to summarise all the teachers mentioned and the three forms of outcomes orientation defined, into two tables, one for each school. Here are the summary tables for case school North Waygo, Table 6.10, followed by those for case school Regis Street, Table 6.11. Each table is sorted by the type of outcomes orientation. Note that only the class teachers are included, support staff and Principals are excluded from these tables.

Table 6.10: North Waygo case members' ordered by Outcomes orientation type

Teaching members of case school North Waygo		
	Classification	*Evidence—Note form only, see text for elaboration.* *Ratings of '+' and '-' suggest whether item supports classification or not. Indirect but relevant comments unrated*
Olwyn	Content	+ ICT is a subject; +Kids know more than we do; +We need computer specialist, couldn't do without one; +Esp. to advise us what children can do(all 'content-thinking' stuff); +Leanne, Nora agreed to rating; +/- fear of ICT but willingness to talk; credible view of teaming from novice; -Membership of ICT committee; D/Principal
Leanne	Student	+ Range and type of ICT activities undertaken not restricted to standard software; +Rating by Nora, Paula; +Strong evidence avail. +Appeared very flexible; Leadership with rest of staff variable - both consulting and sharing types?; -Attitude to email (eg IMM vs e-mail, suggested frustration); -Tandem partner never mentioned; 'follows my lead', ignored?
Nora	Student	+Watching Leanne (when in yr3) 'made decisions is in my head'; +Development from 97-99 positive; +'Students this year were great'; +'I missed them when A/D-P'; +Use of Lane Clark's 'wheel'; team-teaching with Paula typical of student-centred approach
Paula	Student	+I realised that I was irrelevant, needed to change; +We now take T&L seriously; +Huge development in 3 yrs. +Use of Jerry Smith, Lane Clark as springboards; +'I tell my students that school is their job, not mine'; +Her students are digital camera consultants to rest of school; +Import of collaboration to her; +Her team-teaching etc

Here now is the summary for RS school:

Table 6.11: Regis St. case participants ordered by Outcomes orientation type

Teaching members of the case school Regis Street		
	Classification	*Evidence—Note form only, see text for elaboration.* *Ratings of '+' and '-' suggest whether item supports classification or not. Indirect but relevant comments unrated*
Brenda	Content Centred	+Allowed student use but unable to help them; Agreed ICT was tool but never used it. +Frustrated by lack of support on staff; Antipathy with Principal, other staff undermined her ICT use.
Christine	Content Centred	+ Desks layout rarely grouped; +'searching on the web is a complete waste of time'; +Argued that hi ICT skills equates to hi curric. skills (content-thinking); +Discounted ICT tools like concept kbd, dig. camera w/out seeking proof; +Re-created Ann's Bookmarks as teacher-centred technology activity rather than a learning one.
David	Content Centred	+ ICT viewed as a subject, despite SpokesTeams premise; +Fears, irritation about ICT, and his ambivalence about teaching; +Lack of student usage during class time; +Lack of variety of computer activities; spends a lot of time on the computer himself and seems to have the best personal computer skills amongst the staff; +Ann has not seen any evidence of this being transferred to the classroom; - Involved parents in puppet play
Gail	Content/ student Centred	+ Use of parallel worksheets (ie all students use same sheet) in Internet activity; +Computer roster based on time not need; +imposition of THRASS stuff on all kids; + Willing to ask for kids' help; +Exciting<—>outrageous room design; +Students contribute to room designs/(mainly) themes
Fiona	Content/ student Centred	+ Great interest in ICT (10 yrs ownership); +Willing to drop teaching ('I'll move on to something else soon'); 'we think alike' (so can they be grouped together?); +Interest in handwriting is content not process, but perhaps understandable in yr3?+Commitment to teaching quality eg weekends at work, handovers; room design?
Ann	Student Centred	+Class seating; +Performance not time-based e-mail activity; +Criterion-based digital photo activity; +Computer roster but use also needs based; +Student contribution to class decision-making; +Speech-wp ('divine inspiration') story; +Quick to see new ways to use ICT to meet outcomes
Evelyn	Student Centred	+ Views on learning; +Willingness to consider own practices; +Use of cooperative activities a lot; +Adapted some provided ideas to suit her needs (eg PMI, farm animals idea); -Easily frustrated; Losing patience & energy to continue.

6.3 Analysis of RQ 2—How an outcomes orientation supports teachers' ICT uptake

This section considers the forms of outcomes orientation identified in the case teachers, and shows how these orientations affected their uptake of ICT. The two forms of outcomes orientation that were elaborated from the reviewed writings have been successfully identified in the case schools' teachers. These include two teachers who were classified as showing evidence of both types, and were probably in an early transition phase. An analysis of these data led to observations about the people, the schools and the situations in which they found themselves. These observations are expressed as a number of assertions, and the data are used to explain and elaborate these assertions, and hence give the reader a clearer understanding of the role that an outcomes orientation played in the ICT adoption process.

The assertions are as follows:

Table 6.12 Outcomes orientation assertion list

Assertion ID	Assertion
6.1 stability of orientation	Teachers' outcomes orientations are relatively stable.
6.2 process-centric preference	Teachers perceive a more process-centric outcomes orientation to be desirable
6.3 support determines software	The level and quality of support influences software types chosen
6.4 software affects outcomes	Use of content-free software/hardware encourages more (process-centric) outcomes thinking
6.5 resourcefulness	Teachers using process-centric approaches overcome impediments to their ICT usage more easily

6.3.1 Assertion 6.1:

Teachers' outcomes orientations are relatively stable

Teachers' outcomes orientations have been shown to range from content-centric to student-centric in this study. Many indications suggested that these orientations were relatively stable, or in other words most teachers did not change their outcomes orientation in any significant way over the study period. Furthermore, of the small number of the case teachers that did demonstrate a change in their outcomes orientation, their transition appeared to have taken place over such a long period,

perhaps three years or more, that the relative stability of teachers' outcomes orientations was re-asserted.

This stability does not imply that there were no changes, just that the single large measure of outcomes orientation was not finely graduated enough to capture them. Many individual responses to the survey questions did change, and indicated generally a more positive attitude to the use of ICT in their classes, even if no changes in major behaviours were evident. For example in question 11 of the survey questions (Table 6.13 and Table 6.14, extracted from Appendix 5c)—'the use of ICT is changing my teaching'—the average for RS moved from 3.1 to 3.5 out of 4. The most obvious change was Ann's rating which leaped from 1 (no, not at all) to 3 (yes, somewhat), which aligned with all her other comments about ICT and outcomes. This suggested that the variability in these replies was more than just random perturbations.

Table 6.13: Change in Views on ICT and learning of NW staff

Round 1, NW	**Leanne**	**Maya**	**Nora**	**Olwyn**	**Paula**	**Ross(a/P)**	**AVG**
9 It is important that IT is a regular part of the way students learn	3	4	4	4	4	4	3.8
10 My personal use of IT is changing my assessment	3	4	4	3	4	3	3.5
11 I believe access to suff. technology will change the way I teach	3	4	4	4	4	4	3.8
12 Learning teams of teachers seem a satisfactory way to help adopt technology	4	2	4	3	4	4	3.5
Round 2, NW	**Leanne**	**Maya**	**Nora**	**Olwyn**	**Paula**	**Ross(a/P)**	**Avg**
9 It is important that IT is a regular part of the way students learn	4	4	4	3	4	4	3.8
10 My personal use of IT is changing my assessment	3	4	4	2		0	3.3
11 I believe access to suff. technology will change the way I teach	4	4	4	2	4	4	3.7
12 Learning teams of teachers seem a satisfactory way to help adopt technology	3	1	4	3	4	4	3.2

A similar table for RS:

Table 6.14: Change in Views on ICT and learning of RS staff

Round 1, RS	Ann	Christine	David	Evelyn	Fiona	Gail	Iain(w/d)	Jerry(P)	AVG
9 It is important that IT is a regular part of the way students learn	2	4	4	3	4	3	3	4	3.4
10 My personal use of IT is changing my assessment	1	4	0	0	0	3	3	3	1.8
11 I believe access to suff. technology will change the way I teach	1	4	3	3	3	4	4	3	3.1
12 Learning teams of teachers seem a satisfactory way to help adopt technology	0	3	3	4	4	3	2	3	2.8
Round 2, RS	**Ann**	**Christine**	**David**	**Evelyn**	**Fiona**	**Gail**	**Iain(w/d)**	**Jerry(P)**	**AVG**
9 It is important that IT is a regular part of the way students learn	4	4	4	0	4	4	4	3	3.4
10 My personal use of IT is changing my assessment	3	4	2	3	3	3	4	3	3.1
11 I believe access to suff. technology will change the way I teach	3	4	3	3	4	4	4	3	3.5
12 Learning teams of teachers seem a satisfactory way to help adopt technology	4	3	3	3	3	3	2	2	2.9

Nevertheless evidence of the stability of outcomes orientation abounded in this study, at both system and local level. Many factors provided contributory evidence that this stability was wide-ranging and a number of factors militated against change.

The factors justifying the assertion are listed below and then presented in detail.

1. Sometimes teachers' claims or observations that they had changed did not actually represent a changed outcomes orientation
2. Teachers had to make significant decisions when they changed their outcomes orientation
3. For those teachers who changed their outcomes orientation, a considerable time period was involved

4. Some teachers were ready to resist any change to their work environment, and that included change around Outcomes
5. EdWA planned their 'Outcomes' initiative to take10 years

1. Sometimes teachers' claims or observations that they had changed did not actually represent a changed outcomes orientation

Although many changes were observed over the period of the study, few of them in the end represented a 'serious change' in outcomes orientation. Furthermore, even some changes that were related to outcomes orientation were nevertheless not seen as a change in outcomes orientation directly but were more about expressing oneself better, or simply misapprehension. Ann and Christine provided an example of each.

Ann indicated that she passed some major landmarks with her uptake of ICT during the course of the study, but it was not clear to the researcher that her outcomes orientation changed at all. Rather, she described the acquisition of sufficient new terminology that now allowed her to describe how she had always felt:

> ANN: {After an 'English Leaders' In-service} It's starting to make serious sense and I believe the more I understand the more I believe in outcomes-focussed education. I think I always have, but I didn't have the language to explain it before.
> (Journal:22.Oct)

She was aware of her transition towards a more explicit outcomes orientation. As she learned the language of an outcomes orientation she realised that it was satisfyingly consistent with her philosophies, and her own growing understanding of what outcomes-based learning meant. However she was the one who identified that much of the transition was in language only, so to describe this as a serious change in outcomes orientation would be rather glib.

In complete contrast, Christine used the phrase 'I'm very different now {this year}', when asked about her approach to teaching.:

> CHRISTINE: well I'm very different now. Compared with last year. Now it is very different. Now I'm more 'this is the topic, go for it'. This is the program you're using, on CD-ROM, now go and work. (1:142)

Ironically there was equally little change evident. The differences she described were more related to new descriptions of old actions, rather than a serious change in outcomes orientation.

Overall these apparently significant changes about orientation are more illusive than was first obvious, reinforcing the proposition that outcomes orientations are even less changeable than even some teachers believed.

2. Teachers had to make significant decisions when they changed their outcomes orientation

Not all teachers seemed ready to embark upon the long and apparently difficult path towards a new outcomes orientation. Some teachers were not ready to make those decisions, or were not even ready to admit that there was a difference between what they were doing at the time and what another approach to outcomes would have them do differently.

For example, Nora and Paula from North Waygo, had apparently worked through those decisions. Nora talked of Leanne's role in her changes, which took a considerable time period and significant angst, as she started her journey:

> NORA: Leanne had the Year Threes next to me, and she was doing a technology project. She wanted my help, or she wanted to work collaboratively, and it started very very slowly. She started using *Hyperstudio*, and I started as an observer on that, because I watched her set up and how she used it, and all the work the kids did with it. I was involved trying to help, but I just felt that it was too much for me to take on. It was mainly just an observation role...
>
> *: It was more than an observation role, wasn't it? You have mentioned it is one of your major flagstones?
>
> NORA: yeah, it made decisions. It was an interesting one, in that it made decisions in my head.
>
> *: 'it made decisions', … what do you mean?
>
> NORA: I really enjoyed what Leanne's kids were doing, and I could see how much they were learning. It changed my ways of possibly teaching in the following year; that I was going to start using {ICT} a little bit more. (1:36)

Leanne, she explained, encouraged students to regard the computer as a tool rather than a subject, or a machine to be used just because it was there, and this too helped her change her approach:

> NORA: So that started me on a different way of thinking... using technology as a tool rather than {the traditional} 'oops, its a computer, let use it'. So, looking at ways of using a computer {differently}... (1:41)

Paula, in the classroom next door, had obviously made some decisions too. She saw herself moving from teacher as entertainer to a teacher as facilitator, who was concerned about her students' ability to think:

> PAULA : ….as subjects become more integrated… and we bring aboard thinking skills, allow the kids to learn how to think, to set their goals and so on—whatever —it means that they have to work more independently, they need to be more self-motivated, and {be} given the opportunity to set their own goals. This is as opposed to someone playing entertainer, and pulling surprises out of a hat for the students each day. (1:196)

These changes, including her disenchantment with her 'old' teaching role, took place over a long period of time:

> *: OK, when did these changes in thinking begin occurring for you?
>
> PAULA: Probably in the last couple of years. I was really disenchanted with standing in front of the class and telling them what I knew. Suddenly what I did know was irrelevant, and I felt I knew nothing about the present world, and what I used to do as a teacher did not make sense. (1: 287)

Fiona, from Regis St, was less advanced in this change process, apparently. She appeared to be one of those much closer to the start of such a journey:

> FIONA: This {'the Outcomes initiative'} is a bit like standing at the bottom of the lane and seeing a long journey, but if you only consider the first few hundred yards it will be easier. I don't think it's going to be as daunting as I think it is {'looks'?}, you know what I mean? (2:86)

Teachers like Nora and Paula, who changed their outcomes orientation, demonstrated commitment to the process of changing their whole teaching approach, and appeared to support the importance of collaboration in the process as well. Nevertheless, they represented only a small proportion of the teachers in the case schools, and the rest were not seen to be involved in making significant decisions about their teaching and learning styles. Further, they illustrated quite clearly how time-consuming the process of change can be.

3. For those who changed, a considerable time period was involved

Although it was true that some teachers clearly had changed their outcomes orientation, it had not happened quickly for them. This is predictable, if outcomes orientation is indeed a stable characteristic. To cause it to change must involve considerable forces, or involve a long gestation, or both.

This indeed seemed to be so for Paula and Nora, who each described a time period of around three years as the major reshaping of their orientation. This three-year transition may be smaller than others would expect, because of their collaboration. Paula and Nora were working in adjacent classes over that whole period with open divider-doors, and it is clear that they supported each other and collaborated well

over that time. Such collaboration has already been noted as valuable in Chapter 6. Therefore it seemed likely that other teachers with less full-time collaborative opportunities would have taken even longer. Leanne and Ann were also judged as being of process-centric orientation, and by their own description seemed not to have changed their orientation in a long time.

Overall, there is justification for the argument that very little change should be expected during this study, and very little occurred. It seemed that when outcomes orientations did change, the rate of change was sufficiently slow as to further confirm the relative stability of teachers' outcomes orientations.

4. Some teachers were ready to resist any change to their work environment, and that included change around Outcomes

Some reasons for the stability of outcomes orientation were personal. Either teachers felt that the pressures to change—eg from their Principal—were rather diffuse, and avoidable, or they felt justified in actively minimising their participation, giving frustration and lack of time as reasons. The resistance to change may not have been aimed at Outcomes, per se, but simply been a reflection of the stresses and pressures that they felt under as teachers, and the consequent lack of space they felt to enable even the smallest amount of change in the way they arranged their teaching and learning environment.

If the Principal was not zealous about outcomes, some teachers felt that they were safe from the distant pressures of Head Office or District Office. It appeared from talking with many of the teaching staff at RS, that there was a palpable lack of enthusiasm on the general topic of outcomes. In contrast, there was often lively debate on or around the topic of outcomes at NW, and it was easy to get a considered comment rather than a defensive one from staff at NW.

Fiona described Jerry's support in a way that made it clear that his priorities were not strongly oriented towards anything curricular, compared with things technological:

> FIONA: He is especially good when it comes to the technology stuff. And I think his attitude is very good, because it does filter down. He is so keen that if there is some whiz-bang {technology} thing we should be getting, we know Jerry will look at it and investigate whether we should buy it. (2:118)

Hence she did not feel too pressured by her Principal, when it came to Outcomes, because that was apparently not his real priority.

Gail described how they could not find a 'content' topic anywhere in the new Outcomes books. She asked the researcher rather than Jerry, her Principal. This indicated that she did not regard him as a source of curriculum knowledge:

> GAIL: It got to the stage where we said, who do we ask? …. How many other people have been through this same process? (2:91)

Admittedly there could have been some embarrassment in her reserve as well, but Jerry himself admitted that the curricular area was not one of his strongest. He pointed out that DoE(WA) had not trained their Principals 'well enough to inculcate the pedagogical changes {implied} in the curriculum frameworks', and he indicated that he was starting to do something about it. Despite his facility with the educational jargon, a certain lack of confidence edged through his explanation:

> JERRY: …But you also need the confidence, ability and skill to lead from the front. I'll give you one example…. At the moment I am up-skilling myself in running a workshop, where I get up there and show the links between an overarching statement and a student outcome down here, then to an activity... {using discovery learning, and adult learning principles, he implied}. Those kinds of things, I don't think EDWA has trained us well enough in. I have a slight concern that I need to up-skill myself in that area. (1:407)

For these teachers at least there seemed no sense of urgency from their Principal to change their outcomes orientation. They may not have regarded the pressure as completely avoidable, but at least it seemed 'postponable'. Fiona implied that they could not avoid changing to an outcomes orientation forever, but seemed to find justification in her current approach:

> FIONA: we are not afraid to do them {Outcomes}, but would like more help. It shouldn't be the school's responsibility but the Department's. We find the whole thing quite off-putting. (2:71)

Fiona's explanation represented those of many teachers, who seemed to be avoiding changing their outcomes orientation.

Sometimes they used their personal frustrations as justification. This frustration, implied above by Fiona, was echoed in an earlier comment implying that she had not been to many workshops on outcomes:

> FIONA: … I haven't really looked at Outcomes, I am putting it off, I haven't really come to terms with it. …. I hate the way we all seem to be doing our own separate thing with outcomes, and it's a waste of everybody's time. (2:59)

Gail, in a tandem pairing because of her young family, was conscious that she had limited time, and felt that, admirable though the Outcomes initiative was, it was not

going to get the time it might need from her, simply because she was already a busy person:

> GAIL: by giving everyone ownership, they're saying.. {pause}. Look, I don't want to own everything! I don't! {laughs} Just tell me the easiest way and I'll do it - I've got other things to do! (2:63)

Leanne said that at North Waygo PS, there was already plenty of pressure on the staff, and that this was taking its toll. In her opinion the staff lost creativity when they were too stressed. This was critical for her as ICT coordinator and supporter of ICT usage, because it took 'creative juices', she argued, for normal teachers to start learning about new outcomes orientations on top of their normal approaches.

For teachers actively wanting to minimise the changes going on around them, some felt that the 'local' pressures to become more skilled in outcomes could be avoided, especially if Principals were not as determined as they could have been. Also, personal feelings about frustration and lack of time created barriers. The researcher felt there was a sense of being 'frustrated to a standstill' in many of the feelings expressed by the case teachers in both schools, so that their opportunities to change were ossified under the weight of all the pressures they felt on them.

Teachers mentioned stress, lack of time and personal frustration as factors which reduced their interest in changing their outcomes orientation. Also, the less determined the Principal, the less likely they were to feel pressured to change. Although their preference to avoid change may have been broadly based, its consequence was that there was less likelihood that they would be addressing their own outcomes orientation and the issue of changing it. This was another factor therefore supporting the stability of teachers' outcomes orientation.

5. EdWA has now planned the 'Outcomes' initiative to take 10 years

The Curriculum Framework/Student Outcomes initiative began in 1997, and its deadline for complete implementation was recently extended two years, to 2006. It would seem that DoE(WA) regarded the process of transition from a content-focussed curriculum to an outcomes-focussed Curriculum Framework as complex, and never intended the project to be rapidly implemented, as both the timeline and the extension attest.

This does not make it a low-pressure project. Substantiation came from the commitment and energy DoE(WA) invested into achieving their goal within this

period, to the point where they acknowledged significant stresses were being felt by teachers. At a half yearly meeting in only six months after the ends of the research period, (June 2000) DoE(WA) advised all their District Education Office staff that there were too many simultaneous projects putting pressure on teachers, including those trying to speed the adoption of their Outcomes initiative. 'They were told to ease up for the rest of the year', reported Jerry, as there were complaints, and they had not affected the slow uptake of Outcomes anyway.

Summary: Assertion 6.1: Teachers' outcomes orientations are relatively stable.

Despite the fact that most teachers had apparent change around them and even within them, underlying consistencies in their outcomes orientation characteristics were identifiable. For those that did change their outcomes orientation, the process appeared to be sufficiently slow to easily warrant the tag of relative stability.

In summary, the study provided consistent data that supported the assertion that teachers' outcomes orientations are relatively stable. There were many examples that demonstrated little change, and the few apparent changes were shown to not be substantial contra-indications. Although it was originally expected that some changes may be detected over the study, it transpired that there were no major changes. Given the short time frame this is quite understandable, and although there may be many transitory and incremental signs of change, none was sufficient to undermine the general assertion.

6.3.2 Assertion 6.2:

Teachers perceive a more process-centric outcomes orientation to be desirable

Teachers' outcomes orientations range from process-centric to content-centric. Despite the spread, there was strong support for the principle of being more process-centric, certainly in words if not in actions. No doubt some of the support lacked real meaning or determination, and some believed that it was all just another educational reform which would go away. One of the journals records the comment by a teacher from RS who claimed that 'there were schools in America which have now dropped Outcomes', implying that DoE(WA) would do so shortly too.

Some could describe the current DoE(WA) Outcomes initiative as simply the latest in a long line of reforms, and make the jaded argument that teachers will be quick to neutralise its major effects, then turn what is left to their advantage, and hence leave their classroom largely unscathed—just like they have with previous major reforms. Whether the reforms are calls to be more student-centred or activity-based, thematic or employer-driven, or use technologies like pencils, educational television or film, the literature has often demonstrated that reforms that survive usually only do so by a process of accommodation (McLaughlin, 1990).

A less cynical viewpoint argues that teachers have always been exhorted to approach the education of their students with a fresh eye, and the latest initiative is simply concordant with modern principles of accountability and measurable performance. Whatever the reason, teachers in this study seemed to agree that the plan for more process-centred education was laudable, and it appeared that they wanted to be part of it. There was a range of support for this proposition, detailed in the following paragraphs, and summarised in four points below.

1. Teachers never defended a content-centric curriculum orientation.

2. Teachers never rated themselves as more content-centric than the researcher rated them.

3. Those changing described only transitions away from content-centric.

4. There was significant central/system pressure on uptake of new (process-centric) outcomes orientation

1. Teachers never defended a content-centric curriculum orientation

Two staff at the same school probably represent opposite stances on this issue. Paula and Olwyn (NW) took different approaches, but both appeared to conform to Assertion 6.2 that teachers wanted to support a more process-centric approach. Paula's dismissal of the importance of content may have appeared a little extreme but it certainly was consistent with her behaviour. She was asked to place her teaching style preferences on a scale for 0 to 10, between Curriculum concerns (0/10) and Student concerns (10/10):

> *: so you would put yourself there {she had firmly pointed to 10/10} right now, where would you like to be if you had your options?

> PAULA: I would like to stay right there! No, I am there; I don't care about that one {points to other end, ie 0/10}. Curriculum, yeah, but not what other people impose on me. I don't care.

Olwyn on the other hand was far more circumspect. When asked to place herself on the scale from 0 to 10 with the same question, she presumably saw the importance of both, for not only did she ask multiple clarifying questions, but when 'cornered', she ultimately opted for a gambler's solution:

> Olwyn: In the middle {ie 5}. Two bob each way.

If these views represent the two extremes on the issue of defending the content approach to teaching, then Olywn's rating of 5/10 being the highest in favour of the content approach suggested that few teachers were prepared to defend a strong content approach to teaching in their school and that most teachers regard the process-centric approach as a more acceptable stance for a teacher to defend.

2. Teachers never self-rated as more content-centric

When placing themselves on a scale from 0 to 10 indicating their content-centred or process-centric disposition, over a quarter placed themselves further towards the process-centric end of the scale than the researcher could, based on observation, surveys and interviews.

A subset of the two ratings is compiled as Table 6.15 for teachers at the two schools, omitting many of those who rated themselves as the researcher did. It illustrates the process-centric ratings for 6 of the 15 case teachers, and includes an explanatory comment on the rating provided. Both Paula and Nora are included as examples of process-centric teachers whose ratings were relatively accurate, as they were the two teachers who had made recent progress towards a more process-centric outcomes orientation. The table is ordered on the Researcher Rating column, which therefore lists the teachers from the most content-centric (Olwyn) in the two schools to the most process-centric (Paula).

Table 6.15: Researcher and personal ratings for process-centrality, for sample of case school teachers

Teacher	Researcher rating	Evidence	Personal rating	Comment
Olwyn	2	Her language, her concerns and Leanne's evaluation	5	Flippant 'two bob each way' jibe
Christine	3	Seems misunderstood thrust of process-centric approach	7	Too impatient, controlling, to see issues clearly yet
Brenda	4	Too stressed to judge herself; others suggested weaknesses	5	Compromiser, but avoider of stress, esp. technology
Nora	7	Her comments, comparison with Paula, Leanne's evaluation	7	Overcoming 'control freak' predilection
Maya	6	Progressed but still patronised students, teachers	9	Realised ICT was a solution; over zealous
Paula	10	Nora: 'I'm not as extreme as her'; Leanne: 'almost extremist'	10	Was feeling irrelevant, determined to change

Across all teachers, none rated themselves as less process-centric than the researcher did, and about a quarter of teachers in this combined group actually 'overrated' themselves towards a more process-centric orientation. This was taken as evidence that all these teachers perceived a process-centric outcomes orientation to be a desirable state.

3. Those changing describe only transitions away from content-centric

Teachers from the content-centric Christine to the process-centric Paula, all described how they regard things differently now. In Christine's case her changes appeared to be more plans than substance, but both wanted to be supporting more student-centred approaches. In Christine's case it was going to involve more WebQuests for her Year 7s:

> Christine: I'm getting lots of WebQuests, where the kids have a topic and go searching. That's all in place for next year.

In Paula's case it meant a rather more cerebral approach for her Year 4s:

> PAULA: … I want understanding. They have to set themselves goals, tasks. They have to know why, and be prepared to take it a step further. At the end of the day I might say 'So what', {or} 'what can I do with this', but they should not wait for me 'til the end of the day.

Gail and Fiona were rated as content-centric but becoming more process-centric (Table 6.11). Although both admitted that they had not made much progress with Outcomes yet, their discussion about the direction they were heading was still

obvious. For example, Gail felt that her attempts to make more use of Outcomes had not progressed because she was still learning about the ICT 'gadgets':

> GAIL: well, to compare? Next year, I think Outcomes still {need work}.. and the teaming.. well it's ongoing for Fiona and I. That's been good, and will hopefully continue. {But} It {indicates 'Outcomes'} have played second fiddle to the gadgets, I think! (1:382)

It was clear to the interviewer that she was confident of making more Outcomes initiative progress, even if it would be in another year.

There was a clear emphasis from all those teachers who were talking about their changing orientations, either explicitly or tacitly, that they were going to become more outcomes oriented. Given the emphasis of the DoE(WA) Outcomes initiative on more process-centric outcomes, it seemed reasonable to conclude that all the teachers who were talking about change, regarded a more process-centric outcomes orientation as the desirable state.

4. There was significant central/system pressure on uptake of new (process-centric) outcomes orientation

All the teachers in both case schools were well aware of the Outcomes initiative, and the fact that it had a deadline which was only a few years away, in theory, before full implementation. These issues were increasingly incorporated into annual school plans, key school outcomes for the year, discussed at staff meetings addressed in school newsletters to parents and so on.

At RS all staff had voted at various staff meetings in the last two years to identify and focus on important school targets for major learning area topics. They also undertook the planning, designing and modifying of new assessment and reporting procedures intended to line up with the requirements of the Curriculum Framework's reporting requirements. Their Principal Jerry was sufficiently cognisant of the imperative to describe at interview how he was 'up-skilling' himself to run a workshop on the Outcomes initiative for his staff.

At NW, they too had been setting school focus areas and reviewing their reporting processes in readiness for the full implementations of the Curriculum Framework materials. Also, Leanne had been chairing outcomes planning meetings—with visitors like Victoria from their local Education Area District Office—where

interested staff reviewed their early attempts at using outcomes approaches in their classes and shared their feedback with one another.

When asked to describe the biggest challenge facing NW school, Ross the acting Principal, replied, 'the Curriculum Framework, without a doubt. It has consequences for all our teachers and parents as well as the students.' Ross was certain that the Outcomes initiative would have far-reaching effects. He volunteered the opinion that as teachers moved to become facilitators, a more appropriate title for their role may even arise.

It would be a very unusual teacher at either of the case schools who claimed they had no idea of the basic principles involved about outcomes. This does not mean that some staff were not either confused or frustrated and did not feel confident about the next steps. A good example was David, who appeared to have developed some rather negative views about teaching over recent years:

> DAVID: But it's just got to the point where all this extra stuff is being piled on top, in the last couple of years, and my reaction is to sort of freeze up…. I mean it is getting a joke, the amount of pressure, the expectations. (1:252)

The freezing up he described applied to the progress he had made, for example, on outcomes with ICT. This was a teacher who both Christine and Ann reported was one of the most knowledgeable about computers in their school:

> DAVID: and this is the Outcomes {indicating Three Spokes diagram}, I really don't have any idea what the outcomes are in terms of learning technology (1:385)

Despite his lack of progress, he was not saying that he has no idea about outcomes, the idea, just Outcomes in practice. In other words the years of pressure from DoE(WA)—from Central Office, the Minister for Education and down through District Offices and Principals—to make teachers aware of the Outcomes initiative, was considerable, and even the most frustrated teachers seem to have some knowledge of it. As a result they would nearly all have been aware of this State-wide requirement supporting an outcomes approach, and its eventual desirability for all teachers and students.

Summary, Assertion 6.2: Teachers perceive a more process-centric outcomes orientation to be desirable

In summary the overall findings from the study suggested that teachers regarded a process-centric outcomes orientation as more desirable than any content-centric one.

There was both top-down pressure as well as some bottom-up pressure to consider the advantages of such a process-centric outcomes orientation. The pressure had been sufficiently successful for even some content-oriented teachers to re-cast their own activities in a more outcomes oriented light. It was therefore deemed reasonable to conclude that every teacher in both case schools was aware of the imperative towards outcomes and, more than this, that they detected a strongly sanctioned desirability for their teaching style to embody a process-centric outcomes orientation.

6.3.3 Assertion 6.3:

The level and quality of support influences the types of software chosen

It has already been described in Chapter 6 that certain types of support apparently were critical in determining the uptake of ICT in the study schools. They also appeared to affect the types of software used as well. It is useful to elaborate this argument here, even though it may appear only peripheral to the issue of Outcomes and more relevant to other collaborative issues, because it is important for the next assertion, 6.4.

There was a wide range of software available in the two case schools, but it has already been argued earlier in this chapter that they can be projected onto a scale from Content-rich to Process-rich software (see Table 6.16). With no support systems around them, an ICT-adopting teacher needs very high frustration thresholds, almost unlimited time and sometimes superhuman determination. Only a special few make much progress under these circumstances. Leanne was probably one such teacher, but in all probability there are precious few like her, in most schools. Furthermore, not all adopters of ICT use the whole range of software available.

Table 6.16: {Also Table 6.5} Examples of software ranging from low user control/content-rich to high user control/process-rich types

Restricted user control			**Unrestricted user control**
content-rich ◄——► ***process-rich***			
minimal teacher decision-making			**maximal teacher flexibility**
Drill & Practice Tutorial Eg THRASS CD Eg Math Games CD	Internet worksheets avoiding Searching, Restricted WebQuests, Simple simulation software	Book raps, Travel buddies and tailored e-mail tasks, Extended simulation software, Open-ended WebQuests, Simplified programming environments eg Turtle	Word processing, spreadsheets, e-mail, Internet research, PowerPoint designing, Full programming environments eg Logo
Strongly content-focussed software	*Less content-centric or reduced/tailored tools access*	*Specific tasks using tools*	*Open access to tools*

The actual conditions under which the support available to teachers adopting ICT can influence their software usage are described in this assertion. The observations were:

1. With limited school-wide support teachers often regarded content-rich software as appropriate, and tended to forsake content-free software;
2. Good 'local' support encouraged more use of content-free software;
3. Rich support, especially collaborative, provided the critical multifaceted endorsement that teachers need to develop with classroom ICT;
4. Supported teachers were likely to use both content-free and content-rich software.

1. With limited support, teachers often regarded content-rich software as appropriate, and tended to forsake content-free software

When visiting the classes at RS around this time, one would have been struck by their new inkjet printers, and the similarity of software being used by many of the teachers. There was a CD or disc of a reading activity or game, and something similar for a maths game. There was also some mention of word processing, and they often pointed out their new printer. However, looking at the empty printer in-trays, and the paucity of printed scrap paper lying around—often common around a busy classroom with lots of printing going on—there was little evidence of a busy writing program or regular student printing of written materials.

The printer situation was different at NW, because although they had approximately the same student:computer ratio, their computers were in a lab, which was fairly heavily used by staff on a roster system. Noticeably, a large laser printer and a colour inkjet printer both appeared to be well used on most occasions. It is hard to compare printer use under these circumstances, as the single laser printer in the lab at this school of around 10 classes was required to handle the equivalent load of multiple smaller printers in six or seven classes in the other school; but comments about the printing usage from support staff of Maya and Teresa suggested their laser printer was quite heavily used every day. If a load of say 100 sheets a day were divided across 7 printers, then around 14 sheets printed each day on each printer at RS would be an equivalent load—but it looked like the RS figure was closer to 1 a day, in most classes. If printer output is taken as a very rough proxy for word processing use (as opposed to content-based software which tends not to use printouts), then it looked like NW made much more use of open-ended word processing software.

An equally significant difference was that, at RS, ICT support was based around helpful colleagues and occasional visits by a contract technician, and most support provided by Jerry the Principal. At NW, formal support was available from Maya (part-time ICT support), Teresa (keen parent ICT helper, there most days) and Leanne (ICT coordinator and tandem teacher), all of whom appeared to take a much more educational outlook on the choice and use of software in their school.

One conclusion was that the level of word processing at NW was much higher than at RS; but also because of Leanne's and Maya's well-publicised interest in and support for interactive multimedia tools in the school, the general impression of the researcher was that there was far more widespread usage of general or tool software at NW. This was supported by the survey results reported in Table 6.7. This suited Leanne, who felt strongly when she described the more curriculum-driven or content-rich software as 'decisionless' software, and argued that it should be restricted to mindless uses outside classrooms in her school.

A quick perusal of the software cupboards in both schools showed an equally distinct difference. At RS, the librarian bought software that she felt teachers would use, and the software cupboard, in Jerry's office, was full of content-rich packages, dating back over the previous four or five years—Jerry complained that the current librarian was a 'sucker for any new educational software the salesmen brought through the

door'—whilst Teresa at NW showed the researcher 'our ten or twenty most popular packages, from educational games like *Crystal Rain Forest* and *Monster Puzzles*, to our most popular software including *HyperStudio*®, *Kid Pix*®, and *ClarisWorks*®.' All the school software at NW, including site licensed software, was stored in the cupboard, which was in the computer room and usually open. Teresa installed and maintained the software on all the school machines, and was available to help staff who wanted to do something special or unusual. She attended school most mornings, and seemed to do much of the simpler management functions for which less well-supported schools would have had to call technicians.

All schools in WA had access to a suite of standard software tools after DoE(WA) negotiated a state-wide license with a well known computer software manufacturer to provide the complete range of office productivity tools. Jerry kept the school set of 50-odd CDs not in the software cupboard but on his own cupboard in his office. To his credit he made sure all the newer computers had most of these packages installed, but they would not run on any of the older computers, so they tended to be used just for content-rich software. When something did go wrong, Jerry usually called the original installer and had them come back and do the changes. These sorts of changes seemed to happen very rarely.

After running some PD for staff at RS on image processing and manipulating pictures, it was recommended that a normally installed piece of software called *Microsoft Picture Editor*® be returned to the start menu on all the newer machines. Despite staff agreeing that this was a good idea, it was never done. A review of the diaries indicated that Jerry never promoted the process-rich software tools at any of the meetings. Word processing was the only software tool mentioned by teachers at RS. It seemed that the level of interest in ICT at RS did not regularly extend to include the software tools and software maintenance that the teachers at NW enjoyed.

It was clear from observation over a period of months that the level of educational support at NW was more broadly based, and more strongly supported by the majority of staff, compared with RS. A further problem at RS was the level of dysfunctional relations between different factions of the staff, which tended to undermine significant educational support for ICT usage, despite the Principal's best efforts.

These observations indicate that, at NW, the higher level of educational support for staff also translated into more support for staff to use process-rich software. The range of popular software covered both content and process rich tools, and it was evident that Leanne was much less supportive of content-rich approach, arguing it often required so few decisions in use that it lacked educational value. On the other hand, at RS, from the staff who purchased software to those who looked after and used it, there was little discernible support for the more process-rich software.

As a result of this cross-case evidence, it appeared that low levels of support tended to restrict teachers to content-rich software, whereas higher levels of support with a learning rather than a curriculum focus appeared to encourage a broader range of software usage, including process-rich software.

2. Good 'local' support encouraged more use of content-free software

The previous evidence suggested that the support for process rich software needed to be school-wide support. In fact this was not clearly the case at all. Consider the relatively low level of support across the whole school at RS. It was not equally poor for all teachers, but had highs and lows, and this could provide further support for the assertion that support determines usage. Of the staff that participated in the SpokesTeam's research, some took part to different extents and some demonstrated different levels of support for one another.

These differences can be contrasted best in a two by two matrix comparing the level of support across the whole school with the level of support available to teachers 'locally', ie within their current support and collaborative groups. If each support level has a high and low value, then there are four cells to consider. Staff from the two case schools will fall into those four cells—see Table 6.17.

Table 6.17: Overall support levels at the schools, and some example participants who could be ascribed to them

SCHOOL level / **LOCAL level**	**Low (eg. no ICT coordinator) akin to RS**	**High (eg ICT support AND ICT coordinator) akin to NW**
Low (eg no in-class support, no nearby collaborators, mentors, etc)	Least case: David, Evelyn	Under-utilised, avoided: Olwyn, Peter
High (eg in-class support, multiple local collaborators or mentors)	Good local support: Ann; Gail? Fiona?	Best case: Paula, Nora, etc

In Table 6.17, the cells contain teachers who covered the range from least supported to best. Evelyn and David from RS probably represented some of the people who felt they had the least support around them. As an example, David is discussed here, but their situations were similar.

David's school, RS, was rated in Chapter 5 as a low support school. He too was rated with low support around himself and this, it is argued here, illustrated the consequences of low support in his software usage. He appeared to use ICT little and when he did, it was usually based around content-rich software or with a parent helper according to his friend and neighbour Ann:

> ANN: David spends a lot of time on the computer himself and seems to have the best personal computer skills amongst the staff—but I have not seen any evidence of this being transferred to the classroom. (1:85)

At the same school, but describing some quite strong support systems around themselves, are Ann, Gail and Fiona. Although their support systems were different—Gail and Fiona relied quite heavily on each other, for example—all three had roughly similar experiences. Ann's experience is not an example of the group, since none of them was representative, but rather they were examples of the group type.

Ann seemed to have good local support structures in place to compensate for the relative paucity of structured technical help at her school. She described strong collaborative supports in Chapter 5; for example, she was able to list a wide range of supportive people that she called on when things did not progress as planned. According to Jerry she was a popular supervising teacher for students on teaching practice, and readily formed good relations with others who had a keen interest in

students. These seemed to become part of her extended network of supportive professionals, if the number of times the researcher met Ann's previous student practice teacher called Lynda in her class, was any guide. When describing her approach to seeking ICT help, for example, she showed the breadth of her support systems when she explained:

> ANN: If I have a{n ICT} problem I call on people like Iain, and Jerry, and some Dads, as well as David and Lynda {the recent practicum student who often visited}, before I call on you. (2:84)

It seemed that it was this level of local support, which she had developed, that also provided the encouragement for her to continue her efforts with ICT. More importantly, her usage of ICT tools was wider than David's, for example. Her usage of process-rich tools was also quite wide. She was observed supporting students using e-mail, a speech word processor and a normal text editor. Also she taught her students to collect photos with a digital camera, and taught them some simplified Internet searching for problem-solving activities, as part of their ICT usage. How this occurred was testament to her personal support systems as well. She had learned to use a subset of the complexity of the web searching abyss when she heard about *Yahooligans* as a portal and search starter for younger students. Iain had once explained about it, and so she asked him to help her to set it up as the default page when the browser was started.

Fiona fell in the middle of the list for support structures, but, like Gail, showed some interest in tools, or process-rich, software. She attended the PD workshops on record-keeping with spreadsheets and WebQuests during the study period, and began to plan for their use in her class. At the same time her proportion of Internet searching seemed, to the researcher, to increase as she gradually became more willing to consider less structured activities on a computer. Potentially all of these tools are able to support more process-centric approaches to learning, and Fiona must be in a stronger position than teachers at her school who are not making use of such facilities.

Even within a single school the level of support that surrounded teachers was highly variable, and suggested that the better supported teachers used or were able to use more process-rich software in their classes.

At NW, Leanne defined her role as supportive and secondary:

> When providing support for a teacher, I am not the driver. Instead we are driven by their teaching program and their needs.

This strength of support was an important ingredient for Olwyn, who had traditionally preferred to use more content-based software. When Leanne suggested that an open-ended tool called *Inspiration*® might be appropriate for Olwyn's class and her teaching program, she reported that Olwyn showed 'extreme reservation'. Leanne interpreted this not as an unwillingness to use *Inspiration*®, which was very different in nature and function from any previous software she had been comfortable with, but simply an inability to comprehend how it could be useful. 'She just had no idea how it could fit in, but when I explained she said, 'hmm, all right, if you think so''. It was easy to imagine that Leanne's support during incidents such as this was a critical part of the process of open-ended software uptake by Olwyn.

Peter was a member of staff at North Waygo who was less interested in ICT. He was chided early on by Maya for encouraging his students to play games rather than make 'proper use' of the school facilities, and seemed only to take his students in when they were rostered. The activities his class used, often based around games, suggested that he used the rostered computing time as a reward rather than an integral part of his teaching program. He chose not to use any of the opportunities offered to him by Leanne, and so his low level of interest as well as his restricted support systems was an example of teachers who were rated as low. He did not utilise content-free software with his students.

Overall, when the support systems around teachers in a school were examined, it seemed that the local support factors were at least as important as the more general school based ones; and these seemed much more important than the generic or system-wide supports. By assembling a two by two table comparing school and local support, there was much more energy and enthusiasm when the support was local than under any other circumstance. Even when the local support was not as strong as school support, teachers were still able to make progress with process-rich software tools. This support seemed to be able to help teachers over the hurdles that faced them as they made use of more process-rich software.

3. Rich support, especially collaborative support, provided the critical multifaceted endorsement that teachers needed to develop with classroom ICT

With little encouragement to keep them using ICT, and only limited support around them for when things went wrong, it was understandable that many teachers forsook the opportunities to use interesting software or try new ideas.

Evelyn from RS was an unfortunate example as she appeared to be more willing than most to make progress, and was rated as reasonably process-centric initially, but was rated with low support systems in Chapter 5. She felt that she lacked any depth of assistance to help when things went wrong. When she had questions, or even wanted to strike out in new ways, there were few people to seek help from. Her software usage was restricted to a farm animals CD, reading software and maths games, despite having two flat keyboard Concept Keyboard machines in her room, with a range of both educational and tool software on them, and an attached printer. In her case personal and family pressures stole important energy and time away from her ability to make progress with ICT, nevertheless her weaker support systems predicted less progress towards process-centric software as identified in Table 6.16, and this was indeed the case.

Ann's support systems were probably the opposite to Evelyn in many ways, even though she too was stressed (she had approximately ten days off during the study period for medical and related problems) and was concerned that she might have to retire early. Nevertheless she had a variety of strong support systems around her, and they seemed to provide cause for optimism as well as providing support:

> ANN: Good sharing gives you the confidence to try, to fail, to adapt, to encourage, to praise, to complain, to grow, to laugh—together!

In this case it could be argued that her development gradually encouraged her to view computers with new eyes:

> ANN: I have definitely found that as I'm getting better at using it (ICT) myself, it becomes a means to meet our needs. I look at the computer quite differently now.

This broad local support that she was observed to participate in, then allowed her to broaden the range of software she might use:

> ANN: I am becoming embarrassingly aware that in the past I only used a few ways of learning, but 'good' IT —as illustrated in a properly designed WebQuest—has opened up many areas of learning to suit different children's different learning styles. This is a huge help to me, too, in planning different experiences for Outcomes.

Although Ann draws attention to WebQuests—the best of which are classified in Table 6.16 as relatively process-centric tools—at the same time she was making increasing use of the Concept keyboard and a speech word processor with her students, suggesting that her experiences were gradually encompassing a wider range of software types.

Another example of someone with a rich support system around her was Nora, from NW. Her support systems encompassed her family—especially her school-aged children— access to the Internet via a home computer and some university study. At school there was a strong developmental relationship with Paula in the class next door, and of course the 'normal' help from support staff Maya and Leanne. These all seemed to provide the flexibility and encouragement to make good progress with ICT in the two years before and during this research study. Over that time she started using *PowerPoint*® and *HyperStudio*® with her students, as well as specific content-rich software for some of the weaker students in her class. She continued to have her class utilise word processing software, and they started using e-mail and the web in the context of their Book Raps and Travel Buddies writing and research.

A person whose case appeared to contravene the norm was Christine. After all she had developed with ICT to a higher level than most of the other teachers at RS, according to the table of software usage (Table 6.8) and had reasonable support around her although very little of it appeared to be at school. And yet she did not encourage her students to use enough process-centric software to rate as one of the more outcomes-oriented teachers. Perhaps the key here was that her support systems were not face-to-face, and therefore she had less opportunity for genuine interaction, dialogue and reflection about her reasons for doing what she did. Also, since Christine was at the heart of some of the social disharmony in the staffroom, it seems likely that her described interactions with those that she chose to talk to were based on something other than supportive and collaborative personal development interactions. In the end, although Christine was seen as a large user of ICT at her school, she was not perceived as having a rich, interactive locally based support system around her to help her develop towards more Outcomes orientated learning activities with her students.

Whenever the issue of development and sustained usage with ICT was relevant, there were very few case teachers whose support systems were not predictors of their level

of likely development. At the same time they were often users of a high proportion of content-free software with their students. This is more evidence of the assertion that the better the support, the more likely a teacher is to use open-ended or process-rich software.

4. Supported teachers were likely to use both content-free and content-rich software

Teachers who found both greater depth of support, like those at NW, and better quality of support, like those using more peer-level collaboration as identified in Chapter 6, were probably in a better position to choose appropriate software for their needs. As their skills improved under the tutelage of helpful local support, they were increasingly more able to evaluate a student's needs, and simultaneously to select from a wider range of software.

Taking a cross-section of teachers from the two case schools, and choosing some from each support category from Low to High, makes interesting, if predictable reading. In Table 6.18, below, there are two teachers in each of Low, medium and High support levels. The cells list representative examples of the range of software they used, based on diaries, interviews and observation.

Table 6.18: Comparing SUPPORT vs UPTAKE with ICT for a sample of teachers.

Name	Supp-ort	Support factors described or evident	ICT uptake	Software used
David	Low	W'drew; Parent helper, significant reservations, trepidation, bought home computer &e-mail address. Overall lack of interest, or much hardware in class	Low	Mainly done with parent helper; CDs reading, math Some limited word processing
Evelyn	Low	home computer + I'net, brother, Jerry (rarely), rarely asked for help. 'husband wrecks, I fix'	Low	Farm animals, reading, and maths games software
Fiona	Med	home computer, some e-mail, daughter's boyfriend helpful, assertive, calls Jerry for problems, critical of lack of school Outcomes & ICT support	Lo/Med	Content-rich CDs—reading, math games; following URLs, limited web browsing, THRASS CD later
Christine	Med	Limited to e-list ('very, very supportive') using home computer +I'net, 'chatting' w. Iain, Brenda; hockey club sometimes; wont ask Jerry	Med	CDs of s'ware on reading, maths; Carmen San Diego; Aspire-the Games CD; limited I'net, e-mail; some wp, avoided art tool, PowerPoint, digital camera
Ann	High	School incl. Jerry, David, Iain, Lynda, etc, the researcher, a contract techy; home computer +self-arranged I'net, helpful young nephews, brother	High	Math, reading, spelling CDs; text editor, word processing, digital camera, I'net, e-mail, speech word processor
Nora	High	Family esp. children, home computer with I'net, Uni studies, sharing with Paula, help from Leanne, Maya, etc etc.	High	Weak students (SAER) with 'content' CDs, rest with tool soft-ware like e-mail, PowerPoint, word processing, spreadsheets, browsing etc

The cells indicate the ranges of software used in class, but it is noticeable that they are nearly all from RS school, since this is the school with a weaker set of support systems, and therefore the progress of individuals would be of greater importance than would be expected of staff as a whole in a better supported school.

This selection of teachers is sufficiently representative of the whole, to be able to conclude without difficulty, that the range of software used increased greatly when teachers found themselves in richer, more supportive environments.

Summary: Assertion 6.3: The level and quality of support influences software types chosen

As teachers adoption of ICT progresses, they have available to them a range of software types from content-rich to content-free, or from process-poor to process-rich, whether they realise it or not. Good support systems and support staff can

influence the types of software that teachers learn to utilise, and poor support or lack of support can throw the teacher back onto their own possibly very limited, resources. It would seem that the breadth and strength of support provide opportunities for teachers to re-evaluate the types of software they use, and increasingly to consider more open-ended and process-rich types of software. Although there are other possible factors associated with this development, no other factor seems as likely to be the reason for teachers to reconsider or reflect on their usage of something as complex as ICT, as rich and collaborative support systems, detailed above in Assertion 6.3.

6.3.4 Assertion 6.4:

Use of content-free software and hardware tools encourages more outcomes thinking

By encouraging teachers to use an outcomes focus for their use of ICT, this study chose to capitalise on the DoE(WA) Outcomes initiative—now administered by the Curriculum Council of WA, and called The Curriculum Framework. One of the characteristics of the Outcomes initiative was the increasing focus on outputs rather than inputs to the educational equation. A noticeable trend in the transition to an outcomes approach, was the fact that the outcomes tend to represent process and generic skills rather than content skills and abilities (Western Australia Curriculum Council, 1998b, p. 6). The separation of software into content-rich and content-free (ie tools) software exploited this apparent dichotomy as well. Software and hardware that support generic tasks tend by their nature to address broader processes rather than specific content skills; and software with specific content aims (‘to teach about the causes of WW2’; or ‘to teach addition of single digit numbers’), no matter how laudable or critical, could not easily be used for other content purposes.

In truth this is not a dichotomy and there is much overlap but this assertion represented a principle that seemed to hold true for teachers in this study. In essence the more content-free software teachers used—sometimes called process-rich software—then the more obvious was their interest in student outcomes rather than their own inputs to the classroom learning. This interest in learning was indicated by the following observations:

1. The content-rich software they chose was limited in scope compared with the content-free software available to them.
2. Content-free software allowed teachers greater control over their students' learning.
3. Content-free software provided a productive environment to observe their students' development rather than just giving them a score or assuming that they had learned something by being on a computer.

1. The content-rich software they chose was limited in scope compared with the content-free software available to them.

There are software tools with quite broad educational aims and quite capable of meeting process outcomes, but which are still quite content-rich in their make-up. Three easily available Australian examples are *Lake Iluka*, *Stage Struck* and *The Games*. Most content-based software is very limited in its reach, including Maths games, Spelling games and so on. Although the intent of such content-rich software is laudable its scope is relatively narrow, by comparison with the problem-solving or inquiry-based software mentioned earlier. Such content-rich software supports a tailored and limited range of outcomes and therefore lacks broad applicability. Even though the outcomes may be important, they tend to be product not process oriented, and therefore lack impact over a whole process-outcomes oriented teaching program.

Only one teacher at RS chose to use any of the broadly-based content-rich software—it was Christine, who used *Aspire-the Games*® CD—and despite her enthusiasm for it, the researcher noted no acknowledgement of any significant process outcomes when she talked about it; nor when she was observed using the CD with her class. For example, she wanted her students to learn about the Greek Games, presumably because it was an important history lesson in her eyes. Admittedly she could have made deeper comparisons when the researcher was not observing, but such behaviour would have been atypical and seemed unlikely.

One advantage of choosing content-rich software was that it can take less time for novice teachers to learn and use with their students, but such a time saving was a reflection of its simplicity. Leanne's description of these types of software as 'decisionless' epitomised and perhaps even exaggerated their weakness. Paula was

equally disparaging of people who avoided the process-rich software (like e-mail) for the content-rich, when she argued that they were closing their minds off:

> *: so not all staff are on e-mail, why is that a serious weakness?
>
> PAULA: they just don't 'get it', they just don't get it! {Laughs}. Otherwise tools like e-mail, ICQ and the Internet are just seen as playing games; and they're not of course, they are all part of life.

It may be that people who had not yet moved to using tool software did not think of the value of process-rich software in the way that Paula argued for. In that case the relative lack of scope of content-rich software appeared not to have encouraged a more outcomes oriented way of thinking and may even have discouraged it.

2. Content-free software allowed case teachers greater control and creativity over their students' learning

Those case teachers who used a range of content-free or process-rich software appeared to exert more influence over their students' use of computers, including encouraging more creative uses; also they appeared to have a clearer rationale for the use of their computers in learning. As examples, both Ann and Paula illustrated the ability that good process-centric software had for leaving them in control, and free to consider the outcomes processes:

> ANN: So an outcomes focus to me means not using ICT as an input, but a means of encouragement, giving opportunity, providing tasks, a tool for kids attempting to show their outcomes. (2:128)

In a similar way Paula described how some of her students had become the school experts, which left her free to consider the learning that was going on:

> PAULA: In my class there was a handful who were experts at taking photos, printing and downloading. Another little kid decided he was interested in scanning. Now I haven't got a clue how to do those—I know they're not hard—but why should I bother? So I handed over to them. It's more of, me standing back, getting time to understand and observe {while they do the work} (1:202).

Although there may have been more challenge in learning how to use some process-rich software initially, equally it could be argued that their students would have had to learn a particular software tool only once, and then have used it without hindrance in multiple circumstances. This contrasted with most content-centric software packages, each of which they would presumably have needed to discard after they had learned what it was designed to teach them.

Teachers using process-rich tools probably had greater initial hurdles to overcome, compared with content-rich software, but the advantage was more time to observe and think about their students' outcomes once the students had become competent. For Leanne one of the major reasons was creativity. 'How else am I going to see their creativity?', she said, as an explanation for using multimedia tools with her students. Ann showed that it did not require great mastery on her part, and implied that it had left her free to watch their achievement of outcomes. She described the process thus:

> ANN: Consider my comments about the making of bookmarks. I had to learn how to use the digital camera {enough} myself, before I could demonstrate its use and capabilities to the children before they used it. Then they were up and away and discovering more of its capabilities! (e-mail:28nov)

It was evident that she was indeed looking for outcomes when she described in her diary one of the episodes with her children using the digital camera. Not only was she enjoying watching their achievements, but she described how, by supporting one another and giving encouragement, they were also meeting Interpersonal Skills outcomes in the Health outcome strands as well as some art skills in the Viewing outcome strand area by practising their evaluations of one another's photos.

The greater flexibility afforded teachers who made use of content-free software (and hardware) seemed to leave them more in control of their teaching and learning environment, allowed greater creative opportunities to their students, and led them to make more perspicacious comments about possible outcomes they sought.

3. Content-free software provided a productive environment to observe their students' learning

As their focus on outcomes and especially process outcomes increased, software that supported a more process-oriented way of working and thinking could be expected to have greater significance for these teachers, and indeed this appeared to be the case.

The teacher who underwent the most change development with regard to ICT and outcomes during the study was Ann at RS. Her usage of content-free software and hardware increased significantly during the study, and multiple entries in her diary and emails showed that she was aware of changes in her usage of and thinking about both ICT and outcomes. For example the researcher helped her students produce the bookmarks mentioned above, with their own photos and a typed list of their 'favourite things'. It was educationally a relatively simple technology process,

looking at bookmark designs and their purposes. At the same time it was technologically quite a complex activity for a novice, using word and picture processing, sophisticated layout features, colour printing and laminating. Although she found the ICT side daunting, she was in charge of the activity at all times and reported being very pleased with her children's development. She reported about it in an e-mail afterwards:

> ANN: because it was my 'first effort' at this activity I was overwhelmed with the computer/technology aspect of it - that was a steep learning curve for me, lots of 'firsts' that blinded me as to the child outcomes orientation of the project. … When it was all over I realised the richness of such an activity using technology and had every intention of repeating the exercise this year with Lynda {keen prac student}—only time restraints and her own practice timetable stopped us.(e-mail:10oct2000)

Although her failure to repeat the activity was an indicator that her ICT use may not have been sustained after the study finished, her defence is plausible, and she still showed other evidence of change:

> ANN: I have definitely found that as I'm getting better at using it {ICT} myself, it becomes a means to meet our needs. I look at the computer quite differently now. (2:123)

It appeared that her thinking had been changed in some fundamental way that now allowed her to take better regard of her students' outcomes. it seemed that she was seeing herself and her students in a new environment.

> ANN: But now it's the finding out that is important, the process, the skills, the resources that are used to find this information, and the ICT that will/can be used in the storing and communication of this information. The children have to make decisions as to the best and most effective way of presenting this information. (2:130)

At NW school the levels of change were much greater, but they took place over a much longer time period. Paula, like Ann had, talked of the development in her pupils. Their software use, as she described it here, appeared to be even more strongly tool-based. She was referring to a conversation with her students about the frustrations of having to book and share the lab computers (for which she was using the metaphor 'pencils' at the time):

> PAULA: They are feeling the frustration too. Whereas before it was, 'Oh, pencil-lab day, yea! What are we going to do today?' Now it's different. The kids look at what they have been doing, they have a book that they scribble in so they know what they want to do when they get into the pencil lab, ensuring that they don't waste time—because they had to save up everything they want to do for half a week or whatever.

The evidence suggested that these teachers were finding the environment supported by process-rich tools was productive and helpful for the sorts of learning that they were planning and organising.

Summary: Assertion 6.4: Use of content-free software and hardware tools encourages more outcomes thinking

Overall it was evident that some teachers found the content-free tools difficult to adjust to; but that those who made significant use of them seemed to have their learning structured in different ways, from those who did not. Part of the challenge of ICT uptake for teachers was finding a balance between integrating a computer into one's existing program of work, and changing one's work. Those who changed their approach had begun to integrate their intentions into a new structure, which was enabled by the computer. Evidently Olwyn and Christine found this less easy than others like Nora and Ann. This might explain why, despite their preparedness to use computers, Olwyn and Christine had tended to forsake the content-free tools; and they made quite different progress compared with Nora and Ann, who seemed to have readily adopted content-free software.

Christine was very firm when it came to computer things she did not understand, dismissing the item as pointless or inappropriate. She castigated the Concept Keyboard as 'a total waste of time because it was meaningless to me. It didn't fit in to teaching, it didn't happen'. Next she dismissed digital cameras saying she couldn't see their value. Fortunately this decision was only transient, as she later began to make some use of the school's new digital camera. This was seen as a healthy sign, as it suggested that her resistance to less structured tools was able to be broken down, and she could well be making more use of content-free tools over time.

Olwyn's avoidance of content-free software was explained by Leanne (earlier in this chapter) as an inability to see its value, rather than any unwillingness or deep philosophical prejudice. Leanne was of the opinion that good support would overcome this.

Nora appeared to make exemplary use of process-centric tools. She described a large range of activities requiring software tools, including Slideshows, Book Raps, Travel Buddies, all of which required her students to make use of word processing, e-mail, simple graphics and spreadsheet activities to help their learning. When asked what

else she had planned, she replied, 'When I see something I like, I'll do it my way, but I haven't yet seen anything.' Her reply indicated that the creativity and control were both important to her. There is no doubt either that she was successful as a teacher when she started to use these tools:

> NORA: It was just great with the kids because they really worked as a team {this year}. The cohesiveness of the class was great; there wasn't anybody who missed out. The feel of the class was very different to the other {previous} years. (1:374)

Ann came to the realisation that she did not need to know all about some software or hardware to make good use of it. At the same time she was convinced that good 'local' support was important too, and could not let the opportunity pass without drawing attentio0n to this point in passing:

> ANN: {your} fixing of problems so that we could continue to use ICT … allowed me to concentrate on educational outcomes, not on equipment. … I do not believe that you have to be an 'expert' before using ICT—otherwise I'd never get started! —But having a knowledgeable cooperative colleague seems, to me, to be essential.

Here was a teacher making increasing use of content-free hardware and software, who was becoming more concerned about students' outcomes than her ICT development. Again it seemed that the open-ended tools were supporting the thinking that went with a process-centric outcomes orientation.

Overall, the observations above have shown that content-free software was associated with a greater range of educational aims, more creative approaches and left teachers greater options in they way they approached their work. At the same time it was obvious that teachers who made greater use of content-free software were also making greater use of outcomes thinking in their teaching and learning programs, and it seemed reasonable to deduce a connection between these factors. Most of the available evidence suggested that, for most teachers, it was the usage of the content-free software that preceded the changes towards a more outcomes oriented thinking approach which has been documented here.

6.3.5 Assertion 6.5:

Teachers using process-centric approaches overcome impediments to their ICT usage more easily

It became obvious that those teachers within the two case schools who had a more process-oriented approach to their teaching seemed to be more resourceful when using ICT in their classrooms. In other words they were less likely to be upset by a

problem or something going wrong, and may even have felt willing to look for a solution themselves. Most seemed more content with their usage or even lack of usage of ICT, and were quite willing to share their concerns as well as their skills with others, including their students. The evidence for this assertion is derived from three observations, namely:

1. Teachers using content-centric approaches were easily flustered by small hardware or software problems, while others were not;
2. Teachers using process-centric approaches often involved students in problem-solving ICT problems, while others did not;
3. Teachers using process-centric approaches were more willing to involve ICT to solve problems while others were not.

1. Teachers using content-centric approaches were easily flustered by small hardware or software problems, while others were not

Every teacher found cause to be frustrated at some time in their use of ICT, but the reaction of the more content-centric teachers appeared to be more marked. Process-centric teachers on the other hand were less likely to find such a problem distressing. Perhaps they gradually became inured by previous exposure to these problems, but whenever a problem occurred, one of the difficulties for content-centric teachers was that they did not know if it was a small or a big problem, and it was probably easier to avoid problems when they had no control over them and certainly felt that they could not fix them.

When an older computer in Christine's class failed to start up and reported an error one day, she mentioned it to the researcher. Upon visiting her class a student said that they were told to turn it off and leave it, even though this student wanted to try and fix the problem claiming he had a similar machine at home. Whether he could have or not was moot, as the machine stayed like that for many weeks, waiting apparently for the contract technician to fix it.

Christine had a huge complaint about the school e-mail once, and this typified the lack of control felt by people like her. She said, 'That was a cause of great frustration, because it was much more simple at home, using e-mail, than it was here'. In her diary Christine commented on this issue more than once, and it was

clearly a point of significant annoyance for her. After all, she thought they had lost a series of student emails from the previous weeks. She was severely critical of Jerry for his role in this e-mail difficulty, and it was the only time she appeared to swear in the whole period of the research.

Nora stood in bright contrast to Christine. Although she agreed that in times past she 'would avoid using the computer', nevertheless her development appeared to have proceeded at a faster rate than Christine's, so Nora was increasingly, 'willing to fiddle around, to have a go.' In fact Nora's improvement was well exemplified by her willingness to find a solution when her e-mail system stopped during class one day. She explained that she simply told the students to save their e-mails into a file, which they could call up and send later when it started working again. Such response to problems was more likely with process-centric teachers. Although this seemed like a reasonable response, it was doubtful whether Christine would have reacted so amiably to the same problem.

Where content-centric teachers saw such problems as a time of extra stress, process-centric teachers seemed to regard them more as problem-solving opportunities. They were more resourceful under these circumstances.

2. Teachers using process-centric approaches often involved students in problem-solving ICT problems

One major source of help and support in the average classroom was apparently ignored by some teachers, and yet welcomed by others. None of the teachers who rated as content-centric ever commented on asking students for help. Christine, for example, although she may well have asked her students she never thought to mention it as she left the researcher in no doubt that her students were not equals in her classes, and she tended to mention her students as objects of her activities rather than participants or controllers. Even though she thought she was changing her teaching towards a more facilitator approach, for example, she described it in rather 'content' terms:

> CHRISTINE: Hmmm, I don't think so, greatly. Instead of having the bulk of content that I'm going to teach, I'm going to... I mean, kids still have to learn the same facts about things, don't they… (1:268)

On the other hand, many of the teachers who rated as process-centric in tables Table 6.10 and Table 6.11, mentioned their propensity to ask for, or even rely on, student

help with their classroom computing. Fiona, Gail, Evelyn, Paula, Nora and Ann all mentioned their students as contributors in this way. Although Leanne did not mention it, there is no doubt in the researcher's mind that she too would have called upon her students without a moment's hesitation, in the way that Gail did:

> GAIL: I'm one of the first ones; the kids are on the Internet, one gets stuck, so I say who knows how to do this? Good, come and show them, and let me look too! {Laughs} Kids quite like that actually, where you say 'I don't know, I don't know how to do it'.

The increased willingness of process-centric teachers to involve their students in helping solve their ICT problems was a characteristic not found in more content-centric teachers. This was one of the methods that such teachers seemed to use to help overcome impediments to their ICT usage in class.

3. Teachers using process-centric approaches were more likely to include ICT in their repertoire of problems solving strategies

Even more important than solving existing problems with ICT was this ability to regard ICT as another useful tool in their teaching toolbox of widgets and contrivances that helped learning. This suggested to the researcher that teachers who could do this had indeed begun to integrate the ICT into their learning and curricular approach, and could be expected to start showing sustained usage of ICT uptake. Both Nora and Ann showed examples of this spontaneous ability to see how ICT could help address a learning problem. At the same time it was easy to imagine that both Paula and Leanne would have little trouble using ICT for the same purposes.

Nora had an abiding interest in children at risk (the SAER program) and took an interest in the topic across the school. She felt that she had often been able to find a way to use ICT to help a child who had something that 'doesn't fit in.'

Ann remembered a particular example that she described in her diary saying 'Friday must be my day for 'divine inspirations''. They had all been using the word processor on the two donated machines which had word processing software with a speech facility in it. Ann liked it because it tended to have an English accent, which she said the students found easier to understand. She wrote in her diary of a student, Callum, who was very weak at reading but was persevering, who asked for help one day with the word 'buttered':

> Normally I would grab a piece of scrap paper, print out the word, and demonstrate how to 'attack' the decoding of the word. On this Friday I was busily trying to

> complete my 2000 stock order (due at 3pm that day). I didn't really have time for Callum just then so, in a moment of desperation (inspiration?), I said, 'Callum, go down to the Acorn {computer} and type in the word {to the speech word processor}, listen to it, and then come back and tell me what it says'. Well it went like a treat. Again that beautiful smile of achievement from him. What a delight—and what a great little teaching tool that I had never thought of using before.

Ann's spontaneous use of an ICT resource in a new problem situation was an example of her new readiness to use ICT to help children with their learning.

No similar confidence was held for Evelyn's ability to do the same—even though she too was rated as a process-centric teacher—given her lack of progress with ICT over the study, due almost completely to her health and personal challenges. Despite her propensity she was never observed using or even suggesting that ICT could help address learning problems; in this case she was the odd-person out.

In all the other cases, these were examples of the spontaneous capacity of process-centric teachers to start using ICT as a extension of their teaching and learning 'bag of tricks'. The broadening of their teaching and learning inventory seemed characteristic of many of the more process-centric teachers in the study, and illustrated that their approach helped them overcome ICT challenges and difficulties in the course of their normal classroom usage.

Summary: Assertion 6.5: Teachers using process-centric approaches overcome impediments to their ICT usage more easily

Teachers responded to ICT in many ways, but the issue of their resourcefulness with ICT was instructive. There seemed to be evidence that their different reactions were to some extent determined by their outcomes orientation, specifically that content-centric teachers were much more likely to be flustered or stressed by even quite small problems with ICT. Process-centric teachers on the other hand were much more likely to demonstrate flexibility and resourcefulness when they had to overcome some impediment to their progress with ICT.

6.4 Summary—Learning focus and ICT uptake

This chapter has addressed the importance of an outcomes orientation on ICT uptake for classroom teachers in the two case schools. Outcomes orientation, which was shown to vary from content-centric to process-centric, was not seen as fixed for

every teacher, but it appeared stable and not easily amenable to change. Nevertheless, this chapter acknowledged that some teachers did change their outcomes orientation, and that others were showing initial signs of change. It seemed reasonable to hypothesise that many teachers could change their outcomes orientation given the supports documented here and enough time. After all there was no evidence that any person was determined not to change and there was much evidence that teachers wanted to be more process-centric in their outcomes orientation.

Importantly, it appeared that those who were willing to use a wide range of software types, may have better opportunities to address a wider set of outcomes in their teaching program. Also, those whose outcomes orientation was more process-centric, were likely to be more resourceful when difficulties struck. and that they apparently had less difficulty in the ICT uptake process At least part of the reason seemed to be the better quality support systems that they built around themselves. Equally importantly, it was obvious that the quality of local support was much more effective in bringing about change and helping sustain it, than broader, systemic supports were, no matter how good those supports seemed to be.

CHAPTER SEVEN

DERIVING A TYPOLOGY OF ICT UPTAKE

Introduction

This chapter proposes an answer to the third research question, namely, 'what typology of ICT uptake effectively discloses teachers' attitudes, understandings and behaviours?'. The answer to this question is important, for a range of people such as individual schoolteachers and their support staff, PD designers and system planners.

Such an answer would be important at both an individual and a systemic level. Firstly, at an individual level, any teacher may draw comfort and inspiration from recognising the commonalities in ICT uptake that many other teachers have felt—from realising that 'they are not alone', as even the simplest ICT uptake scale acknowledges that progress is possible. Secondly, a richer typology was sought in answer to this research question that simultaneously provided guidance and indicated likely needs during that teacher's development.

At a systemic level, an appropriate ICT uptake typology could assist in a further two ways. Firstly it could help those planning and implementing professional development, by reducing the incidence of simplistic PD activities that risk trivialising the variety of teacher needs during the ICT uptake process. It could do this by highlighting for PD designers the inherent complexity and significant levels of change embodied in each transition. Thus a general acknowledgement of such a typology could potentially broaden the range and types of PD and support offered to teachers.

Secondly, by locating groups of teachers across an elaborated ICT uptake scale from early to late, PD designers and system planners (whether they be ICT staff in a school, Principals or central office staff) could make more informed decisions about the type of support and PD needed, likely development paths and even possible timelines for that development. This would presumably have consequences for the types, levels and costs of support, and may conceivably help provide a crosscheck for how realistic some proposed ICT implementation timelines could be.

This chapter delineates the grounded development of a typology of ICT uptake as it occurred during the research. It introduces a four stage model for ICT uptake based on the adult learning literature, and then extends, justifies and describes in detail the application of a modified, grounded model to the case teachers. The chapter closes with a discussion of some further issues that follow from the model.

7.1 Re-evaluating the typologies

In Chapter 2 it was shown that there were few useable typologies or scales indicating teachers' progress and performance that simultaneously provided some feedback about their feelings and their needs. This chapter re-introduces the desirable criteria set for a typology from Chapter 2, and shows limitations that rose in a grounded way in all the typologies that were initially considered. A more appropriate typology based on the adult learning and autonomy literature is then derived and presented as a potentially more useful descriptor for the ICT uptake process by teachers. The process of matching the teachers to the model highlights an important characteristic of those teachers beyond simply identifying their location on the ICT uptake scale, namely whether they appear to be moving along that ICT uptake scale or whether they are apparently immobile. It is hypothesised that this has significant ramifications, including providing guidance for their needed support structures and professional development.

This third and final research question sought a developmental framework that was both simple and useful. Although simplicity was a goal, it was judged important to avoid a scale that trivialised the developmental ICT uptake process or simplified it so much that it was removed from the realities of the classroom, the school staff room, parent interactions or normal workplace demands. At the same time there was little point in a scale that overdramatised the complexities of ICT uptake. A typology was sought that was easy for Principals, ICT staff, outside observers and even the teachers themselves to identify with, and yet rich enough to provide insight, helpful support and direction for the professional and ongoing development of those teachers.

7.1.1 Criteria for a developmental framework of ICT uptake

To justify its selection and implementation, a typology should meet a set of criteria rating its effectiveness. Such a set of criteria was introduced and justified in Chapter 2, when the initial typologies were introduced. These criteria sought to ascertain any typology's value in the ICT uptake environment for this group of teachers. Then, if it proved relevant and appropriate, it would then be worth designing a further research study to ascertain its value with more generalised groups of teachers. The criteria sought a typology that would be simple, and useful, and if it met these criteria it should be called an effective typology. In the realm of quantitative statistics, this effectiveness would be translated as valid and reliable. In this context these were re-cast with a more qualitative interpretation (Miles & Huberman, 1994), namely (i) simplicity, (ii) credibility and (iii) usability. It was thus argued that the following three criteria were therefore appropriate. The typology should:

i) have relatively few steps or levels and be easily comprehended (simplicity);

ii) be strongly grounded with the range of collected teacher data (suggesting referential adequacy), and be easily linked to previous experience so that it would provide some connection into the difficulties and supports of their own uptake process (credibility); and

iii) possess a simplicity in implementation and provide some guidance or helpful strategies for teachers (usability). This may embody generalisability principles too, if the model being evaluated can support all those seeking to make further progress whether they were starting out with ICT or developing their ICT skills. After all, it seemed unlikely that common or undifferentiated strategies would be appropriate for a range of educators who were at different locations along some developmental path.

7.1.2 A Dual Hurdle Model

Initially the typologies from previous uptake models were expected to have application in this process. It was observed that most of the uptake models seemed to imply that there was a growth in understanding of learning principles as well as a reducing reliance on ICT support systems and usage (or, equally valid, there was an increasing sophistication of ICT usage), as a teacher progressed. This dual development was rarely made explicit, however. All the typologies initially

presented in the literature review of Chapter 2 were pre-existing and already proven descriptors of teacher or adult behaviour in some way. The more prominent were:

- Stages of Adoption of Technology (Russell, 1995). Russell described six stages for teachers: Awareness, Learning the process, Understanding and application of the process, Familiarity and confidence, Adaptation to other contexts, and Creative application to new contexts.
- Technological Maturity Model (Sibley & Kimball, 1998) This model proposed that there were four benchmark stages in the process to technological maturity namely: emergent stage, island, integrated, and finally an intelligent stage.
- ACOT five stage model (Sandholtz et al., 1997) described Entry, Adoption, Adaptation, Appropriation and finally an Invention stage, as five steps.

It seemed that many of the ICT adoption approaches assumed both an ICT skill uptake simultaneously with a change or consolidation in learning approach. This duality of teacher development was implicit in many of the models, and it was planned that this research should look for signs of teachers' approaching two separate barriers or hurdles—one to do with ICT, the other learning. Thus the Two Hurdle model of ICT uptake was initially conceived. The researcher was planning to identify both facets during the average teacher's development.

Through the course of the study, the researcher gradually came to the realisation that the Chapter 2 models were only weakly aligned with the collected data, in particular that the teachers were not seeing any significant independence or separation between their ICT development and their learning development. The dominant reaction of the researcher when reviewing the research data was that the teachers were at all times concerned about learning in some form. They were asked to teach, they were asked to learn, and the pressures and feelings they felt and the actions they undertook as a result of ICT were strongly learning related. Teachers would say things like, 'we are under extreme pressure from EdWA to teach our students about ICT'; 'I need to know more about spreadsheets so I can use them in my class' and 'I would love to find ways to build this {ICT} into what I do'. Office workers learning to use computers would most likely argue in the same way that there was a connection between their changing ICT usage (eg learning to use a spreadsheet) and their work needs (perhaps mathematical modelling); and teachers were only a little different. In

general, reasons given related to their work needs, but they were not only concerned with a product focus. Less often did any teacher simply say, 'I want to learn about this, because it is fun', or '…but I have no reason in mind yet'. Admittedly such comments occurred, but they were most likely only from those further up the scale like Paula, who had come to treat ICT in a less object-like and more integrated way perhaps more like a pencil or a car becomes internalised into one's thinking.

A re-interpretation of the dual hurdles

The dual hurdle proposal of Section 7.1.2 has been rejected as too simplistic. In fact the concept of a hurdle may be satisfactory in retrospect, but in prospect it is argued that it lacked explanatory power. In other words, for teachers who had not yet made the journey, describing a significant change as a hurdle diminished the apparent effort and belittled the concerns of those who perceived it as more significant. It was not something with which teachers who had not yet made progress could identify. In prospect, novices saw a much more forbidding problem than a simple hurdle. Knowles (1998), in a classic description of his own transition from teacher to facilitator, described the first steps in a way that implies it was 'just a hurdle', but clearly involved multiple steps of development, which he glossed over. After describing himself as a good teacher by traditional standards, he took a seminar in psychological counselling run by an associate of Karl Rogers:

> I was shocked by what happened at the first meeting. Some 15 students sat around the seminar table for 20 minutes talking small talk. Finally, someone asked if they knew where the teacher was. One of the people responded that his name was Art and that he had been designated by the Psychology Department to meet with us. Somebody else then asked him if there was a course outline. Art responded, 'You would like a course outline?' Silence for several minutes. Another student broke the silence by saying, 'I'd like to know why everyone is here - what did you come to learn?' So we went around the table stating our goals and expectations. When Art's turn came, he said, 'I am hoping that you will help me become a better facilitator of learning.'
>
> I won't attempt to reconstruct the ensuing events, but I can tell you that during the following week I read all books Carl Rogers had written, located students who had taken the seminar and asked them what it was all about, and developed a plan for student inquiry teams, which I presented at the second meeting (which was adopted, with some modifications). I never read so many books and articles and worked so hard in any course I had ever taken. I had never before experienced taking that degree of responsibility for my own learning, alone and with other students, as I did in that seminar. It was exhilarating. I begin to sense what it means to get turned on to learning. I became to think about what it means to be a facilitator of learning rather than a teacher.
>
> ... ...

> {three paragraphs dropped, describing his successful first attempt, and the students' successes.}
>
> ... ...
>
> By the end of that semester, I was confirmed facilitator of learning.
>
> When I analysed what had happened to me, I was able to identify a very fundamental changes. My self concept had changed from teacher to facilitator of learning. I saw my role shifting from content transmitter to process manager and—only secondarily—content resource.
>
> In the second place, I experienced myself as adopting a different system of psychic rewards. I had replaced getting my rewards from controlling students with getting my rewards from releasing students. And I found the latter rewards much more satisfying.
>
> Finally, I found myself performing a different set of functions that required a different set of skills. Instead of performing the function of content planner and transmitter, which required primarily presentation skills, I was performing the function of process design and manager, which required relationship building, needs assessment, involvement of students in planning, linking students to learning resources, and encouraging student initiative.
>
> I have never been tempted since then to return to the role of teacher.
>
> (Knowles, p. 199-200)

His story is a reminder that the difference between prospect and retrospect can be immense in that he presents his conversion as an almost bipolar process, for example 'My self concept had changed from teacher to facilitator'. His explanation supports the observation that sometimes those who have made a transition can easily gloss over the complexity of the journey. This is a major reason why any model presented as a hurdle, or two, may have oversimplified the challenge. Any typology that separated the learning out as a discrete factor was not considering the apparent tight interconnectedness between learning and ICT, which came through to the researcher after working with the case teachers for the period of the study. A better typology was indicated, one that did not rely upon or imply a simplistic bifurcated process.

A typology was sought which would be more strongly oriented towards learning than the ICT-oriented models presented before. Such models are investigated now, then one model is presented and justified; and its value analysed in the remainder of this chapter.

7.1.3 Weaknesses of previous typologies

Predictably, all previous typologies were strongly ICT oriented, and it is now argued that they failed to integrate learning issues—in other words the Two Hurdle approach

correctly summarised the previous models, but failed to address the structure and form of development noted in the case teachers. As the research unfolded, the distinction about ICT adoption levels seemed less revealing than the observation that they were largely concerned with teaching and learning issues even whilst addressing the novelty of ICT. Their concerns with ICT were always ultimately based around its consequences for their teaching. It seemed that learning was the dependent variable in the mix, and that the other factors were better regarded as independent variables. Hence a more relevant typology was sought, one that considered learning at all steps in the process.

Although it was conceivable that there was no such typology that would summarise the uptake process, it seemed more likely that ICT uptake could be regarded as simply another change process. Change processes are often described as some type of typology, eg Kohlberg (1984)'s four levels of Moral Development, or Rogers' (1983) five types in the diffusion of innovations. So it seemed reasonable to expect some typology to be able to describe the process of ICT uptake, with the reservation that it still needed to meet the criteria identified earlier as desirable.

7.1.4 A new typology from the literature on adult learning

Thus a second review of the literature was undertaken looking for typologies with more of a learning focus. Since a key facet of this research was the focus on teachers' learning, and the issue of learning outcomes rather than ICT itself, the writings on adult learning, professional education, self-directed learning, autonomy and teacher development became an obvious branch of the literature to investigate. Since the review built upon the material already identified in Chapter 2, the only significant development was the identification of a series of typologies with greater focus on learning. Five such typologies are introduced, including work by Perry (1970), Curran (1976), Boud (1988) and Brundage & MacKeracher (1980):

- Perry (1970) presented the results of a major study called *Forms of Intellectual and Ethical Development,* which proposed a series of nine 'positions' that students adopted and which described how they saw themselves and their learning.

- Curran (1976) proposed a five stage process that learners move through, with respect to any particular content. The stages were: Embryonic, Self-assertion, Separation, Reversal and Adult stage.
- Boud (1988) described a continuum of approaches to learning, which encompassed the transitions necessary as a teacher moved from a curriculum centred to more student centred teaching and learning style. His continuum ran from *highly didactic*, where students make few of the decisions about learning to a *highly responsive* one where students made most of the decisions. This transition did not show any of the change states through which a teacher might progress.
- Brundage & MacKeracher (1980) have produced a finely detailed micro-level description which identified states or stages through which an individual passes during their learning activities, namely Entry, Reactive, Proactive and Integrative stages (see Figure 7-1). These stages seemed relevant to this research, since they argued that these were the stages that both an individual and a group passed through as they developed autonomy in regard to a specific project or topic.

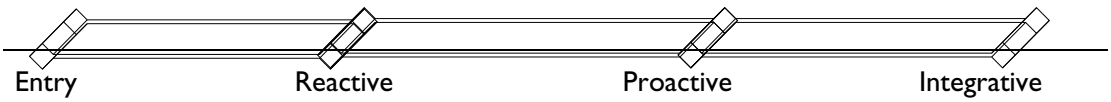


Figure 7-1: Four stages for a learner in a learning activity, Brundage & MacKeracher (1980)

- Boud, in a review of adult learning, described a goal of autonomous learning as the students becoming interdependent learners, able to work with and help each other. He explained that the attainment of the final stage of interdependence 'is often portrayed as a process starting from Dependency, and moving progressively through counter-Dependence and Independence to Interdependence' (Boud, 1988, p. 29). In this case the independence was from an authority figure or teacher, as they progressed to more mature and equal forms of relationship with those around them. He called the progression the 'stages of development of learning'. This typology seemed relevant to the study as it too described many of the teachers as they progressed with ICT. Boud's model is illustrated in Figure 7-3, below.

Dependent Counter-dependent Independent Interdependent

Figure 7-3: Four stage 'development of learning' typology attributed to Boud (1988, p. 29)

Of these models the last two were equally apprpriate. Each had four stages, and each was a micro-level description of the uptake process that could be applied to individuals and groups. There was little to choose between them, and in fact they appear to overlap significantly and it was decided that neither should be discarded but rather integrated as appropriate. The Boud descriptors had one advantage, namely that they allowed a clearer division into two super-categories, namely a more dependent pairing (Dependence and counter-Dependence) and a more independent pairing (Independence and Interdependence). Thus the Boud descriptors of a potential model describing ICT uptake were tentatively chosen, but characteristics from both typologies were integrated to produce the final model (introduced in Figure 7-5). Neither model adapted perfectly to the environment of teacher uptake of ICT—for example Boud was talking about independence 'from an authority figure', whereas it seemed more appropriate that the independence in this version included 'from the need for peer support'.

Since Boud did not assemble the model to apply specifically in the instance of ICT uptake, this hypothesised version warranted a new nomenclature. Its focus on ICT uptake suggests simply the 'Typology for ICT Uptake' which abbreviates to 'the TIU model'.

This new typology will be rated against the already-established criteria to indicate its value, in the section *Justification of the chosen model* later in this chapter. Firstly though, a brief summary of some of the teacher data is given below to illustrate the quality of the match between the data and this model. In the subsequent section comprehensive elaborations will be given showing in detail how well the data match the model.

How the Teacher data aligned with the TIU model

As already illustrated in Chapters 5, 6, and 7, the case teachers varied dramatically in their attitudes, understandings and behaviours to do with ICT in their classrooms and their daily lives. It is possible to summarise much of the data quite briefly to illustrate that the TIU model had suitability. In later sections much greater detail will

be used to show the utility of this model for its purpose, but in this introduction the connection between the data and the four categories of Dependence, Counter-dependence, Independence and Interdependence will be summarised.

Firstly the more developed teachers were less stressed about the role of ICT in their class, and their thinking seemed to have moved beyond planning around ICT to planning using ICT. Furthermore they were more obviously collaborating and sharing their ideas and even providing role models for other staff at their respective schools. Hence at one end of the typology the issues of collaborating and integrated planning strategies should be expressed in any typology chosen. This was characterised in the original Boud model as *interdependent* behaviour.

Secondly at the other end of the typology, obvious novice teachers with ICT were talking of stresses like insufficient time and personal weaknesses, and often included negative observations, usually about themselves but occasionally about the system of support around them. They sought explicit advice and highly detailed guidance with no flexibility. Such behaviour was representative of teachers in the *dependent* stages of a model like Boud's. Parenthetically, one of the reasons for their concern underlined the weakness of the Two Hurdle approach, namely the difficulty they saw in using ICT *within* their teaching and learning activities. This suggested that a model that separated the learning and the ICT was making an artificial distinction.

Thirdly some of the case teachers were rather negative, and others positive, about their own level of development, and the negativity was not limited to novices, teachers who were rated as still in the starting or relatively dependent stage. There was an understandable level of negativity for novices, but also there was noticeable reactivity from some teachers who were otherwise acting in slightly more independent ways. These slightly more ICT-aware teachers were sometimes highly critical of the school or their peers, or at least tended to be more critical of others than they were of themselves, once they seemed to be making a little progress. These types of behaviour were characterised as *Reactive* by Brundage & MacKeracher (1980)

The typical 'entry' problems of frustration, lack of stability and lack of certainty did not drop away for every teacher but seemed, for some, to increase as they started making progress. This suggested that the typology, for these teachers at least, needed to accommodate some increasingly reactionary characteristics as they began to make

progress with ICT uptake. The reactive phase was more evident for some teachers than others, but it is hypothesised that all passed through it. For some teachers it was no more than a concern. Their time in the phase may be related to other characteristics like personality traits. For some teachers this stage was only brief or minor, for others it was so serious that it seemed a stalling point in their progress (Brundage & MacKeracher, 1980).

This review of the teachers' data suggested that any typology must be able to describe both a developmental process (eg from dependence to independence), a collaborative stage for more advanced teachers (eg interdependence), as well as a reactive phase for many teachers as they begin the process of ICT adoption (eg counter-dependence). The four stages in the proposed TIU model, namely Dependence, Counter-dependence, Independence and Interdependence, appeared to match these data well.

In this initial review it was argued that the four stage TIU model superficially appeared to address many of the characteristics evident in the patterns of the teacher data. The model will now be described in a more developed form. Then, how well the data and model marry will be examined in more detail.

7.2 The four stages model for ICT uptake

The four stage models of Brundage & MacKeracher (1980) illustrated in Figure 7-1, and Boud (1988), illustrated in Figure 7-3, were investigated further, mainly because of their frequent and consistent parallels with most of the case teacher records.

7.2.1 Theoretical model described in detail

The research question concerned more than a simple typology; it sought consideration of multiple domains and dimensions. Without representing learners only elementally—and thus ignoring the organic and interactive whole as a frame of reference—it was thought instructive to take different perspectives on the case teachers using as broad a categorisation as possible. To adhere to this the three domains of educational objectives identified by Bloom and his associates were chosen, namely the cognitive, affective and psychomotor domains (Krathwohl, Anderson, & Bloom, 2001). These are represented in this study by the three dimensions of the research question, namely *feelings (covering items like feelings*

and attitudes); understandings (including items like pedagogical concerns and beliefs); and *behaviours (including observations and practices)*. Each of these categories would allow three sets of data for each of the four levels of the typology, creating a 3 x 4 table. Figure 7-5 below is a data model of the possibilities.

DOMAIN \ STAGE		Dependence	Counter-dependence	In-dependence	Inter-dependence
Feelings	Feelings, attitudes				
Understandings	Pedagogical concerns				
Behaviours	Observations, practices				

Figure 7-5: Layout for theoretical model of teacher ICT uptake development, including the abbreviated domain titles to be used in the rest of the chapter

This model is expanded into a complete workable model in Appendix 7b, with content for each cell elaborated column by column in the next sections of this chapter.

7.2.2 Distinguishing characteristics of the model

There are six observations that cover both theoretical and practical characteristics of the proposed model and which help illustrate its real applicability.

1 Category meanings changed as model application changed

The original meanings ascribed by Boud (1988) to the four categories of Dependence, Counter-dependence, Independence and Interdependence have by necessity changed somewhat now that it is applied in a more technological system. For example Boud proposed that the dependence category referred to a learner whose level of self-directedness was low, that is they were still dependent on their teacher for support and development. This meaning is re-interpreted in this ICT uptake model as a two-faceted concern, one to do with learning and the other with ICT. *The first facet* is indicated by the fact that a teacher feels a dependency relationship with their support systems; and *the second facet* by the fact that this teacher has a very specific and local level of concern about their own learning development with ICT, perhaps at times overriding their concerns for their students' learning. This duality of interpretation is proposed to continue as a teacher progresses through all four stages.

Such a duality is already echoed in the literature on autonomy, as Chickering & Reisser exemplify:

> Mature autonomy requires both emotional independence—freedom from continual and pressing needs for reassurance and approval—and instrumental independence, the ability to carry on activities and cope with problems without seeking help from others and the ability to be mobile in relation to one's needs. Simultaneously, the individual must accept interdependence, recognising that one cannot receive benefits from a social structure without contributing to it, that personal rights have a corollary social responsibility. (Chickering & Reisser, 1993 p. 13)

The ultimate aim of people working autonomously is represented by writers not as people working in isolation, but as engaging in social interaction, working with and helping others (Cornwall, 1979; Goldschmid, 1988).

The two-sided approach in this TIU model was inherent not only at the interdependent stage but all the way through. Consider Stage Three, called Independence. Here the teachers' increasing independence was again reflected in two factors: an increasing level of self-directedness about ICT usage with respect to their support systems, *as well as* a greater willingness to address the learning needs of those around them (in this case their students).

At Stage Four, the interdependent stage, not only would a high level of collaboration be expected with their support systems, but also a more expansive, integrated and inclusive relationship with their learners—the students—so that they might be working together more than before as joint learners.

This bivalent definition is embedded in each of the cells of the expanded model described in the sections following this one.

2 Typologies are sometimes hierarchies anyway

Taylor (1997) attempted to justify the use of the typology nomenclature, suggesting that his "list" or typology was not a scale one should seek to climb, but instead a range of strategies for a teacher to use with different people, who were at different developmental stages themselves. In this model too the various stages may be represented as either choices, pr increasing levels of sophistication and competence. This has some implied consequences. Because of the linkage between notions like empowerment and interdependence, first elaborated by Paulo Freire in the 1980s with his writings on pedagogy and critical literacy, teachers who have developed the ability to work interdependently are more likely to encourage the development of

their peers and their charges in empowering ways (Freire, 1981). Nevertheless this does not mean that only the 'higher' stages are worth utilising; rather the intention is that teachers who have made more progress along the typology have access to a wider range of resources, strategies and learning approaches with themselves, their peers and their students. In essence, even though the scale may make sense as a hierarchy, it is arguably still usefully described as a typology.

3 Progression to the 'end' stage not pre-ordained

The conditions under which people 'change stage' are just as interesting as the divisions between the stages. It is apparent that they are neither trivial nor linear, which is why the topic is of such interest to this research. Two evident characteristics of each of the original scales presented in Chapter 2 were:

i) that they were descriptive rather than predictive; and

ii) that they suggested a developmental process for some but not all participants.

It may be that some predictive features could be built into a staged model, and this issue is addressed in point 5, below. Further, the likelihood of completion is not pre-ordained. Such reservations are not unusual. Sandholtz et al. (1997), in describing their ACOT ICT uptake hierarchy, suggested that only some teachers would ever reach the final stage, and that many would not. One reason was that some people 'travelled' slower than others, in other words that there was not enough time for everyone; but they also entertained the possibility that some were just never going to develop to the final stage. Medici's (2001) descriptive scale noted that around 90% of students reached and stopped at one of the two stages before the last of her typology, namely Explorer and Optimist.

Feldman (reported in Candy, 1988) argued that there was theoretical justification for teachers having difficulty attaining the last stage of Boud's Dependence-Independence scale. Feldman argued that achievement is 'non-universal', and only certain conditions allowed this 'ultimate achievement' of reaching the final stage: 'it is only possible for learners to achieve full independence when they come to view knowledge in relative rather than absolute terms' (Candy, 1988, p. 66). Hence he argued that knowing the individual participant's epistemological views, on learning and knowledge, could be a critical determinant of progress, perhaps ultimately

determining a limit of progress along a typology like Boud's, and therefore this typology of ICT uptake.

4 The reactive phase—stage 2

Although a reactive phase may initially appear to be counter-intuitive, it seemed to represent a common phase for adult learners. For example some researchers pointed out the problem of 'unlearning' that can apply to educated or mature learners, namely that previous educational attainment might be disadvantageous. More academically qualified people often reported feelings of higher frustration and greater loss of self-esteem at early stages of development; for example, when otherwise competent adults choose to learn a second language (Candy, 1988).

A counter-intuitive phase also illustrated the point that there are many possible variations, but this model attempted to highlight the major patterns. Any simple linear typologies will have difficulty describing every possible alternative; in this case it was justified because of its match to the general trends of the case data.

5 The importance of a teacher being at the same stage in every domain

Initially it may be expected that teachers might tend to fall into the same stage in every domain—in other words tend to fall into a single column in Figure 7-5—and the extent to which they do not, could imply a weakness in the model's predictive ability. A contrary interpretation is that these very distinctions between, for example, teacher feelings and their behaviour could add markedly to the explanatory power of the model. Instead of being purely descriptive of a teacher's 'location', such a 'misalignment' or inconsistency may indicate a teacher who is undergoing change, that is from being classifiable largely at one level of learning to being classifiable in the next one along.

In fact this observation led to the contention in this study that such discordance may be a simple but elegant indicator of a person in the process of changing stages in their ICT uptake. This process of change could be indicated in different ways. One example of an inconsistency or variation could be represented by a teacher who was performing in the first stage, Dependence, for all their domains, but whose feelings, only, were also rated in the second, Counter-dependence stage. This could be interpreted as a person who felt increasingly confident about ICT usage and felt

slightly less dependent on their support structures, but whose basic understandings and classroom behaviours had not yet begun to change.

6 The significance of a mismatch in the domains

The concept of 'fit' to the model should be reviewed further before investigating individual teachers. It might be tempting to argue that a good example of fit to the model was someone whose data placed them in a single column in all three domains. However, probably more interesting than this would be the teacher whose data fell into more than one column, as they would appear to be at different stages of development in the three domains being measured. Did this mean there was a problem, a measurement error, perhaps? More likely it illustrated people whose development was progressing normally—that is at different rates. Such a mismatch between imagined and real explanations is not uncommon. Piaget (1955) described a 'cognitive dissonance' when his student subjects seemed to show intellectual confusion when confronted with a real world model which did not match their professed internal intellectual model. In a similar way, it was proposed in this model that a person's development could proceed at different rates on the different domains. Perhaps the theoretical equivalents of an emotional dissonance and a behavioural dissonance were needed.

One possible interpretation, then, for an imperfect 'stage membership' across the three domains was that it demonstrated a person undergoing change. The corollary would be that a person whose data placed them in a congruent pattern (corresponding to a single vertical column in one of the figures, or all domains in one stage), ie at the same level of ICT uptake across all their domains—could be classed as undergoing less dissonance in their development and hence rating as more stable. If they were all at the first (or perhaps second stage) in all domains, this might suggest they had less interest or capacity to change.

One reason to consider the multiple domains was to look for consistent and supportive data, perhaps offering multiple verifications for conclusions. Another was to look for useful differences between developments in the domains. By looking at some of the individuals and their differences, some useful insights about their uptake processes might be extracted.

7.2.3 Summary

The six topics were regarded as opportunities to extend the reader's understanding of the TIU model , and to draw attention to important characteristics that distinguished this model from the Brundage & MacKeracher (1980) and Boud (1988) models from which they were drawn.

They were intended to be illustrative of practical and theoretical facets of the TIU model introduced in the previous section, including the following three observations. The fact that two processes not one were evident at every stage; that progress to the end of this typology was not guaranteed in any way; and that variations in any one teacher's stages on each of the three domains were proposed to indicate a teacher in some way 'in transition' between those stages. With the increased clarity provided by these topics, it is now appropriate to elucidate the model in significant detail in the next section.

7.3 Justification of the chosen model

To prove effective, the final model was required to both serve the purpose for which it was chosen and to meet the three established criteria given at the start of this chapter, namely simplicity, credibility and usability. A model that met these criteria was potentially useful for teachers, planners and professional development staff, and it was proposed that these three criteria should identify an effective model. The following sections examine in detail the prospect of the TIU model meeting these three criteria, and therefore earning the rating of effective.

7.3.1 Criterion 1: Simplicity of the model

There is no doubt that the process of ICT uptake is a complex one, and that any model that rendered it as trivial and simplistic would be open to misunderstanding, abuse and misuse. Although superficially rather simple, it was hoped that the proposed model would possess sufficient utility and flexibility to justify its further investigation. One reason was that a model that can provide guidance to many or even most teachers might be justifiable, even if it does not address the full spectrum of teacher development.

No single scale will accurately describe every person, due for example to differences in independent variables like personality traits or level of optimism (Candy, 1988;

Seligman, 1992). The TIU scale described adults who gradually feel increasingly independent, but those in the earlier reactive phase were more likely to assert their individuality, and less accepting of changes around them. As they progressed to the later more proactive phase they were learning to adjust to differences, were willing to consider shared norms and were more dialogic in their approach.

An indicator of the scale's simplicity was its ability to be split into two. The major distinguishing characteristic, namely the level of dependence, allowed the scale to be divided into two 'super-categories'. The first incorporated the first two stages, namely Dependence and Counter-dependence, and could be called the Dependent category. The second category subsumed the last two stages namely Independence and Interdependence and could be styled the Independent category.

Overall the brevity of TIU's four-step model seemed to easily meet the simplicity criterion re-iterated at the start of the chapter; also its ability to be divided into two 'super-categories' of Dependent and Independent further underscored its relative simplicity.

7.3.2 Criterion 2: Credibility of the model

The real variability and human richness of all qualitative data are acknowledged as part of their heritage. Capturing this groundedness in a way that accurately reflects the breadth and complexities of the teacher development process contributes to the credibility of any model. Establishing the credibility of a model required many facets, suggested Guba (1981), including the following: The use of rich description within the model can provide ready identifiability for the participants; peer debriefing allows the individuals involved to comment on, adjust and evaluate the model, thus confirming its credibility; and the referential adequacy of the model needs to be established by the comparison of the model and accompanying parallel data collected over the same time. All these factors can confirm credibility.

The last notion is particularly powerful, if there is matching data from the collected dataset. In a quantitative environment there may be data regarded as an outlier set and which may even be discarded. In a qualitative paradigm, these data can instead be seriously insightful (Miles & Huberman, 1994). An example of a credible insight that added to the referential warrant of the model came from one of the case school teachers, Ann. She was in a reflective mood one afternoon and described her own

development as a three step process. This process had close parallels to three of the fours stages in the TIU model.

She explained her ICT development began with self-concerns (arguably Stages 1 and 2 of the TIU), and gradually developed into student development concerns (Stage 3) as her confidence improved. Finally they became joint concerns as she argued that both her development and her students' development were intertwined, and she recognised that they needed to address their simultaneous learning in a conjoint way (Stage 4). She summarised her concerns using the words 'me development', 'them development ' and finally 'us development'. The closeness of this pattern of development to the TIU model was striking, and suggested that the TIU model would have an easy and intimate connectedness with her own experiences, and perhaps the experiences of many more teachers.

It seemed that the teachers could find that their journey with ICT was encapsulated in a readily identifiable description within parts of the TIU model's stages. For this reason member checking was undertaken with a draft version of the TIU model. The results of that member checking are detailed in a subsequent section, and so only a summary is necessary here. The model was sent to a subset of the case teachers, selected so that they hopefully represented a full range of possible levels, and their feedback has been integrated into the model. It was instructive than none of the responding teachers had any reservations or complaints about the hierarchy and a number strongly identified with the TIU descriptors provided within the model. This did not mean that the model could not be improved, and in fact two of them made small and useful suggestions to the draft version of the model they used, which are incorporated in the model provided here. The opportunity to develop the model further is an issue to be taken up in the concluding chapter as well. Overall the groundedness and rich detail inherent in the model, as well as the quality of feedback from the member checking process suggested that the TIU model did indeed possess credibility for those who used it.

7.3.3 Criterion 3 Useability of the model

The final criterion for a useful model of ICT uptake concerns its useability. This embodies two principles, namely the ease of implementation of the model (Mills, 2000) and the generalisabilty of the model (Maxwell, 1992).

The process of implementation was relatively simple. The complete table was presented to the subjects, with explicit instructions asking them to consider one row at a time, from left to right, and do one of two things: circle any phrase with which they could identify themselves and their journey; and underline any phrase that did not make sense, was misplaced or needed changing. This meant that some phrases in the table were circled, some left untouched and some may have been underlined. They were asked to do this twice, once for a time period called 'then', and another called 'now'. They were asked to nominate the actual year in each case.

A preliminary trial administration showed the instructions were satisfactory and the whole process took less than 10 minutes, so the rest of the instruments were mailed out. All but two out of nine were returned. No phrases were underlined implying there were no improper or meaningless phrases, but two were relocated after comments from two teachers. The returned table with data circled in some cells is evaluated, using only one principle, to become that person's 'TIU location chart' (see for example Figure 7-9: David's TIU location chart). The principle was the multiple instances principle, equivalent to the one that teachers use in evaluating a student's achievement of an outcome, namely, 'are there sufficient repeated instances of the particular characteristic, as embodied in the pointers in each cell, to justify selecting the whole cell?'

These data suggested the item was easy to use as a measurement instrument, easy to implement with multiple teachers, and easy to translate to a "rating"—in this case, the small graphic called a location chart.

The second principle incorporated concepts like repeatability and utility with a wider audience. The instrument proved to be credible for multiple teachers, based on their feedback and their lack of complaints, and seemed to produce results in line with predictions. Before sending out the survey for member checking the researcher assembled predicted charts for the teachers. The resulting charts are provided in Tables 7.11 and 7.12, and showed over 70% agreement between the predicted and actual marked cells.

It was felt that this instrument could also provide some clear guidance for those seeking to make judgements about professional development and PD planning, both for themselves and for others. For example, the four categories of development along a scale concerned with dependence and autonomy was reminiscent of the situational

leadership model popularised by Hersey & Blanchard in the 1980s. In summary they proposed that participants at different locations on their particular scales warranted different styles of leadership and guidance. For lower maturity followers, they proposed using a 'telling' style; for moderate maturity a 'selling' style was appropriate; and for higher levels participating and delegating styles were appropriate (see for example Blanchard, Zigarmi, & Zigarmi, 1985). Another way to use such a model could address the speed at which people traverse the stages. Some quantification of this issue could allow improved planning of professional development activities. For example trainers could have a better idea of how long they might need to promote certain types of training activities if they knew more about the staff involved and their development needs, as indicated by the TIU model location charts.

In summary it was concluded that the TIU model proved its useability. The researcher was confident that all of the case teachers could be categorised with the TIU model. It was also noted that the process of member checking had apparently verified its useability as it showed that it was an instrument in its own right which was quick to complete and attracted useful comment. The instrument had some predictive power, using the results at attempted prediction by the researcher as an indication and it may have application in helping the planning of professional development activities.

7.3.4 Conclusion

A typology of teacher ICT uptake was thus deduced which appeared to serve the purpose for which it was designed and met the criteria for simplicity, credibility and useability. It had four levels; it appeared to match a number of the personal experiences described by a range of the case teachers. Such a model could therefore be called effective.

If there are weaknesses in the model, the major ones could be that its generic descriptions will not address all teachers; and that the model alone may not predict progress to the 'final' states. Specifically it is predicted that individual teacher differences in learning style may be a further determinant of success and whether teachers possess the readiness to make the progress with ICT as an integrated learning tool, and hence their uptake with ICT.

Evidence and counter-evidence of the explanatory power of this proposed model will be offered in the next section.

7.4 The four stages described

Introduction

This section describes the TIU model and describes the four stages and their context in detail. The staged descriptions from both Brundage & MacKeracher (1980) and Boud (1988) were integrated and re-cast to provide the basis for the TIU model. This corresponded to the fleshing-out of Figure 7-5. This section gradually assembles all of the theoretical content for all the cells of the complete TIU model. The full table can be seen in Appendix 7b.

The descriptions in each cell are derived from the typologies based on adult learning, autonomy and self-directed learning topics (Boud, 1988; Boud & Griffin, 1987; Knowles et al., 1998; Taylor, 1997). It was important to attempt to integrate comments and descriptions from literature that addressed teachers' perceptions and understandings in ICT-associated areas (eg McLoughlin & Oliver (1998); McLoughlin & Luca (2001); Albion (2000)), and thus it was not difficult to identify theoretically appropriate data for each cell. Hence the details inside a four-stage model to describe teachers' development during ICT adoption were derived.

Explanatory data for each stage are now presented one stage at a time, from Dependency to Interdependency. Since there are four stages, there are four tables (Table 7.3 to Table 7.6). This was the complete theoretical content for deciding a teachers' location on this developed ICT uptake typology.

The major content of this section, following this introduction to the TIU model, describes each of the ICT uptake stages, one at a time, and looks at all three domains in each of those stages—in other words it addresses a vertical slice—a stage—each time, from left to right, of the model in Figure 7-5.

Describing the four stages of the typology

Each of the following stages was from Boud's model. It has already been pointed out that both the ICT aspect as well as the learning aspect should be included in the

description of attributes of people at each stage of the process, as both facets were evident as participants partook in adoption of ICT in their school.

The major domains are summarised by the words *Feelings, Understandings* and *Behaviours*. These are only placeholders—just like *Head, Heart* and *Hand*—for the more detailed descriptions in each sub-division

Each of the stage descriptions has the following format in each cell:

> In each column they begin with the general identifiers or explanations that are representative of the category; then it lists specific indicators under subheadings that allow identification of those characteristics in individuals.

Table 7.1: Demonstration of content structure in every cell of ICT uptake tables

Identifiers… (eg Lack control over Self or Situation)
Indicators… (eg •Disoriented; lack of ownership; isolated; helpless; out of control; ashamed/ guilty at lack of progress)

The Identifiers provide a general description of most teachers in that category. They are referred to also as General Identifiers.

The Indicators are specific individual pointers indicative of a person at that stage. It is unlikely that any one person would possess all of the indicators in a stage; rather it is proposed that the more of these indicators that align with a person, the more confidence there would be that they are indeed accurately diagnosed as being located at that stage, for that domain. While indicators are not meant to be either prescriptive or exhaustive—indeed, it may be instructive for teachers to create more—they can offer useful descriptors against which teachers can judge themselves and the performance of others and come to common understandings in their progress with ICT uptake. They are also referred to as Specific Indicators.

All the Indicators are grouped under sub-topics, derived from the literature and modified by observation, such as *support needs, views on standards* and *observable performance*. These sub-divisions are listed in the right-hand column of Figure 7-3, below.

Table 7.2: Sub-divisions used to categorise indicators in each of the domains

DOMAIN	INDICATOR SUB-DIVISIONS
Feelings	Feelings Communications Support needs
Understandings	Learning Views Views on Standards
Behaviours	Interactions with others Observed Performance and Classroom activity

As already noted the specific indicators are intended to address both ICT-oriented as well as learning-oriented descriptors in all categories. The two topics are sometimes difficult to separate when they represent, metaphorically, two sides of the same coin. This is a predictable consequence of the nature of the two topics and their inter-twined make-up. This was the reason for discarding the original ICT uptake typologies and it is the rationale for the new typology, which it is claimed was discernible throughout this research.

Details of how teachers react are embodied in discussion below, and were derived from Boud's and Brundage & MacKeracher's descriptions, but have been adapted to suit their new role as an ICT uptake model. They cover the three domains of (i) Feelings (the descriptor for the domain called *feelings and attitudes*), (ii) Understandings (descriptor for *understandings and pedagogy*), and (iii) Behaviours (descriptor for *observations and practices*). Each has some typical General Identifiers, listed first, and then multiple likely and Specific Indicators are described, using the sub-divisions introduced in Table 7.2.

7.4.1 Stage 1: Dependence

Teachers know when they have entered the initial or dependence stage because of the recognition of novelty in the situation and the associated stress. At this stage of their learning journey—presuming that they don't choose to ignore it—typical characteristics of teachers include strong feelings of a lack of control. Dependency is exemplified by feelings of incompetence and lack of control over the situation and sometimes even themselves as learners. Although their larger concerns are more personal survival issues, they wonder how to use ICT in their teaching and with their students. This pressure not only to become competent with ICT personally but also to

use it successfully with their class or classes adds an extra piquancy to the challenge of ICT uptake for teachers.

These are common reactions of adult learners in any novel learning environment. As well as perceiving the threat and novelty of ICT, it is common for them to acknowledge the need for support from others with more skills or experience in the same area. At this stage teachers cast around for resources and support, often without knowing exactly what they need, perhaps making inappropriate assumptions in their research. They either have not yet built strong support systems or have not marshalled existing ones to the new challenge or have not yet learned to make use of the resources that may be available to them.

For teachers in the Dependency stage, their understanding of ICT and its usage in their own classroom is limited, so that they tend to focus on survival-level facets as they begin the process of considering ICT usage. Their concerns about pedagogical issues are evident but overshadowed by their own learning needs and stresses.

They regard ICT as a new object and cast around to find parallels with other objects in their lives to help them understand it. This objectification phase leads them to regard ICT in general and computers and the Internet like more subjects to be taught, which distracts them from the intended process of integrating it into their teaching and learning. These attitudes are reflected in the interactions that they have with other staff and those involved in supporting them. Their observed use of ICT in class will be relatively minor at this early stage, with simple activities actually undertaken determined largely by the support or lack of it available to them.

Domain 1 (Feelings)—General Identifiers of Dependence

- Feels lack of control over self and situation
- Perceives novelty of ICT, or threat
- Needs support to progress

Domain 1 (Feelings)—Specific Indicators of Dependence

The indicators in Domain One are in three sub-divisions, namely Feelings, Communications and Support needs.

Feelings: Their need for support and help is evident. Predictable feelings include nervousness, inadequacy and frustration. They may appear uncommitted, disoriented,

isolated or admit to feeling out-of-control when they think about ICT and their teaching.

Communications: For these people the description 'lack of time' is keenly felt, but it is more often a proof of the lack of progress rather than a simple label, as it is for those more advanced along the scale. In conversation they can appear defensive, nervous, inhibited and, if they feel their improvement is slow (whether they have objective evidence or not), describe feeling guilty or ashamed at their lack of progress. They may insist on remaining uncommitted, or be monologic or sceptical.

Support needs: In this early stage dependency is characterised by seeking support systems which provide clear unequivocal guidance, and offer known consequences. These people seek stability during a process that they regard as turbulent, unsettling and challenging, even if they regard it as a positive part of their development.

Domain 2 (Understandings)—General Identifiers of Dependence

- Survival issues with ICT
- Concerns are with own mastery and learning

Domain 2 (Understandings)—Specific Indicators of Dependence

Indicators in this domain are in two categories, namely Learning views and Views on standards:

Learning views: Indicators include a wariness of ICT's enormous flexibility, and therefore its incomprehensibility and apparent instability. They show a keenness to latch onto single-issue and single-task software (rather than open-ended software used by more independent teachers), they are continually questioning their own roles, and cannot yet comprehend ways to use ICT broadly; ICT is an object to be examined, learned, taught about. Although they may have been told of or seen examples of good pedagogy with ICT, too many other variables cloud their comprehension and they are still searching for some simple use or uses of ICT which are manageable for them. Typically teachers in this stage seek simple examples and choose stability in a difficult period, preferring to repeat a simple activity rather than change it and place more stress on themselves.

Views on standards: At this stage they seek explicit standards, definitive solutions; prefer to learn about single solutions to problems and attempt to minimise overload by looking for 'easy' starter activities.

Domain 3 (Behaviours)—General Identifiers of Dependence

- Regards ICT as object
- Example *'Internet as Incomprehensible'*

Domain 3 (Behaviours)—Specific Indicators of Dependence

The Indicators in Domain Three are in two categories, namely Interactions with others (Interactions), and Observed Performance and classroom activity (Performance).

Interactions: As they progress towards the 'higher' stages, teachers integrate ICT into their work and their daily practices; it becomes an integral tool and even a catalyst for learning activities that they plan and execute with their students. At this early stage, however, many teachers regard ICT as a relatively remote object that is totally external to them and their needs, and may even appear to be an unnecessary imposition from above. Thus their interactions will encompass minimal teaming; many will engage in sharing only for selfish support. More cooperative teachers may accept unguided parent involvement but PD is minimal or avoided.

Performance: Observing these teachers and talking to them shows that they use traditional approaches with ICT eg rosters, worksheets; prefer closed tasks, easy-to-use software. The types of activities that actually undertake were shown in Chapter 7 to be determined by the support system, but the simplicity of the activity is paramount. A further relatively simple indicator for this category is that they almost never implement any challenging ideas that they learn about at PD activities.

These descriptions can be collated into a single column version of the table originally illustrated in Figure 7-5. Hence, Table 7.3 below is the ICT uptake typology table with only one column completed, based on the elaboration above.

Table 7.3: Specific Indicators of Dependence stage in each domain

Domain	Dependence			
Feelings	*Lack control over Self or Situation* *Perceive threat, novelty of ICT* *Need support of others*			
Specific Indicators…	•Disoriented; lack of ownership; isolated; helpless; out of control; frustrated; inadequate; ashamed/ guilty at lack of progress •Defensive; nervous; inhibited; argue lack of time, personal issues; monologic; uncommitted; sceptical • look for support systems with clear unequivocal guidance, known consequences; seek stability during difficult times			
Understandings	*Survival issues with ICT* *Concerned more with own mastery and learning*			
Specific Indicators…	•Wary of ICT's flexibility, instability; question own role; cannot yet comprehend ways to use ICT broadly; ICT is object to be examined, learned, taught about •seek explicit standards, single solutions			
Behaviours	*Regard ICT as object* *eg 'Internet as Incomprehensible'*			
Specific Indicators…	•minimal teaming ; share only for selfish support; unguided parent involvement ; PD minimal or avoided •use traditional approaches with ICT eg rosters, worksheets; prefer closed tasks, easy-to-use software; challenging PD ideas never implemented			

7.4.2 Stage 2: Counter-dependence

The counter-dependence stage can be represented as a first stage of independence, rather like adolescents wishing to establish their autonomy, and beginning to make decisions for themselves. For some it is a time of growth as they begin to make fledgling independent progress, for others it is a time of frustration as they see weaknesses in others around them. External factors like the quality of their support systems and their ability to handle frustration may be important variables that determine how long a teacher spends in this phase of their development.

Teachers were classified as Counter-dependent if they have decided that the problem was one of control, and they feel that they need to get more control. They desire autonomy and independence, but do not yet have the skills and development to achieve it. Some may criticise, even resent or refuse support, arguing that it is becoming irrelevant for them, or cannot keep up with their needs, as they see changes in themselves but have difficulty detecting similar changes around them.

The pedagogical understanding of counter-dependent people is limited by their focus onto ICT and the challenges of teaching their students about it. On a teaching—learning continuum they have fallen back on their first principles about teaching, and this teaching orientation characterises this phase of the ICT uptake process.

One way to summarise their activities and interactions with others is as an extension of the objectification they felt in the previous stage; only now the object has taken more form, and they are starting to use it. 'ICT as instrument' acknowledges their increasing competence at mastering the object called ICT. These are the people who might perceive the Internet as a Maze. Although it may be confusing, the metaphor is more useful as a description—it suggests that it is somehow navigable, for example—compared with the previous stage's version of 'Internet as incomprehensible'.

A series of Specific Indicators which help identify teachers currently in this stage follow the General Identifiers.

Domain 1 (Feelings)—General Identifiers of Counter-dependence

- Frustrated by control issues but improving
- Desire autonomy, independence
- May resent or even refuse support

Domain 1 (Feelings)—Specific Indicators of Counter-dependence

The indicators in Domain One are in three sub-divisions, namely Feelings, Communications and Support needs.

Feelings: By this stage the teacher is attaining a sense of what it means to be an independent actor; he or she may start to feel independent, autonomous and even pioneering. Their excitement may possess some of the 'don't look down' feelings of simultaneous excitement and fear; but they may also feel forced, or without choices, in their ICT use as they cannot get the technology to do what they want, and help 'is never around when you want it. If this is how they feel, they may even start to feel resentful about what they regard as poor support—'they don't understand what I need' might be how they feel, no matter how unreasonable such expectations are of those providing their support systems.

Communications: They may express negative feelings; or argue and engage in conflict. Depending on their ability to handle frustration they may start to criticise their support system as confused, incompetent, restrictive or less supportive than they would like.

Support needs: At a counter-dependent stage in their ICT uptake, a person will share with others if it provides specific support or minimal pressures; they are likely to consider sharing relatively low-level materials and specific activities rather than big ideas or general principles, as few of these have started to gel for them yet.

Domain 2 (Understandings)—General Identifiers of Counter-dependence

- Limited/local thinking about ICT
- Teaching rather than learning oriented

Domain 2 (Understandings)—Specific Indicators of Counter-dependence

Indicators in this domain are in two categories, namely Learning views and Views on standards.

Learning views: At this stage the teacher has only a rudimentary understanding of how ICT can fit into their learning program. Their comprehension of ICT use could be described as early and linear. When verbalising their arguments about integrating ICT into their class work they tend to use unsophisticated explanations or one-liners rather than developed and thought-through justifications. Inconsistencies could easily be expected in their rationalization and even confusions about the sort of outcomes that are achievable with ICT and their current skill level.

Views on standards: Teachers at the counter-dependence stage show ambivalence about standards. They admit a concern for standards but feel they are not being shown sufficient guidance and may need to take increased responsibility for a perceived lack of direction around them. They are focussed more on their own development than that of their students and many seek a high level of self-understanding. Consequently they are less interested in the need to meet external standards and tend to seek just to meet their own needs. At the same time they are less likely to demand any adherence to formal or outside standards when they are somewhat uncertain of what and where they are themselves in terms of ICT uptake.

Domain 3 (Behaviours)—General Identifiers of Counter-dependence

- Treat ICT as instrument
- Example *'Internet as Maze'*

Domain 3 (Behaviours)—Specific Indicators of Counter-dependence

The Indicators in Domain Three are in two categories, namely Interactions with others (Interactions), and Observed Performance and classroom activity (Performance).

Interactions: Counter-dependent teachers are often easily identified as they tend to be insular and self-centred rather than caring for others in the same predicament. They may be either unwilling or possibly unable to support others because of the pressures they feel on themselves. Under these circumstances they may be seen to choose individualistic solutions and individual activities over group ones when given the choice.

Performances: The classroom behaviour of a teacher using ICT at a counter-dependent stage is noticeably strictured. Their software use tends to be simple and repetitive, and they will attempt to make the curriculum totally direct their choice and use of ICT resources, rather than adapt and adjust as more experienced teachers do. They rarely use ICT in multiple ways. A common reaction is that of using the ICT but making it an addition to their existing curriculum. When they start using ICT in a new way it will often be another teacher's activities transplanted with minimal or no adaptation 'because it worked for them', treating it rather like a photo-copiable worksheet than a tool to meet a classroom need.

These data are summarised as the second column of the ICT uptake model, as Table 7.4, below, called Counter-dependence:

Table 7.4: : Specific Indicators of Counter-Dependence stage in each domain

Domain		Counter-dependence		
Feelings		*Frustrated by Control issues* *Desires autonomy, independence* *May resent or even refuse support*		
Specific Indicators…		•Attaining sense as independent actor; may feel independent, autonomous; pioneering; 'don't look down' excitement; but may feel forced, w/out choices, even resentful •may express negative feelings; argues and engages in conflict ; or describes the support system as confused, incompetent, restrictive or less/unsupportive •will share if it provides specific support or minimal pressures; doesn't demand adherence to standards		
Understandings		*Limited/local thinking about ICT* *Teaching oriented*		
Specific Indicators…		•Comprehension of ICT use early, linear; unable to verbalise integration of ICT arguments at sophisticated level; confused about ICT and the outcomes achievable with ICT •May seek high level of self-understanding; feels the need to take increased responsibility for perceived lack of direction around them		
Behaviours		*Treat ICT as instrument* *eg 'Internet as Maze'*		
Specific Indicators…		• may be self-centred or careless of others; often unwilling or unable to support others; chooses individual activities over group ones •Rarely use ICT in multiple ways; tends to impose ICT on existing curricular activities or as an addition to curriculum; will use activities of others with minimal or no adaptation		

7.4.3 Stage 3: Independence

Teachers were classified at the independent stage in their ICT uptake if they showed the characteristics of good self-directedness with ICT and a positive learning orientation for their students with ICT.

Domain 1 (Feelings)—General Identifiers of Independence

- Shows self-control, begins to feel comfortable with ICT
- Independent of old support needs
- More accepting of differences between team members

Domain 1 (Feelings)—Specific Indicators of Independence

The indicators in Domain One are in three sub-divisions, namely Feelings, Communications and Support needs.

Feelings: Indicators that teachers' feelings about ICT uptake are at an independent stage include the feeling that they are largely in control. By this stage they will appear more concerned for their students than themselves, and their topics of conversation will carry this conviction. They will acknowledge a sense of achievement, express pride in their students' progress as well as their own and will appear satisfied with at least part of their progress. By this stage too, some signs of self-acceptance as a functioning ICT adopter will be evident, and hence they will be expected to show an increasing acceptance of others in the group or groups with which they interact.

Communications: Domain One indicators that a person is at an independent stage include the fact that they regard group activities as mutually beneficial. Such individuals are able to cooperate with other teachers with little difficulty. By this stage there would be fewer arguments about direction and support, and they would feel the need for fewer individual activities.

Support needs: At this stage teachers could expect both to give and receive support in manners that suit their particular needs. Also by this stage they have sufficient confidence in their own skills that they appreciate direct and helpful explanation about their progress. A group where most members are performing at or near this stage of Independence is likely to find that it is a highly productive time for the whole group.

Domain 2 (Understandings)—General Identifiers of Independence

- Directed, focussed ICT thinking
- Teaching and learning oriented

Domain 2 (Understandings)—Specific Indicators of Independence

Indicators in this domain are in two categories, namely Learning views and Views on standards.

Learning views: Teachers at the Independence stage have started to place teaching and ICT issues to the forefront of their activities. They recognise an increased concern for their students and a concomitant reduction in concern for their own development because they are beginning to understand how ICT can fit together into their teaching and learning program. Although they do not regard ICT as a

transparent or everyday part of their repertoire, they are beginning to see it as tool over which they have control and which has a place in the design of their lessons.

Views on standards: At the Independence stage teachers can see ways to meet their outcomes and standards with ICT. They have started to understand how to create tasks using their ICT tools and equipment to meet their students' needs and may be able to spontaneously create activities to help their students meet some criteria. By this stage they appreciate immediate, descriptive feedback on their progress.

Domain 3 (Behaviours)—General Identifiers of Independence

- Uses ICT as tool
- Example*: 'Internet as Library'*

Domain 3 (Behaviours)—Specific Indicators of Independence

The Indicators in Domain Three are in two categories, namely Interactions with others (Interactions), and Observed Performance and classroom activity (Performance).

Interactions: Teachers who show Independence stage characteristics can be regularly seen preferring group activities over individual ones and readily participating in dialogue with others who are also on the ICT uptake journey. They may be seen to displace their old feelings of dependence onto others including their students or may act in a superior fashion. They may even be dismissive of outsiders to their group who attempt to provide support.

Performance: Teachers at the Independence stage may still choose activities that leave them in charge rather than their students. They may prefer to use structured or less open-ended activities, for example they may prefer to use relatively structured look-up or searching activities rather than allowing students to choose and execute their own open-ended activities. By this stage they most likely will have started to use mastery principles with their students and themselves. Also such teachers are willing to attend relevant professional development They are able to adapt existing ICT activities independently to appropriately suit their plans and their student needs.

This data can be assembled as column 3 the of the table describing ICT uptake model Table 7.5, namely the third stage, called Independence:

Table 7.5: : Specific Indicators of Independence stage in each domain

Domain			Independence	
Feelings			*Shows Self-control, begins to feel comfortable with ICT* *Independent of old support structures* *More accepting of differences*	
Specific Indicators…			•largely in control, more concerned for students than self; sense of achievement; pride; satisfied; self-acceptance and hence increased acceptance of others in group • sees group activities as mutually beneficial; able to cooperate with other teachers ; less arguments, individual activities • expects to give and receive support; appreciate immediate, descriptive feedback with respect to standards; highly productive time for whole group	
Understandings			*Directed, focussed ICT thinking* *Teaching and learning oriented*	
Specific Indicators…			•teaching and ICT issues at forefront; increased concern for their students; ICT not transparent, but beginning to see it as tool •can see ways to meet outcomes and standards with ICT; able to create tasks to meet needs	
Behaviours			*Use ICT as tool* *eg 'Internet as Library '*	
Specific Indicators…			• chooses group activities, dialogue; may displace old feelings of dependence onto others including students; may be dismissive of outsiders •tends to use structured/closed activities; often prefers look-up or searching activities to open-ended; starts using mastery principles; willing to attend relevant PD; can adapt ICT activities independently	

7.4.4 Stage 4: Interdependence

Teachers were classified at the interdependent stage in their ICT uptake if they showed a willingness to share and learn together both with their colleagues and their students. ICT usage has become almost second nature to them and they have no difficulty incorporating ICT whenever it is suitable. They regard it as part of the milieu in which they work and learn rather than an add-on.

Domain 1 (Feelings)—General Identifiers of Interdependence

- Feels in control of situation using ICT
- Willing to give, share and develop ICT ideas and practices with others

Domain 1 (Feelings)—Specific Indicators of Interdependence

The indicators in Domain One are in three sub-divisions, namely Feelings, Communications and Support needs.

Feelings: By the Interdependence stage a teacher feels that control issue are much less relevant, perhaps even irrelevant to their teaching role, and at the same time the problems of lack of control over ICT have faded to irrelevancy as well. They would see value in joint development activities between students and teachers, and may regularly do so without reservation or even the slightest consideration. Their attitude to ICT and their teaching is relatively contented; they feel that they have just sufficient time to be a little more thoughtful and confident than they used to be. They may even feel proud as if they are self-actualising in their chosen career. It would be understandable if they felt fulfilled, relaxed and balanced, since their competence is not under threat—if it ever was. Many of these teachers will feel valued and supported in their learning efforts with ICT.

Communications: Teachers would have little difficulty comprehending how others are approaching their own learning and how it varies from their own. They would be able to integrate others perspectives about teaching, learning and ICT with their own; and they would perceive a balance between themself and others, and how they were contributing towards it.

Support needs: They are confident to help or support others and understand the frustrations of others;. They will act as a co-learner and value the individual and the group simultaneously. These teachers carefully maintain interpersonal relationships.

Domain 2 (Understandings)—General Identifiers of Interdependence

- ICT thinking and usage become second nature
- Learning oriented, student-focussed

Domain 2 (Understandings)—Specific Indicators of Interdependence

Indicators in this domain are in two categories, namely Learning views and Views on standards.

Learning views: Teachers at the Interdependence stage make time to consider learning issues in all their planning with ICT. They are aware that both they and their students are developing and will continue to do so. They are aware of their status as model for good learning and are comfortable not being the expert all the time. They

are able to consider both student and software roles in activity design whether they are designing an activity or encouraging their students to construct one.

Standards: The issue of standards is not as significant for such teachers as they comprehend and propound the value of internal standards, and multiple perspectives. Standards are still important but they are less concerned with fixed skills in ICT and more with the students achieving self-determined or internal standards.

Domain 3 (Behaviours)—General Identifiers of Interdependence

- Uses ICT as catalyst
- Example *'Internet as community'*

Domain 3 (Behaviours)—Specific Indicators of Interdependence

The Indicators in Domain Three are in two categories, namely Interactions with others (Interactions), and Observed Performance and classroom activity (Performance).

Interactions: Interdependent teachers can be seen proactively building support structures they and their students need. They may be seeking out PD and identifying or if necessary creating the groups needed for support, guidance or self-development. As well as acting as a supportive role model they can give advice thoughtfully and without reservation to others in need.

Performance: Teachers at the Interdependence stage use ICT to address their varied needs. They will be seen integrating it into their learning activities seamlessly. They will design activities to carry educational outcomes, and choose, allow or encourage open-ended student tasks. They will work to ensure that their students are in control as far as reasonable and they will encourage team-based and collaborative tasks.

These are assembled to make column 4 of the ICT uptake table model or the stage called Interdependence, given as Table 7.6 below.

Although the model clearly implies that interdependence is a stage to strive for, it may be that an interdependent relationship between teachers could simply reinforce and hence stultify them at their current stage of development, and may hinder more advanced development. It is possible for instance that Gail and Fiona demonstrated this stability in their ICT teaming relationship.

Table 7.6: Specific Indicators of Interdependence stage in each domain

Domain				Interdependence
Feelings				*Feels Situation control* *Willing to give, share and develop with others*
Specific Indicators…				•feels that control issue irrelevant; sees value in joint development with students/ staff; contented; thoughtful, confident; proud; self-actualising; fulfilled; relaxed; balanced; competence not under threat; valued •able to integrate others perspectives with own; perceives balance between self and others • confident to help or support others, understands frustration of others; act as co-learner; values individual and group simultaneously; maintains interpersonal relationships
Understandings				*Beyond ICT thinking* *Learning oriented*
Specific Indicators…				•Makes time to consider learning issues; aware that both they and their students are developing; aware of role model status; able to consider both student and software roles in activity design •propounds value of internal standards, and multiple perspectives
Behaviours				*Uses ICT as catalyst* *eg 'Internet as community'*
Specific Indicators…				•Seeks out PD ,groups for support, guidance, self-development; acts as role model; gives advice thoughtfully and without reservation •Uses ICT to address varied needs; able to integrate it into work seamlessly; designs activities to carry educational outcomes; chooses open-ended student tasks; ensures students in control; encourages team and collaborative tasks

All these previous four tables makeup the fours columns of an amalgamated table. This complete version of the ICT uptake model is provided as Appendix 7b.

7.5 Fitting the data

7.5.1 Introduction

This section describes how well the case teachers fitted the TIU model. There are a number of reasons an effective model is potentially valuable. First it could provide a consistent descriptor of teachers' ICT uptake; secondly, a means to measure teachers' progress; thirdly, a mechanism for supporting teachers who are exploring activities and outcomes and finally it may allow predictions of teachers' progress and hence the selecting of appropriate interventions to support their ICT uptake.

Three methods are used to indicate the relative fit between the data and the model.

Because of the theory-building process used it is not possible to presume that the model and the data are independent—after all the model was constructed from that data—but this does not mean that the model is untestable. Firstly by showing exactly how a range of teachers is fitted to the model, it will be evident whether the model has breadth and successfully summarises the existing data, including difficult or even exceptional people. This descriptive step presents a selected subset of the case teachers in some detail, and shows how each was fitted to the model.

A second method takes a horizontal slice through the model. Until now the analytic approach has been showing *each stage* in detail, which happens to correspond to a vertical format in the table. The current method seeks to highlight all the developmental stages, by taking a horizontal pass through the table that describes the model. By considering a sample issue, 'the Internet and ICT uptake' and seeking to show that the descriptive processes possess commonality with the experiences of teachers who were at different places through the model, the method shows how many teachers progress in their usage of the Internet.

The third validation process involves member checking, which allowed a comparison of the case teachers' personal classifications on the model with those of the researcher. This process was undertaken in the second half of 2001, and the next section describes the process. The results include a complete set of three tables for every teacher who returned their completed TIU survey forms, showing their development and their comparative fit to the researcher's estimates, with some notes on the reasons for the similarities and differences.

Presented first, because it is a brief section, is the 'horizontal slice' corresponding to the developmental process elucidating 'the Internet and teachers' ICT uptake'. Then the subsequent section shows how case teachers fitted into the cells, the consequences for describing and summarising their development, and discussion of the level of agreement between the case teachers and the researcher after member-checking. Finally the member checking presents the results of the validation process of checking the TIU model.

7.5.2 *Illustrating teacher development – the example of using the Internet*

It is now appropriate to illustrate briefly a horizontal or 'across the table' perspective, that is the changes that could be expected as a hypothetical group of teachers progresses from the first towards the last stage of the typology. For the purposes of the example a brief view of their understandings, behaviours and usage of the Internet in class will be used, and comments from and observations about particular teachers at different stages in the model will be offered as illumination. Although this risks seeming superficial because of its brevity, it could also provide an insight into the likely changes that could have been observed in any of the case teachers' classrooms during, and indeed before and after the research period. Again the descriptions are an amalgam of the detail from Boud (1988) and Brundage & MacKeracher (1980) tailored to the current ICT environment.

Four "metaphors" are chosen as keywords to represent this hypothetical progress over the four stages: the Internet as Incomprehensible; the Internet as Maze; the Internet as Library; and the Internet as Community (see Figure 7-7, below). Although the first word is not strictly a metaphor, its very weakness embodies the lack of identifiable structure and uncertainly that a teacher at the Dependent stage can feel.

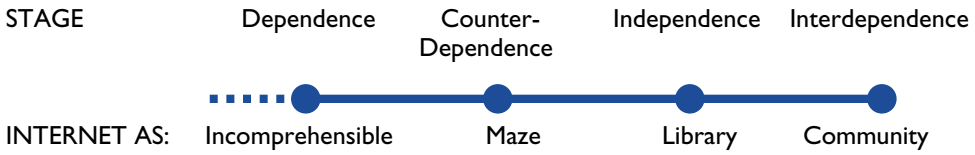


Figure 7-7: Metaphors for the Internet at various ICT stages

Dependence

Teachers at the Dependence stage recognise that they find themselves in a highly novel situation, which tends to be challenging or disorienting. They will tend to regard the Internet as confusing, perhaps a little frightening and certainly hard to come to terms with. Gail's comment—delivered with a laugh—that 'even my husband has an e-mail address but only on his business card!', suggested that she felt left behind. There was no hint of fear in her stance, only a lack of time, mainly because of her family situation. But at this Dependent stage she was unlikely to ask for support on something she saw as too hard. This model of the incomprehensibility of the Internet is reflected in their feelings, their questions or lack of them and their

likely minimal use of it without support. It will maintain a low priority in their class activities and be easily dismissed or relegated below more understood learning activities.

David began to use the Internet at home when he purchased a computer during the study. Yet he never used it with his students, and reported still avoiding it almost completely 18 months after the study had finished. He attributed this to lack of appropriate school support. Even at his new school he sought and apparently never received from the ICT support person, 'explicit, step-by-step instructions on what to do in her computer laboratory'. Progress through this stage will be expedited by good support systems that appear reliable and have clear and explicit standards.

Counter-dependence

By the Counter-dependence stage teachers are starting to make some sense of ICT and may see some patterns in it. It may seem like a maze, but at least a maze has some patterning and structure even if it seems inscrutable. They may have begun to assert some autonomy as they try to master some of this new object called the Internet. They may be stimulated further if they believe that other people are not using it as well as they are going to, or if they perceive that the support systems are less able to provide support or are inappropriate or weak. At this point it is possible that reservations and even cynicism or resentment may have crept into their views as they reform and rebuild their understandings of the Internet as a learning tool. For some teachers this is a time of negativity and conflict as they feel that they have left their old support structures behind, or that these structures lack relevance to their current needs.

Fiona had been fearless with computers and exploited mercilessly Principal Jerry's concerns to help keep the school computers going. When something went wrong she would send a student to the Principal's office with a message about 'the computers' so that he would come running if he were free. Christine, on the other hand, was unwilling to call Jerry and had to rely on more informal solutions, like asking Iain when he was free, or her 'very supportive' online list server.

Gradually, but particularly if there are good support systems available, teachers rated as Counter-dependent will have started to make sense of some chunks and have started a useful mental model— perhaps using the maze metaphor or other

construct—which provides some understanding and explanation. It is easy to hypothesise that the better their metaphor the more quickly these Counter-dependent teachers will come to understand and use some section of the Internet in this pre-independence stage. Whatever the circumstances, if they have both success as well as flexible, uncritical and preferably personalised support through this stage, then relatively quick progress to the next stage seems likely.

For Fiona her support systems included a keen daughter and son-in-law under the same roof; a burgeoning interest in e-mail with friends and family around the world and a willingness to read and talk about computers. Christine was critical of all parts of the support system at RS, and it seemed her only major support was her list server. She did not seem to make progress at a fast rate.

Independence

Independent ICT usage is indicated when a teacher begins to plan and implement for their students Internet activities of which they feel in control. These activities will probably involve using the Internet as a tool, perhaps using the metaphor of a library resource for which they design searching activities or other structured tasks. Late in the study Gail began some Internet use with her students based around photo-copiable Internet activity sheets. She continued to avoid e-mail activities, and described the Internet as an electronic library rather than a communications tool, when given the choice, suggesting no hint of interdependence in her thinking at that stage.

Such teachers will be increasingly willing to use a variety of software and hardware applications and their focus will be increasingly on the learning outcomes that their students are gaining. At the same time they may feel less frustrated and more willing to accept the variability of others around them, as they feel more confident of their own role. This implies an increased willingness to share plans, ideas and activities with peers. It is likely, according to Brundage & MacKeracher (1980), that a group with many teachers in the Independence stage will be a highly productive group. Certainly the group of teachers organised by Leanne at NW were a vibrant, interested and enthusiastic group, according to the District Office staff member who visited them often because of this. It was the researcher's opinion that many of Leanne's ICT committee and Learning committee were at or near the Independence stage.

Interdependence

Reaching the last stage—Interdependence—is not pre-ordained, and may take a significant time. Nevertheless, for teachers who reach the stage of Interdependence, their willingness to use the Internet as an open-ended communications environment is matched by their increasingly supportive approach with their students, as well as a recognition that they can contribute to the development of those around them. Nora and Paula were a good example of such interrelatedness. They shared students, they shared computers, and they shared ideas. The range of software they used and the high proportion of open-ended tools in that list was all evidence that they were working relatively interdependently.

Their understandings about the Internet will have matured to the point that it has become a catalyst for the many rich and varied activities that take place in their class, rather than being a particular focus. In fact it is likely that a matching change will have occurred in the way they view the learning activities that they now design with the active contribution of their students. Also at the same time, their understandings about their peers will have developed to the point that they can integrate other's perspectives at the same time and learn from this, in a way that they probably did not originally expect to. For schools where sufficient teachers reach the Interdependence stage, the metaphor of 'Internet as Community' may well become a metaphor for how they teach and learn as a staff room and as a school.

7.5.3 Selected teachers and the model

It was important to show whether the collected data and observations would match the TIU model sufficiently to confirm its utility; and whether it would provide some predictive value as a model for highlighting and supporting the planning of further teacher development. In an attempt to show how the case teachers' data helped to locate them in cells on this table, the existing collected research material was reviewed, and used to place teachers in columns or cells of the model. The three domains were already identified as significant, mainly because of their initial inclusion in the research question on which this chapter is based. As a result they corresponded to nodes in the existing NUDIST database, so it was not difficult to

collect teacher data for each cell. These snapshots of the teachers are presented now, as evidence and counter-evidence of support for this model.

A selected subset of the case teachers who were based in classrooms were reviewed and placed across the uptake model. The snapshots describe each teacher during the six months of the research period, but when development was evident, then the snapshot refers to their status at the end of the period rather than at the beginning. Six of the ten case teachers at RS were classroom-based, and four of the seven at NW were also classroom teachers. From these groups three were chosen from RS and two from NW. The subsets were as follows:

David, Christine and Ann at Regis Street Primary School; and

Olwyn and Nora at North Waygo Primary School.

David, Christine, Ann, Olwyn and Nora represented a range of uptake levels, if their data presented in their vignettes and the previous chapters were any guide. Thus they could be expected to fall across the spectrum on this version of the TIU model. Since it was shown in Chapter 6 that relatively little change occurred for most teachers—except possibly for Ann—the data drawn on covers the research period for all but Ann.

They are reviewed, one at a time, to demonstrate their fit to this ICT uptake model, and any consequences of their particular fit. They should also illustrate the interpretations that may be placed on such a variety of data.

David

David showed some evidence of a dependence level of uptake, including a dependent relationship with his support systems, and greater concerns for himself than his students. Evidence across the three domains—feelings, understandings, and behaviours—was available, and was reviewed in that order, culminating in a small chart which represented David's ICT uptake progress diagrammatically.

Feelings

David seemed to be a conundrum, when it came to using ICT. He bought a computer during the study, but was rarely seen encouraging his students to use their class computers. He admitted to a high level of frustration with ICT.

Not only did David explain that he had contemplated resigning from the teaching profession, but also it was noted that he regularly used words like 'irritated', 'frustrated' and 'disappointed' to describe his views about ICT. His Experience of Change score confirmed this marked reserve about ICT, placing him lower than any teacher at either school with –11 on a scale from +20 to –20. To represent such strong feelings he gave the highest rating to word-cards like 'frustrated', 'isolated', and 'dissatisfied'. When asked about the presence of computers in his classroom he was quick to explain, before being asked, how little he actually used them:

> DAVID: yes, but, I mean, I have never felt like I really made good use of them. Even in this year... Late in the year I got a late model computer {for a total of three} erm {pause} and really I haven't {pause - sentence incomplete}…. It's just to me a kind of an irritation. I feel irritated as far as computers {pause} as far as educating children how to use computers in the classroom. Irritation is{pause} yeah. (1:52)

These data suggest that he does not feel at all independent about his ability to use ICT. His feelings and attitudes are strongly bound to his personal reservations about ICT that appear to go back a long way. There was some irony in his attitude to ICT and students, as he had also recently purchased a home computer and was starting to make progress with it:

> DAVID: And I bought a computer myself a couple of months ago.
>
> *: so most of your technology development sounds like it might have happened quite recently?
>
> DAVID: yes. I'm starting to build a Web page. I suppose that's a pretty simple kind of thing. I'm interested in doing more education on how to use a computer. But I haven't really used it very much at all. There have been a few games to play... But nothing… nothing in any systematic way. (1:63)

Although he appeared self-deprecating, Ann had later commented that he was one of the more knowledgeable of the staff at school when it came to knowing about computers; and Christine had already named him and Iain as the two teachers with good knowledge of computers in the school to whom she was able to refer for technical help. Nevertheless, they did not mention his skills with computers as a classroom resource, and here they did not seem to be disagreeing with David, whose interest seemed to be on 'how to use a computer', apparently for personal use. This was quite understandable given his concerns and feelings about computers in his class. This comment suggested that either he saw it as a subject—which placed him in a Dependence stage; or his learning was for personal benefit only. In fact he tried to interest the researcher in some Internet-based pyramid selling scheme that he had

started taking part in, at about this time. As a result it seemed likely that David's interest was more personal than educational at this point in his development. Since he had pointed out that Ann was the person in whom he felt he could confide and with whom he could talk about educational uses of computers, and she said they had done little of this, his level of interest in classroom ICT was rated as low.

Overall, despite the fact that David was acquiring skills with ICT, and was interested in learning more about using a computer, his feelings implied a decided lack of independence about using ICT in his class. These data suggest a person who was highly frustrated. The frustration was not because he was making progress without support (which could suggest a Counter-dependence stage of development), but more simply because he had made so little progress with ICT.

Understandings and pedagogy

When describing ways to use ICT in class, his language implied that he only had non-mainstream uses for ICT in mind, for example:

> DAVID: I do actually like the idea very much of using it for remedial purposes, like teaching phonics, that sort of stuff. (1:199)

Although a commendable aim, it suggested that he did not regard the computers at the back of his class as integral parts of the teaching process. In fact his understanding about pedagogical issues seemed to play second string to other issues, like how to use it, for example:

> DAVID: I don't have a clear idea in my head, or goal, of how the computer can be used in the classroom. (1:193)

He did not appear ready for sophisticated usage, being more concerned by principles for allocating students to use computers, if two evaluative comments at different times in the same interview are indicative:

> DAVID: …but I can't see how it's integrated into the learning environment. (1:194)

> DAVID: I mean I have some organizational issues to sort out, like getting the class organised so it's possible to send kids off to the computer. (1:469)

Occasionally, however, he showed that he was aware of other ways to use ICT, and his language suggested that this approach appealed to him as a teacher. For example he saw some value in e-mail. He had been watching Ann in the class next door making increasing use of ICT including some tentative steps with e-mail. She was arranging to swap emails with a class in Glasgow, Scotland, the following year and

David was clearly impressed. Ann suggested that their two classes could interact this way when he moved to his new school the next year. By this stage he already had started using e-mail personally, but had never done so with his students.

> DAVID: I would love to set up e-mail between here and there {next year's school}, if I'm on-line. In fact between any two schools. I want to set up e-mails if I can, because that gives a real activity to the students. (1:479)

This indicated that, in theory, he was able to consider the students, and plan some appropriate educational activity. It seemed that, at least in his pedagogical domain, there were signs David was moving towards the Counter-dependence stage. None the less, it was one of the few signs that he was putting students before himself in his ICT uptake. Furthermore, it was not followed through the following year according to Ann. Overall his pedagogical approach suggested a teacher who felt little control with ICT in a learning situation, who was beginning to learn how to use it but was not describing ways to apply this skill back into his classroom activities, and who was definitely reliant upon support from others to stimulate his ICT usage and planning.

Practices

There were few signs that David had adopted or changed any ICT related classroom practices, however. For example he let helpful parents tacitly determine the curriculum contribution of his computers, because he welcomed one and occasionally two fathers on some Friday mornings into his class. He admitted feeling embarrassed that he was not able to help his students, but would most likely have argued that the students were getting more than they would have, had he not encouraged any parent helpers at all. Further evidence that he put his concerns about ICT before the students' learning needs occurred when he was asked about how he would like any support systems organised:

> *: would you rather they {ie an ICT specialist} worked with your students or worked with you?
>
> DAVID: Probably with me. (1:511)

The rapidity of his answer at the time confirmed his self-concerned stance. Because of his initial withdrawal and subsequent re-connection to this study through the support of Ann, David avoided any reference to his reflective journal. This seemed to suit his needs, as he was sufficiently frustrated about ICT that it appeared to distract

him from most related tasks. He was willing to work with others if it provided him some help and support, and Ann was willing to try and help. She summarised their collaboration over the study period saying, 'I had been sharing with David a little.' When combined with the fact that rarely was any computer seen on when the researcher visited or walked by his classroom, this suggested that he was making little progress. In fact he commented deprecatingly once on some students attempting to turn the computers on without his permission, suggesting he was determined to stay in control of ICT in his class, even if it was only the on and off switch.

The rating of Dependence stage for his practices was further justified since both Christine and Ann described him as one of the more competent staff members technically, but it appeared that he was one of the staff whose evident computing skills had the least impact on his classroom practices.

Summary - David

When reviewing David's overall attitude, pedagogy and practices there were some patterns. He seemed overall, but not totally consistently to feel threatened, to feel in need of support, to be more concerned with his own progress than his students, and to regard ICT as another subject to teach. Connecting these descriptors and the indicators from the ICT uptake table, it was evident that a rating at the Dependence Stage was justifiable. More likely it seemed that the minor variations mentioned in the pedagogical domain could suggest that he was beginning to think in a more sophisticated way. It seemed likely that he was in an early state of transition towards the Counter-Dependence Stage, given this one domain's data in the Understandings domain. Thus a TIU location chart was constructed for David helping visualise his approximate development in each of the described domains, and is given at Figure 7-9:

	Dependence	Counter-Dependence	Independence	Interdependence
Feelings				
U'standings				
Behaviours				

Figure 7-9: David's TIU location chart

So at the end of the study, only some comments with pedagogical implications suggested any sophistication in his thinking beyond the Dependence stage. Thus it was reasonable to classify him as slightly beyond the Dependent stage alone. The shape of the chart suggested that David was developing his understandings about

ICT use, and that these understandings were more 'advanced' (represented by two adjacent greyed boxes in the middle row) than either his feelings (represented by only one greyed box on the top row), or his actual classroom performance (represented by another single greyed box to the left in the bottom row).

If each of the stages represented a unique and consistent intellectual niche, or cusp, in the development cycle of a person's ICT uptake, than this could be interpreted as implying that David was probably undergoing some intellectual disharmony on his way to a more stable setting. In this new circumstance, all of his attitudes, understandings and behaviours might gradually be in a matching state, in this case the Counter-Dependent stage. Overall it seemed that David was at an early stage in his ICT uptake, and that he was possibly going to be undergoing change in his ICT uptake. He could perhaps be described as in a understandings-led transition, but given the strength of his antagonistic feelings towards ICT in his class, it seemed that it might be only a slow transition.

Christine:

Christine demonstrated a range of feelings and behaviours, which covered both Counter-dependent and Independent activities. It was clear that she had no great fear of technology or ICT as an object. On the other hand there appeared to be some factors that would make it hard for her to make progress under the circumstances observed, including her lack of reflective writing and self evaluation, and her apparent antipathy towards some of the support staff at her school.

Feelings and attitudes

Christine seemed not to feel threatened by computers, given her willingness to buy one years before, and even start publishing the newsletter for her sporting club—'that really started me', she commented. She felt good about her skills with computers, regardless of how good or bad they were, and this was seen as a useful potential base on which to build. She avoided the Internet initially, choosing to use fax machines and letters, until she discovered e-mail. Then she found the Internet exciting, and again indicated her lack of fear with ICT. At the same time she felt positively inclined towards teaching:

> CHRISTINE:… and totally loving what I'm doing. I just love teaching, and to me there are always things I can do to make me better; and I think these changes are great, because changes keep me motivated. (1:254)

Such a positive attitude suggested someone with no fear of items like new technology, and therefore it seemed that with such an attitude she might progress through the first, Dependence, stage without major hindrances. The only concern would be that there was a sufficient modicum of appropriate support for her.

The fact that she quickly mentioned to the researcher her perception that the support systems were poor at RS, suggested that she was already becoming less dependent. In terms of the model she was probably already in a Counter-dependence stage at the start of the research:

> CHRISTINE: And then I get very frustrated at school. That was a cause of great frustration, because it was much more simple at home, using email, than it was here. (1:101)

She blamed Jerry for 'changing things'; she also criticised the new library and by implication the librarian, arguing that 'just because they have a new library does not mean that they are going to use it well'(2:49), which seemed rather hyper-critical, if not antagonistic. In the same breath she had complained that, 'nothing you do here is valued' and 'we need better planning' (2:48). Some of her complaints were understandable, even if they were unfounded concerns or their logic was rather hard to fathom. For example she often seemed to complain about the Principal for making decisions that she would not have made, even though they appeared appropriate and often had the votes of the majority of other staff behind them. Christine mentioned on multiple occasions her frustration with ICT at RS, as well as her lack of time. For example

> CHRISTINE: Finding time is very hard. I haven't done it. I'd need to rearrange things. We are going down a track - we are on-track - I feel it is fast enough {right now} (2:94)

Another activity she had not done was teaming. She seemed to prefer to work independently, suggesting that she may have been on the cusp between the two stages of Counter-dependence and Independence, awaiting development of her teaming skills.

Overall, Christine seemed fairly independent, avoiding teamwork and was often critical of others, either their lack of support or lack of progress. She was critical, in front of the researcher, of the Principal Jerry, the librarian Heather and occasionally others. She attempted to work with two other staff only out of the whole school staff, and their collaboration was apparently minimal: 'Iain and I would chat occasionally'

was her observation, and her diary showed that she twice 'sent' material on to Iain, and once to Brenda. One e-support was well rated by her, namely her listserver, which she rated as 'very very supportive'. Her feelings and attitudes suggest a predictable 'counter-dependence' case, with elements of independence.

Understandings and pedagogy

Christine seemed to have some rather confused ideas about student-centred learning.

> CHRISTINE: Well I'm very different now, compared with last year. Now it is very different. Now I'm more 'this is the topic, go for it'. This is the program you're using on CD-ROM, now go and work. (1:140)

And later she explained in detail the changes in teaching over more than 30 years, in her view:

> CHRISTINE: Teaching is still the same. Instead of doing programs, we now do plans; instead of having objectives, you now have outcomes. Instead of saying this is content I'm going to teach you (that's still in the back of your mind), this is where I'm going to lead you. So it's just a different style. I don't think teaching has changed really. (1:238)

This approach does not seem to embody either the common principles of constructivism or student-centred learning as explained in any student text book today, and addressed in the literature review in Chapter 2 of this research. In fact her views about the primacy of the teacher meant that she would see no conundrum in the phrase 'student-centred teaching.' Christine seemed to imply that the students were fitting in around her needs, rather than she to theirs. For example when she wanted to teach and there was a rostered group using the computer, she explained, 'I tell them to re-arrange their computer roster so I can teach'(2:9).

Ann expressed a concern about colleagues possibly over-representing their own efforts. It was known that she often passed Christine's class on the way to her own, and when she was pushed to explain, she noted a mismatch between Christine's comments in the staff room about being student-centred, and her practice. Ann never saw any other authority structure than Christine at the front and students in rows, either listening to her speak or working individually and independently.

Observations and practices

It appeared that a common structure for her class was sitting at her desk at the front, addressing students. It always appeared that the students were under tight control. Her standard way to address the class was 'right, pay attention', using a one to many

role; she was never seen dealing with subgroups for example. Even the rostered students at the computer tended to be addressed from the front of the room. It also seemed that students were admonished publicly, rather than in private, and this seemed to be occurring not irregularly. She was rarely seen talking to a student outside her room on an individual basis, for example.

There was no doubt that Christine tried to use a variety of computer applications, including e-mail, word processing and specific software. Her usage of the more challenging software was limited, however. Consider her adaption of the Year 2 bookmark activity by Ann's class, where each student researched and then created their own bookmark. Although Christine claimed to be well supported by her listserver, it was not able to help her with specific technical problems. One day she rang the researcher for help with the 'bookmark' document template, which included multiple frames on a single page. It was a version of the activity that Ann had done a few months earlier, but instead of contacting Ann, after ten days of no success she rang the researcher for help. This suggested a degree of stubbornness which, although an admirable trait in some circumstances and small doses, may have been overexercised in this case.

The educational value of the activity as completed by the Year 2 class was severely curtailed when she decided to arrange a single common bookmark for every student in her Year 7 class, rather than a personalised one. This raised doubt about her interest in providing activities with intrinsic interest for her students.

Christine's complaints about Jerry particularly, seemed hard to justify, to an outsider. By contrast Fiona once commented on how amenable Jerry was and how willing to provide technology support, justifying her comment with a story about sending a student to Jerry to ask 'where the sound had gone'. Jerry appeared immediately ('as I knew he would; it was a technology question, after all!') and solved the problem in a flash. His willingness in such circumstances, his support for their efforts and his determination to let them get on with it has already been documented. He checked that teachers were happy with his proposals, or what they understood of them by airing them at staff meetings; he provided good resources; and he had a part-time technician available when something was beyond his ability.

It was evident that Christine's interest in being competent with ICT was real, even if her skills were not nearly as concrete. Similarly her perceptions about learning

seemed to be full of misconceptions, and her desire to be competent and independent in the ICT uptake typology was not so evident in her practices. It seemed likely that she was probably performing at both a Dependence and Counter-independent stages with her ICT and learning practices. She probably deserved the benefit of the doubt and was rated at Counter-dependence in the Behaviour domain.

Summary

Christine showed a range of feelings and behaviours, which covered both Counter-dependent and Independent activities. Although such a distribution was proposed to establish a prima face case for someone in the process of transition, there are other factors which suggest that in Christine's case, this might not occur as easily.

In fact her behaviour around the staff room raised doubt whether a state like Counter-dependence could be masked by personal views and feelings to such an extent that these prevent genuine development and progress. For example Christine appeared to spend much time worrying about the apparent weaknesses of other staff in 'her' school, and seemed less interested or willing to reflect upon possible personal weaknesses.

At the same time she had concerns for 'her school' and was always worried by other staff letting the school, and her, down. Coupled with her lack of reflective intent, as indicated by her reflective journal which was full of descriptions and information but lacked any significant reflection of any sort, it seemed that she was not going to make progress through any autonomous or self-critical means.

The data suggest that Christine was largely at the Counter-dependence stage, but had occasional touches of Independence stages in both her Feelings and her Understandings and beliefs. Her practices did not yet seem to match the potential seen in the other two stages, so she was rated as Counter-dependence in that region.

	Dependence	Counter-dependence	Independence	Interdependence
Feelings				
U'standings				
Behaviours				

Figure 7-11: Christine's TIU location chart

It seemed that Christine's practices were more traditional than her feelings or even her understandings about ICT, teaching and learning, as there was little evidence uncovered of Independent activity in her Behaviours domain. It appeared that there

was no one area consistently and obviously providing some intellectual or emotional challenge for her, and so she was rated as rather stable. To the extent that her TIU location chart at Figure 7-11 indicated her relative greater competencies in two domains, then until her remaining domain changed—how she planned and executed her teaching activities—it seemed likely that her progress would remain slow.

Ann:

Ann had initial consternations about ICT. On the one hand she had no real idea of its value and some doubts, but she was prepared to be persuaded as well. She felt she could commit herself as long as there was going to be support. Furthermore she was prepared to muster some from the ranks of other teachers. She perceived clearly that she was going to be reliant upon, or at least wanting to work with, helpful supportive people at early stages. This was made evident by her first EoC of -4 (which rose to 10 afterwards). Nevertheless she had some broad and successful support schemes already in place and was able to call upon a range of people for help. She had already proven to be very collaborative, (Chapter 6) and this should have helped, according to the theories discussed in Chapter 2. She was one of the few teachers who appeared to change in her usage of ICT significantly over the study period. This analysis reports her final position, and shows some of the evidence of changes through which she passed as well.

Feelings and attitudes

Ann's initial reaction to working with ICT was not one of fear of the technology but insecurity with the unknown. She directly rebuffed a suggestion that her early experiences with ICT were 'threatening', explaining instead that, for example, she was asking her students for help from a very early stage. Late in the study she commented that, 'there is a stage where computers are a bugbear at the beginning', but there did not seem to be any strong emotion attached to her description. She described her early ICT usage elegantly but unemotionally—'insecure was a good word. I knew I lacked understanding and information'. This was in pointed contrast to David, suggesting that Ann felt much less emotion about ICT even when she was at about the same phase in her development.

It was apparent that she felt equally as uncomfortable and frustrated as others did, for example. However it seemed that this was not the dominant feeling, and she placed this in the context of wanting to address a specific task:

> ANN: How I feel now? Well, sometimes I feel (pause... laughs) comfortable and quite excited. And... if you'd asked me this morning, with {importing from home} these JPEG things, I was confused, because I wasn't sure if I had done them correctly, and perhaps frustrated because I wanted to do it for the children. But that's because I wanted to do a particular task, and I didn't know if it was right. But I also had the back up confidence of knowing you were going to see me sometime {later today} (1:160)

In her final interview Ann commented on her development when she reported some amusement whilst reading her reflective journal:

> ANN: … I can't believe the questions I had then. I'm embarrassed when I see the questions I used to ask! (2:31)

As well as feeling better about the technology, she simultaneously was making changes in her teaching and learning structures using Student Outcomes. It seemed in her nature to be positive and supportive, and this was one of her strengths as a teacher. It meant that she never appeared to lose sight of her role with her students. For example she enthused, 'I am rediscovering my joy of teaching {thanks to Outcomes},' and 'I am seeing so much more in the kids.'

At the same time her support needs changed. In early conversations she mentioned technological challenges, but later she mentioned ones with more learning components. For example her initial concerns were much more focussed on the ICT than on learning activities:

> ANN: Initially, you need someone to smooth the rocky ICT path, so that the outcomes are not clouded by the day-to-day IT problems. (2:163)

Looking forward to the next year, she had different concerns:

> ANN: Well, for example, I need to know what a WebQuest is/does, so I can encourage and support its use. (2:160)

As a result of her participation in this study, Ann's feelings and attitudes with both ICT and learning outcomes appeared to have developed. She described some changed feelings about ICT as well as implying the need for a changing support structure to provide the support she needed to continue her development in the following year. Ann was showing both Independence and Interdependence characteristics in her feelings, communications and support needs by the end of the research period.

Understandings and pedagogy

Ann proved to be a very reflective learner who enjoyed serious conversation on principles of learning and was unembarrassed to talk about her own weaknesses but was less able to talk easily about her strengths. If pages alone were a measure, Ann would have rated as having great capacity for reflection, since she was on to her second reflective journal when few of the others were more than 10 pages total. She found her reflective journal a useful reminder of her feelings and record of her change, and proof that its content was useful was that she asked for her journals back after the research study drew to a close. She made a number of insightful observations, which indicated something about her own development. She had normal reservations about the ICT in her class as she began to use it.

At all stages she was interested in the application of the technology to help her students, so it seemed unlikely that she was a novice at the pedagogical level in the ICT uptake model even at the beginning of this research. It was evident that she was moving easily from stages of dependence to independence over the period of the study. This may have been due to development or an improved ability to express her stage of development as her grasp of the technological and outcomes oriented idiom improved. In other words, even though she may have been initially at one of the independent stages she was not able to express herself as well at that point. In Ann's case it seemed possible that both these factors were involved. What was clear was that her concerns were based around her children at least as much as they were about herself. She was motivated because of her interest in students and their environment:

> ANN: I could see that computers were becoming part of the children's world, and if I'm going to be with the children I need to be aware of that world as well. I mean, I sit down and watch children's TV programmes, just so I know what they're talking about when they talk about Pokemon and so on. Information technology is part of their world, and my world, so I got involved that way. (1:62)

Evidence such as this suggested that Ann had a natural interest in being student-centred, so when she began to learn more about ICT and outcomes, she reported that it helped change her perceptions of what was happening in her classroom. For example she commented at the end of the study:

> ANN: I am seeing so much more in the kids. Before, there were lots of cute little kids, we did the activities and we moved on. Now, everything we do I can see how an outcome is being met. (2:92)

Her understandings about why she was teaching were also being reshaped—which she welcomed—and her descriptions of some of the changes she was perceiving, showed that she was enjoying the challenge of revisiting her assumptions about teaching and learning:

> ANN: Before, I felt a responsibility to impart information to them, to give them something. Now, it is totally different. I have a responsibility to encourage them, to mentor them to their own discoveries. (2:104)

Her changing approach to learning was matched by similar changes in her usage of ICT. Not only did she feel different about it but more importantly she was using ICT in a different way.

> ANN: I have definitely found that as I'm getting better at using it {ICT} myself, it becomes a means to meet our needs. I look at the computer quite differently now. It was a mystery, an unknown, but now when we want to discover something, then off we go. Now we just use it for what we want, and it is not a sacred entity (this could be how an adult could view the computer, I think), nor a challenge to my authority, it's more like a buddy! (2:125)

Ann's understanding of ICT and its contribution to helping meet learning outcomes appeared to have grown significantly over the study. On the one hand it is difficult to imagine that she was not already au fait with ICT to a limited extent, and equally it was evident that her approach to learning was already quite student-centred. But it was also apparent that her skills, at least in the ICT area, had not only improved, but changed in form as well. She initially showed some elements of the dependence characteristics typical of a novice, but there were signs of both independence and interdependence characteristics in her attitudes and feelings, particularly towards the end. This suggested that she had probably changed her pedagogical stance somewhat over the research period.

Observations and practices

As well as showing from her interview record that she perceived change, there was direct evidence that things were indeed different, now that she had begun to use ICT in her classroom. For example, it was very rare that there were not some students using the computers at the back of her class whenever she was observed, and her comment that the focus of the room had changed since the networked computers had become available ('{now} this is one of the most used areas of the room') matched this observation.

Ann was the teacher who recognised that her weak reader could use the word processor with the speech facility in it to practice word attack skills (noted in Chapter 4), in an incident she described in her diary as due to 'divine inspiration.' This insight on a day she described as stressful was admirable, and typical of her growing ability to match student needs with ICT features.

She was also planning ahead with her newly understood ICT facilities:

> ANN: I have frequently given thought to strategies I will plan for and use this new school year incorporating collaboration, IT and SOS {student outcome statements}. I have even booked with Morah in Scotland {an ex-RS teacher} for my grade 2's to be email pen pals with her class this year. (diary, 5 Nov '99)

When happenstance provided an opportunity to have her students sharing e-mails with some Australians at one of the bases in Antarctica she was quick to utilise it. She showed that she was prepared to create open-ended tasks for her students, when one student mentioned that her grandfather was catching the supply ship South a few days hence. As well as providing some authentic writing and research opportunities over a period of weeks, it also was the stimulus for a discussion with an anxious parent about security and protection of young children's identities on the Internet.

> ANN: Another ICT one was that parent complaining about security, when we sent our e- mails and pictures to the Antarctic. (diary, 28 Nov '99)

Again she saw it as a learning issue for both her and her students, and she discussed the issue with them. It also provoked a flurry of emails as she came to terms with topics like security, who had access to e-mail and data traffic, and ways to maximise parent comfort and understanding on problems such as this.

She was willing to work and share with others, as she had attempted to do with David and Evelyn, and did successfully with other teachers on less ICT-oriented activities. David described her as 'very helpful', whenever he wanted some classroom usage ideas, which was unfortunately not very often according to Ann. She had proposed some collaborative class activities with Gail and Fiona, who were going to be next door in the following year:

> ANN: Gail and Fiona keep saying we will share next year. We want to plan concerted efforts on the school's priority like writing and maths. (2:26)

The wording suggested that Ann felt there was more promise than reality in their words. A few months later she commented again on the prospect of working with them:

> ANN: I am looking forward to this. I want this collaboration - they have also expressed a desire for it. (2:29)

Although they spoke positively, this had not eventuated in the 18 months following the research. This was possibly for quite innocent reasons that were beyond the scope of this research.

It was Ann who proposed the three stage developmental model—'me, them, us' —mentioned earlier in this chapter. This is offered as further evidence of her own developmental stage by the end of the research period. The closeness of this three-step pattern of development to the upper three of the TIU's four steps was striking. This also suggested that it was reasonable to rate her development at the highest level, as it appeared that her ability to synthesise the information she had accumulated during her own journey was reasonably high and demonstrated good reflective ability. This development is represented by a full column on the right of her 'Now' self-rated chart in Fig. 7.11.

Summary

By the end of the research period Ann had expressed a range of feelings and attitudes, including some indicating that she was feeling sufficiently in control of the ICT to make productive use of it as a learning tool. There were times when she felt some pride in her development and was able to help and support others seeking advice. This suggested that she was demonstrating capacities typical of people at the independence and interdependence stages of the ICT uptake model.

She also showed prodigious capacity for reflection and her understanding of teaching and learning issues continued to develop. Her pedagogy seemed strongly student-centred and she showed the ability to adapt ICT to suit student needs and use software in creative ways. Her ability to determine and address student needs using ICT suggested that she was showing capacity at the upper stages of the model.

Ann also demonstrated competence in using ICT tools in reasonably sophisticated ways and to achieve learning outcomes that she regarded as important for her students. As a result she was rated at the independent and interdependent stages in her practices, as illustrated by Figure 7-13.

	Dependence	Counter-Dependence	Independence	Interdependence
Feelings				
U'standings				
Behaviours				

Figure 7-13: Ann's TIU location chart

Her TIU location chart suggests it was probable that her ICT uptake had risen to the last two stages of the TIU table by the end of the research period.

Olwyn:

Because she allowed only a small window on herself, the range of corroborating data on and about Olwyn was restricted. Nevertheless even this fact is a further contribution that could be regarded as support for the conclusion that she was not very advanced with her ICT uptake, and that perhaps she felt badly about this lack of progress.

Feelings and attitudes

Firstly it seemed that she regarded firm guidance as critical:

> OLWYN: we need some central office guidelines—there are none. (1:60)

Olwyn's usage of the 'we' personal pronoun was noted as definitely including herself. She was equivocal and ambivalent about teaming, and chose just to describe two apparently reasonable choices; she was rather unwilling to make any judgement:

> OLWYN: People often don't want to become a member of a team until they can offer something to it, do they? They tend to stand back until they feel a little bit more confident, and know something about it. Then there's the other side of the coin, where someone who knows nothing about it may want to become a team member to learn. They don't understand, so they become a team member to see if they can learn from each other. (1:193)

This uncertainty seemed to apply not only to her feelings about ICT, but to all of her ICT perceptions.

The issue of confidence or rather her lack of it recurs even in a five-minute interview. When asked what changes she would like to see, she chose to criticise the Education Department, again using the 'we' and 'us' first-person identifiers, suggesting that she was describing herself too:

> OLWYN: They need to have more PD for teachers overall, so we are all confident before we start teaching. They have thrown the changes on us, and the hardware, but we have nothing to go with it. (1:211)

It appeared that Olwyn was hiding her lack of confidence with ICT with description and complaint ('we' need guidelines, 'we' need confidence). She was feeling nervous and challenged by ICT, apparently, and was seeking strong support typical of a person at the first, Dependence, stage.

Understandings and pedagogy

Her previous comment, asking for more confidence, 'before we start teaching', also suggested that she saw ICT as a teaching issue, rather than a tool, which implied she would identify with stage one teachers in a Dependence stage on their ICT uptake.

A further observation supporting a more dependent rating for Olwyn was that she saw the pedagogical issues rather simplistically, for example:

> *: This is only one way of representing it, but where on the scale would you place yourself, and where would you like to be?
>
> OLWYN: Well, which is number 10? Obviously I want to be at the top, wherever that is! (Laughs quickly) (1:118)

And again…

> *: So where would you put yourself on this scale {Student or Curriculum focussed}?
>
> OLWYN: About three-quarters of the way {towards Students}.
>
> *: {marks the page} And where would you like to be?
>
> OLWYN: Obviously, I want to be at the top too.
>
> *: So you would like to be right up there? {Indicates, without marking}
>
> OLWYN: Yeah, obviously. (1:145)

It is difficult to judge accurately, especially as some of these judgements of a person's pedagogical approach were assembled after relatively little formal contact time, but she may have lacked sophisticated comprehension of ICT usage or application as a tool. Her personal concerns came through strongly. She was probably performing at the Dependence stage of ICT uptake.

Observations and practices

Leanne had reported that Olwyn was prepared to undertake more advanced ICT usage, even though it was not her preference, when she was pushed. Leanne was certain she would require strong support, and simple directed tasks to start with, but felt that it was better than leaving her using the 'mindless' content-rich software

which she currently preferred and Leanne regarded as almost educationally pointless. The researcher judged that the two courses Olwyn had undertaken over the previous three years represented minimal PD, and she appeared to prefer minimum software exposure. It appeared that she was equivalent to a person at the Dependence level in her practices, but that insistent support staff might begin to push her practices so that she made better ICT usage in the coming years and months.

Summary

Olwyn was a difficult case to address, because of the already acknowledged sparsity of evidence. Even under these circumstances, it seemed reasonable to conclude that Olwyn was showing feelings, understandings and behaviours of a person at the Dependence stage on the ICT uptake typology. There was very little to suggest that she had demonstrated any characteristics in any other stage than this one, except perhaps Leanne's observation that she was willing to use a greater variety of software and less linear applications when Leanne was working strongly with her as a support person.

This suggested that her TIU location chart (Figure 7-15) had a kink at the bottom—because of the substantial local support—and her development was going to be led by her support system rather than any significant internal pressures or motivation. Thus it seemed reasonable to intimate that she was going to be led towards more process-rich software by Leanne and the technology support staff at the school, and her reservations and perceptions about teaching and learning would catch up.

	Dependence	Counter-Dependence	Independence	Interdependence
Feelings				
U'standings				
Behaviours				

Figure 7-15: Olwyn's TIU location chart

It is interesting to note that, if it were possible to categorise a person with so little evidence, then maybe this ICT uptake model would be relatively easy to use in a school PD planning setting.

Nora:

Nora's transition has already been documented, from reasonably student-centred teacher with a strong controlling streak, to a much more student-centric teacher who

strongly believed in giving students responsibility for their own education, and acted accordingly. Most of the changes had, according to Nora, taken place over the previous three years, guided partly by Leanne, by her recent classroom neighbour Paula and supported by as much PD she could get to in that time. It would seem reasonable to suppose that she had always had students' interests at heart, but the difference would seem to hinge around her changed understanding first about how students learned, and second of the significance of abilities like multiple intelligences and varieties of learning styles.

She was readily identified as a person at post-dependence stages of development with ICT, and the research confirmed this status. Although she regarded herself as much less extreme than Paula, the differences were more in degree rather than form.

Feelings and attitudes

Nora's developments through the stages of the ICT uptake model were identifiable. For example, she could recall a stage when she was so concerned about her own ICT skills that she did not have time to think of the students:

> NORA: yes! Of course there was! Yes! I would avoid using the computer, yeah.(1:648)

Her growing familiarity with computers was attributed to factors like a home computer and supportive children just as much her willingness to ask the apparently stupid questions and not feel stupid doing so. Her time in a Dependence phase was apparently only brief as she had immediate help available from her children at home and she quickly found the Internet an exciting and stimulating place, and so felt she was becoming more independent. She was attracted to collaborative projects and she picked up her computing skills whilst playing on the Internet and investigating these uses.

> NORA: then we bought a PC {at home}, linked to the Internet and all that. As a result I became a lot more familiar with using a computer. I went on the Internet, I was more interested in the Internet and the collaborative projects there, and I was just starting to feel the water a bit. (1:97)

She was starting to feel in control with ICT and comfortable enough to determine the course of her students' ICT activities. For example, when asked if she would repeat a previous ICT activity on their local community the next year:

> Nora: I'm not sure... not too sure yet. I wasn't really happy the way... because I went 'harsh environments', and they went 'local community'... I started on local

> community but went onto the other track because I found the kids were enjoying it much more. (1:280)

These activities included increasingly open-ended tools, as she became more confident. She was looking forward to making her school a host school in an ongoing activity called the Travel Buddies project, after participating in it in the previous two years; and she had students working in pairs to create slide shows which she wanted to extend the next year. A number of factors suggest she had attained Independence or even Interdependence stages, including the increasing use of open-ended tasks, her obvious pride and pleasure in her progress (Are you a different teacher now? 'Yes absolutely!'), and how she felt about the performance of her students…

> NORA: It was great; the year that's gone by was a really great year with the kids.(1:400)

Also her confidence with ICT was increasing all the time:

> NORA: I'm very optimistic in the way I'm going with it, and teaching kids. (1:726)

Nora's feelings and attitudes towards ICT had developed and changed over the previous few years, to the point where she seemed content with ICT as a tool in her classroom. Furthermore she felt content with the supportive arrangement with Paula next door, and she was confident of the way she had integrated it into her teaching and learning program with some skill. She was therefore classified as showing characteristics of both Independence and Interdependence stages.

Understandings and pedagogy

It was clear from Nora's descriptions that both she and her students were developing. Both she and her students were different after their year together, and each were learning. She talked about her own learning style easily, and the flexible approach she had learned to take with ICT when she faced difficulties. Both of these suggested an interdependent stage of ICT uptake.

> NORA: … I'm not afraid to learn. And the thing is, I have a PC at home, and an iMac here at school, and there is a conflict there to start off with. It's not that different of course but I'm like the kids—I'm willing to practice, I'm happy to use trial and error, and I know that computers don't break, so I'm willing to fiddle around, to have a go. (1:246)

When her style of learning came up, her comments showed that she identified with her students, suggesting that a good understanding existed between them. The form of comparison that she chose—not 'they're like me' but 'I'm like them'—implied a healthy and respectful relationship as well. This quality of relationship was important

to her, and, after some experience in an administrative role as one of the school's Acting Deputy Principals, she was even more confident with her classroom-teaching role and, by implication, her new pedagogy:

> *: while Ross has been acting Principal, you've been ADP. Will you continue? NORA: No, this acting Deputy Principal won't continue next year. I haven't enjoyed it … I just wanted to see what it was like there, and no, it's not for me! My kids missed me; I missed the kids too. I'm a classroom person. A Level Three {a promotional position for classroom teachers}, fine, but not in admin, no way! (1:783)

Paula, teaching in the adjacent class, was always nearby to ask for advice and comment, as they kept the dividing wall open between their classes. It was evident that they talked often, and that the classic description of the creative but isolated schoolteacher hiding in their walled garden was not accurate in this case. Both talked about multiple intelligences as proposed by Gardner (1984) and ways to design activities to help students express more than one or two of their intelligences. Each had on permanent display in their classroom a chart Nora called the 'Students' Learning Wheel', after a structure popularised by a well-known visiting elementary school teacher-educator.

She worried about her students sometimes, in a way that suggested she was not quite ready to let go completely some of her control strings:

> I get really anxious with the kids because I don't think they're using it {their computers} as well as they should be at home, and that is what makes me anxious. (1:736)

According to the ICT uptake table this type of concern was a pointer that located her in the Independence column. Overall, though, as the previous observations suggest, it was just as likely that she could have qualified in the Interdependence stage.

It was evident that her class was a good example of a reasonably student-centred environment where their learning was the key objective. It was also clear that she had no trouble creating pertinent ICT activities to meet their outcomes whenever it was appropriate, and if there was any problem with ICT in her class, it was that there was not enough of it.

Observations and practices

Leanne, the ICT coordinator at NW, said she was impressed with Nora's ability to focus on learning and make the computing technology 'fit in and help'. It was apparent that Leanne had been a fostering, supportive colleague and a good role model, and probably still was. But Nora had developed to the point where she was

prepared to give advice, and probably as competently as she had been able to ask for it before.

As an example of her newfound development, she took on the role as coordinator of the school's Students at Educational Risk (SAER) program, where she found ICT contributed usefully, and she could help others in the school. Nora valued the sharing that she did, including that with her students. She noted that her relationships there had changed as well because of the altered teaching and learning roles that she and Paula had devised for themselves:

> NORA: The feel of the class was very different to the other {previous} years.
>
> …
>
> *: so you are really pleased with the change?
>
> NORA: Oh, absolutely. (1:428)

Nora mentioned the comment of a supportive parent on the morning of one interview who was impressed that Nora detected some intellectual or perceptual weakness in her son as a result of the SEAR program. Rebutting the parent's comment that she should be doing the job fulltime, Nora pointed out that it was her classroom activities that uncovered the woman's son:

> NORA: its only because I get to know my kids so well that I can see the weaknesses!. Besides, I wouldn't leave this job if you paid me... (2:85)

She argued that she—and others like her—were more useful staying 'at the chalkface', and in Nora's case she was enjoying it.

Paula explained how they often shared their students around; for example Nora had more of a science focus than she, so Nora would do some of the specialist science topics with apposite groupings of students from their two classes.

There was further support for Nora and Paula's willingness to use ICT when they found other teachers were not using newly placed computers as well as they might. Initially they were disappointed but acquiescent when their block of classrooms was neither networked nor given new hardware in the first year of a three-year upgrade planned by the IT committee of which they were both members. But when they heard from other students that the staff members were hardly using their four new machines they agitated for at least one each. Paula justified their request saying, 'we can *not* use it just as well as they can; *and* we can use it better!' They won the

argument and Nora was pleased that she had another machine even though it was not to be networked until the following year.

Her classroom (as well as Paula's) was structured as you would expect a more student-centred one would be. The desks were arranged in groups, the students were nearly always working in groups of two to four whenever they were visited. The walls and hangings were adorned with encouraging comments about keeping focussed, cooperative learning, how to be independent, and serious and even semi-humorous signs like 'Is reading this helping you meet your goal today?'

Nora was a significant member of two important school committees according to Leanne, namely the learning and outcomes committee, and the technology committee. Now that her children were older and she did not have to rush home immediately after school each day, she had been able to participate in PD activities and had proven that she was even prepared to pay for her PD as well. Her increased availability for PD activities now that her children were no longer as reliant upon her was seen as a significant element in her development.

> NORA: I'd been to every single PD there was since 1996, and since my own children were old enough for me not to have to come home at 3 o'clock exactly. That has made a huge difference. (1:507)

In both her interactions and her performance, Nora seemed to be performing at a high level on the ICT uptake model. She encourages a variety of student groupings among her class members, she used structured and more open-ended software for a variety of educational needs and the idea of integrating ICT into her learning work was evidently well advanced.

Summary

Nora's development was driven by her increasing interest in student learning; the fact that her children were less reliant upon her increased her availability for PD and associated activities. Her children's rapid development as technological support for her at home and the supportive environment at school were regarded as further contributing factors. By the research period it was evident that she was performing at an independent level. She showed signs of both Independence and Interdependence stages in her learning development and ICT uptake. In essence, both columns of the uptake table seemed appropriate for her at different times and places.

It is hard to differentiate whether she is more in one column, or stage, than the other, and this may not be important to do so anyway as she was seen to be performing at a very satisfactory level as a teacher overall. This lead to a TIU location chart like Figure 7-17.

	Dependence	Counter-Dependence	Independence	Interdependence
Feelings				
U'standings				
Behaviours				

Figure 7-17: Nora's TIU location chart

7.5.4 Member checking

As a cross check to ensure the quality of the existing qualitative data, member checking (Denzin & Lincoln, 1998) was undertaken with all the teachers who were still available. The process was straightforward. As teachers involved in an ICT uptake journey they were asked to place themselves on a copy of the TIU table, so we could construct a TIU *location chart* from their data. Their data was compared with already assembled predictions. The process is described in detail in the next section.

Methodology for data collection

All the remaining teachers were classified by the researcher and placed on location charts in the same way as the selected teachers of the previous section. Then their feedback was collected in September 2001 (Appendix 7a) as a cross-check. The instrument was the complete TIU table (from Appendix 7b) and a pencil. They were asked to read through the TIU table and circle all the phrases with which they could identify. A pilot showed that the process was quite rapid and easily explained, taking less than ten minutes to complete.

Nine teachers were available and they were sent two differently coloured forms with identical versions of the TIU model, for simplicity labelled THEN and NOW, and asked to circle phrases they could identify with on each sheet at each of those times. Jerry at RS expressed interest and asked to participate, so his data are also included. The stages were simplified to Column A, Column B and so on, to minimise any distraction that the stage names might have caused. To improve the forms' prospects for return, it was decided to allow the teachers the maximum opportunity to show their development, if any, by allowing them to decide which years THEN and NOW

referred to. It was presumed that they would like to demonstrate their development and thus be more likely to provide the feedback, even though this might mean that their data did not exactly parallel the study period. More usefully, it may provide a grounded description of how long individual teachers' felt had been needed for them to progress from 'then' to 'now'.

Data results

Seven of nine staff and the RS Principal (a total of eight) returned their forms. The instructions were apparently clear as they were well filled out, and there was no evidence of confusion. One (Leanne) commented that things were changing at her school and that the pace of development had slowed; she indicated that there was not as much support as there had been. Two made minor suggestions on the content of the TIU table, which helped modify the model in Appendix 7b compared with the version that was originally sent out.

The reasons for the two non-returns are unknown. They were both from the same school as Leanne. One teacher had been rated as already quite autonomous (Nora) and one ranked as rather dependent (Olwyn). Both were described in this research as moving very little along the TIU typology (but for obviously different reasons) so perhaps their lack of progress contributed to their unreturned forms. More likely for Nora, if it were not some unrelated personal issue, was perhaps that the pressures mentioned by Leanne were widely apparent, and others were feeling dissatisfaction too, and somehow this affected her return.

To convert a person's marked TIU table to their TIU location chart simply required creating a small version of the table with the 12 empty cells, and colouring grey every cell with multiple pointers marked. Cells with only a single pointer tended to be disregarded, as a single pointer was not regarded as enough weight of evidence. Many more pointers could be constructed to exemplify each cell's characteristics, but it was decided that multiple pointers would be needed to provide confidence that the teacher was indeed feeling, understanding or performing at that cell's stage.

The complete record of self-rated and predicted TIU location charts for all the responding case teachers are provided as Figure 7-19 and Figure 7-21. The right hand side suggests the amount of match between the predicted and final location charts, as a percentage. A score of 100% would indicate no mismatches; a percentage

greater than 100 describes a teacher whose self-rating is higher than their predicted figure and one less than 100% represents a teacher who rated themselves lower than the predicted figure. Also calculated are the average number of years 'transition' (in other words between then and now) and the average variation between now (when they received the instrument, namely late in 2001) and predicted (at the end of 1999).

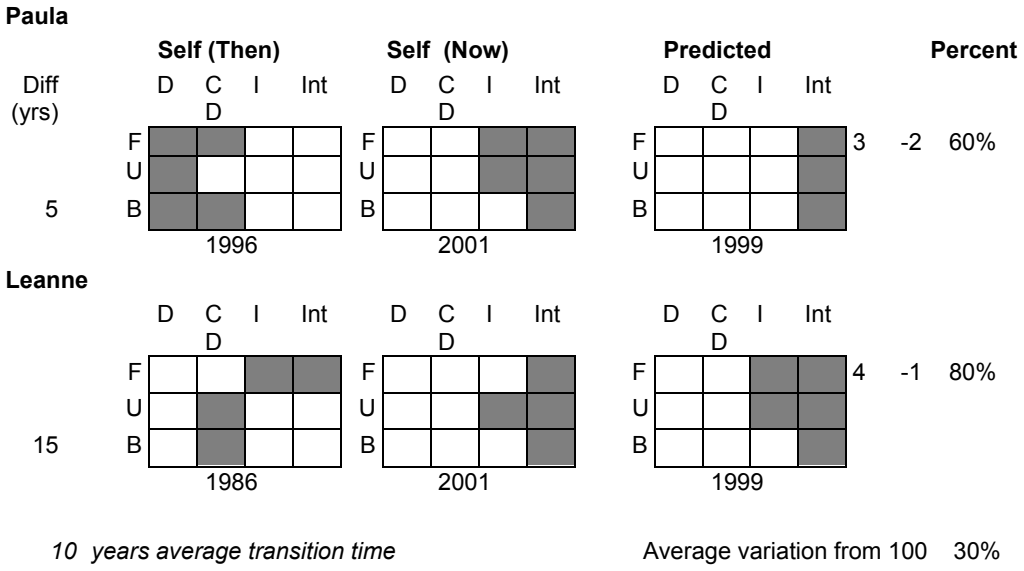


Figure 7-19: Self-rated and predicted location charts for NW teachers

Below is the similar data for RS elementary school.

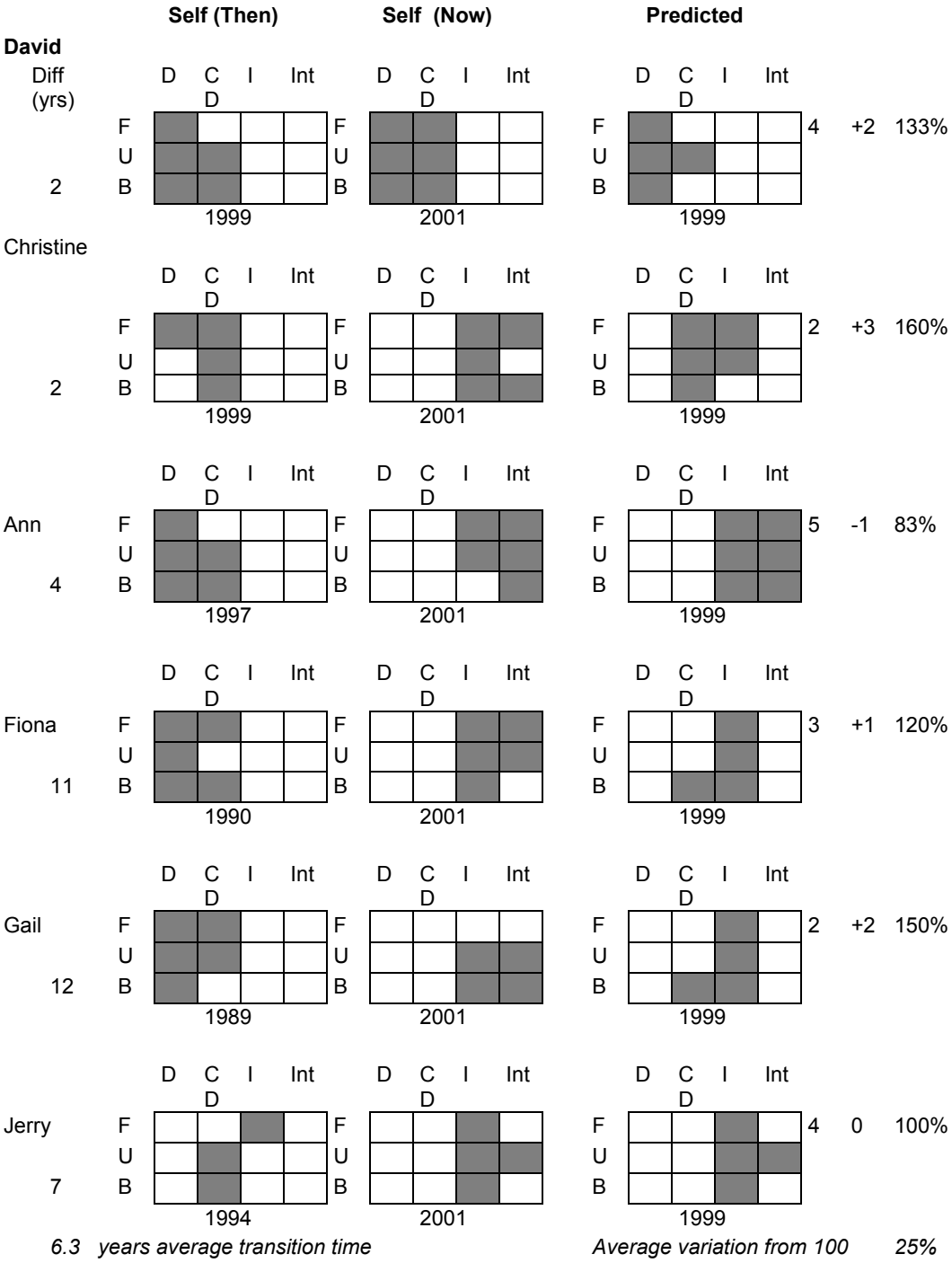


Figure 7-21: Self-rated and predicted location charts for RS teachers

In summary eight teachers provided a picture of their development with ICT uptake using the TIU instrument as their measure. Interestingly the average number of years between then and now was between 6 and 10 years, which provided some confirmation of the assertion from Chapter 6 about the overall stability of teachers' outcomes orientation and how slowly it changes for most people. It appeared that the

match between estimated and actual graphs of the teachers on their ICT uptake journey was reasonable for most of them. The level of mismatch between the research predictions and self-ratings for those who returned the forms averaged less than 30% over the two case schools. The variations and possible reasons for this are addressed in the following section.

Observations and conclusions

No teachers used only a single column, and only one circled pointers in more than two columns. This suggested that there was indeed some apparent congruence between the individual columns, since no teacher felt inclined to circle pointers over all the domains at any one time point.

The idea of development was evident since all of them had moved along the typology, based on the preponderance of pointers they chose in each time period. Most had apparently become interdependent, although David admitted that he had not moved far and was still in one of the dependent phases.

There was some significant measure of disagreement between the teachers' rating and their prediction for two teachers, namely Christine and Gail. Their figures of 160% and 150%) suggested that they significantly overrated themselves. They both rated themselves at one of the Independent stages. All of the mismatches were over-ratings of their apparent stage of development, compared with the predicted ratings. Two explanations are obvious, other than the possibility that the researcher was misjudging some of the teachers. If this were the case, then it suggested for example that there was more data than they had made available to the researcher and which had not been presented, or that the presented data could be re-interpreted. The counterpoint was the data itself, and the review process by trusted teachers at each school (Chapter 6), who confirmed that the research descriptions and ratings of the case teachers were fair and accurate.

The first explanation for this over-estimation was that those teachers were unable to see, or did not rate as significant, the shortcomings the research had identified. These included their reliance on ICT support, an inability to share resources and ideas with others, and an insufficient concern with their students' development compared with their own. Interestingly it was the same over-estimators (asked to self-rate their level of student-centredness, in Chapter 6), who were evident again here. The second

explanation was that their progress since the end of the research period had continued to mature. After all, everyone used the current year for their NOW table, which was perhaps 18 months or more later. This was regarded as a reasonable explanation for Gail, whose children were now older and who therefore had more time to devote to her teaching, PD and planning meetings.

For some teachers it was evident that an outside observer may be needed to improve the accuracy of the stage identification. This may be as simple as looking at the type and range of software used, or it may be that there is some other characteristic like the type of collaboration chosen, as delineated in Chapter 6.

7.5.5 Summary

These data from the member checking have shown that there was significant predictive value in the TIU model when used as an instrument in the way described.

7.6 Summary and Review

In summary this chapter has reviewed the third research question, which sought a simple and effective typology to describe teachers' ICT uptake. The typology originally proposed in Chapter 2 was shown to lack some critical features, which necessitated a further search of the literature. A modification of a typology from the literature on andragogy and autonomous learning was derived and shown to have application with the current data set.

A descriptive process then proceeded showing how many of the teachers fell within the model; the model was then validated through a member checking process. Firstly an instrument was developed based on the developed typology for ICT uptake (TIU) model, and although it was used with only a small sample, it was shown to have some value as a data source. In a pre-trial it took less than 10 minutes to administer and complete. Secondly, the model was sent to all the classroom-based teachers who were available as a cross-check. These steps have led to a verified and relatively grounded model of teacher development, which seemed to be both straightforward as well as credible for the teachers involved, and may be the basis for a simple and elegant tool to help PD design and support staff tailor their activities to the expressed needs of those completing such a form.

At the end of this development process that has produced the TIU model and confirmed some measure of its validity, there are still some interesting issues, some of which are unresolved. These are presented now as a series of observations, covering the issues of progress and lack of it along the typology and alternative ways to describe the typology.

This analysis begins with discussion of three topics which arose from the previous section, namely the significance of the different types of progress along the stages; the prospect of being trapped by different or mismatching support systems as teachers progress through the typology; and finally the need to re-interpret the concept of dual hurdles model, which was deprecated but not satisfactorily replaced.

Finally the significant points of the chapter are summarised in point form at the end.

1: Different types of progress along the stages

Different people appeared to have different domains that dominated their progress. This idea suggested that different types of development and professional support may be needed as teachers make such progress.

For people undergoing change in this three domain world, there was a fixed number of ways to show change. If change were evident by activity in two adjacent stages (or columns), then any one of the domains (ie rows) could be represented in both stages. It could be represented either alone or paired with another domain. In theory at least, activity in all three domains suggested they had reached stability and were no longer in change. Thus there were six obvious theoretical designs for those whose progress is apparently different in the three domains, in other words where teachers who used to be ‘stable’ at one stage, have now developed some spread across any adjacent stage in one or two of the three domains. These six types fell into two groups, and they are presented now.

There were three designs where one domain was ‘in the lead’. They are illustrated as figures a, b and c in Figure 7-23. The other three cases were where two domains lead. They were also an obvious theoretical possibility. There are of course more if the teacher covers more than two stages simultaneously. Conceivably, these latter three cases could also be regarded as ‘one domain lagging’, and both of these interpretations may provide useful insights. Nevertheless, even though both types of the six possibilities were observed in the previous section with selected case teachers

(and there seemed little doubt that these patterns would occur in broader populations of teachers as well), the first three seemed more likely to provide guidance for design of professional development activities.

One way to describe these three possibilities was a feelings-led, a understandings-led and a practice-led transition. For those with different domains 'in the lead', it seemed useful to hypothesise some different consequences for the different domain 'leaderships' most likely in terms of the types of support and the approaches to professional development that should be undertaken. These possibilities opened up a myriad of interesting avenues for further analysis. They will be touched upon briefly now, in a discussion of one teacher—David—who was classified as understandings-led, but were unfortunately beyond the immediate scope of this research.

	Dependence	Counter-Dependence	Independence	Interdependence
Feelings				
U'standings				
Behaviours				

Figure a

	Dependence	Counter-Dependence	Independence	Interdependence
Feelings				
U'standings				
Behaviours				

Figure b

	Dependence	Counter-Dependence	Independence	Interdependence
Feelings				
U'standings				
Behaviours				

Figure c

Figure 7-23: Three cases (figures a, b and c) representing three theoretical stimulants for a teacher in change with ICT uptake. The greyed cells represent multiple confirming pointers were identified for that teacher. Each figure implies a different domain is providing leadership in the change process, namely a feelings-led, understandings-led or a practice-led transition.

David was an example of an 'understandings-led' classification since his TIU location chart (Figure 7-9) was like Fig. b of Figure 7-23. It seemed reasonable to presume that this represented some evidence of change, since, for example, he had

bought a home computer, he had started to use e-mail, he joined this research study and he set aside time to talk with supportive people like Ann about computers in his classroom. The fact that his feelings and his practices were not yet rated in the same domain with his understandings suggested that he would need rather special professional development activities. It seemed likely that one-on-one support would be a critical need for him, to help address his frustration and nervousness, as well as carefully tailored and specific outcomes-based activities that appeal to his understanding of computers. He should get to choose the activities that he is comfortable with, from a range which all integrate with his current plans. Such options are often not available in standard professional development or teacher-training situations, yet David's location chart clearly suggested more personalised solutions were needed.

In summary it seemed evident that the types of support services warranted by teachers might be very different, even though they may appear to be at similar locations on a developmental scale of ICT adoption. This issue has not been explored in this research, but would suggest that the TIU model cannot simply be used as a quick rating scale, but that it would need rather more care in its interpretation and usage if it is to provide useful support for those planning tailored professional development activities for their staff.

2: Prospect of being trapped by different or mismatching supports

We already know, from the original work by Brundage & MacKeracher (1980), that appropriate support systems can lead teachers along/through their developmental typology and inappropriate ones can trap them at a stage. The criticality of support systems has already been established in Chapter 6. Now that the TIU model has identified a domains-based division, it may be that these differences were enough to explain some of the reasons for teachers becoming locked into a particular stage.

Consider the case of David, who was one person who has showed very little ICT development (See Figure 7-9), and who represented one in ten of the staff at one school. David showed very little development if his self-reported TIU ratings were taken as a guide (Figure 7-21). Perhaps the support system or support staff that he needed were mismatched for him, or perhaps his personal development had not yet

proceeded sufficiently to begin the joint progress, that is in both of the two interrelated topics of ICT improvement and process-outcomes needed.

This can be explained another way. A teacher's development is based on the two simultaneous factors of ICT skills and increase in understandings about student-centred learning. These two factors were integrated into the pointers in all the cells throughout the TIU model table, and unless a teacher was progressing along both these facets then it is possible to hypothesise that they would become stuck at one stage until enough equivalent development had proceeded in the other facet.

Thus the generated Typology and the teacher matching process undertaken above have illustrated that very different styles of teacher support and professional development could be justified for teachers at each of the different levels, and changing due to different combinations of domain leadership. This is simply confirmation of the original model from which it is drawn, but it extends the principle by offering some possible explanations for the differing success any non-tailored approach to support and professional development might have had.

Overall it seems that there are some possible explanations for the problem of teachers making little progress with ICT, when this TIU model is used as the analysis tool, if circumstances are akin to these instances of ICT uptake. This concept could warrant further investigation, as the problems of teachers making little or only slow progress in their ICT uptake and development is not a trivial one, as many people argue that David is not an unusual category of teacher.

3: The re-interpretation of the hurdle model

The dual hurdle concept has now been denigrated not because it was not realistic but because it appeared to be a poor explanation for teachers who were still approaching change. It was argued that teachers who had not yet made progress would find it difficult to identify with it. In prospect, novices saw a much more inhospitable outlook than a simple hurdle, which had explanatory power in a retrospective role only. Knowles' story from the start of this chapter (in S.7.1.2) was a reminder that the difference between prospect and retrospect can be immense. His explanation supported the observation that sometimes those who have 'made it' forget the forbidding complexity of the journey. For this reason any model presented as a hurdle or two, probably oversimplified the challenge. Note that this TIU model could

be regarded as only a hurdle if you consider the super-categories of dependence and independence as a binary distinction. But it also had multiple stages for those actually journeying through it.

It was argued that only in retrospect did the metaphor of a hurdle seem a satisfactory explanation. This helps explain why the TIU model attempted to integrate ICT uptake and learning development into every step of the typology. By separating these two critical but related components, one risks producing a fractured rather than holistic approach to the special challenge of ICT uptake by teachers.

7.7 Summary

1. ICT uptake is better regarded and introduced as another example of the change process—another learning topic, with its associated novelty—rather than a special case of a new and stressful topic unlike anything else teachers have met before.
2. Stages along the typology covered both (i) a changing orientation towards learning with ICT but also (ii) an equivalent decrease in their personal concerns about and need for support with ICT at the same time as there was an increasing learning orientation towards students. It was hypothesised and justifications were made that development along the typology occurs best when development occurred in both ICT skills and learning methodologies simultaneously.
3. Careful mapping of the range of feelings, pedagogy and behaviours using the indicators of Appendix 7b would appear to allow the determination of a teacher's location on the typology.
4. Some teachers noticeably over-represented their progress by choosing items further up the scale than an independent observer would choose for them under the same circumstances. This was especially evident for teachers who were not as advanced along the typology, but clearly sought to be. In fact, it could be that this was a measure of their very lack of progress, that they over-represented their progress. It was noticed that the very teachers who over-represented themselves in Chapter 6 on their level of student-centredness also overemphasised their progress here as well.

5. Whether the TIU model is presented as a typology or a hierarchy depends on circumstances. In a PD setting, the suggested interpretation for this model is as a typology even though it possesses several characteristics of a hierarchy. In other words individual teachers should learn to use all of the different stages when appropriate to their class, PD and support needs, rather than regarding any one method/stage as 'best.' This can probably only happen when they have actually passed through all or most of those stages themselves. The consequence is that teachers supplement and support their variety of relationships with their students and fellow teachers with different strategies as they are appropriate. From a PD perspective it may be politic to argue that no stage is preferred, instead all stages are useful at all times for collaborating teachers in the process of ICT uptake.
6. Considering that teachers and support staff may have a propensity to diminish the effort involved in ICT uptake using retrospective analogies like 'it's just a hurdle', then a further implication of the variability observed is that a school may need people at a range of stages to provide the support, collaboration and teamwork to allow progress for everyone in a support group.
7. The TIU model seemed to represent a reasonably inviolate set of stages that most people have to pass through, just like the other models from which it was derived. Some people may pass through any stage quickly or slowly, and other factors are also important, but any teachers who were asked to place themselves on the TIU model did not dispute the progression.
8. Relying on self-rating alone may not be accurate, since some teachers appeared to interpret their performance far less critically than an outside observer might. By adding some third party observations it should be possible to help fine-tune the approximate teacher rating on the TIU typology.
9. The concept of identifying whether teachers are feelings-led, understanding-led or performance-led in their changing whilst adopting ICT in their classrooms may be a useful analytical tool for those designing professional development and support activities.
10. Similarly, teachers and those who provide their support systems should consider carefully how they can address the prospect of becoming isolated or trapped by different or mismatching support systems as they progress through the typology.

11. The researcher's original Dual Hurdles model concept was presented, arguing that the average teacher may find that an explanation which works for those who have 'been there' may be less than satisfactory for those journeying towards, anticipating or even dreading the prospect of ICT uptake.

CHAPTER EIGHT

CONCLUSIONS

Introduction

This thesis has reported on an investigation into teachers' ICT uptake. In the study teachers were encouraged to use collaboration and an outcomes orientation as key parts of their support structure. Two schools were chosen for their normalcy after checking that they passed some selection criteria. The progress of teachers in those schools and their learning was reported during the semester-long investigation. The teachers had different inherent support structures, different levels of supportive interrelationships and different approaches to the use of the Student Outcomes Initiative. As a result they had diverse experiences with collaboration, and diverse experiences with outcomes as a principle. An understanding of their learning and development was gained through documenting the detailed story of the adults who were interested in ICT uptake. The study also presented a development typology that appeared to represent the teachers' progress towards sustained classroom ICT use.

8.1 Summary of the Study

This thesis has been organised into eight chapters. After an introductory chapter indicated the research aim, Chapter 2 reviewed the literature on ICT, collaboration, an outcomes orientation and the process of ICT uptake in schools. Chapter 3 presented the Research Questions and described the methodology that would be used to answer them, including the selection of schools and teachers. The teachers and their schools were introduced in the initial phases of the research in Chapter 4, which addressed the initial environment and the school settings. Each of the three research questions was then addressed in Chapters 5, 6 and 7. Often the technique of assertions was used to draw attention to specific issues which were highlighted by this research. Chapters 5 and 6 considered the contribution of collaboration and an

outcomes orientation to their overall uptake of ICT. Chapter 7 sought a simple, credible and easy-to-use characterisiation for ICT uptake.

This research investigated two groups of teachers from two elementary schools. Each group was interested in IT uptake and agreed to use collaboration and an outcomes orientation as a means to help them with their planned progress towards greater ICT usage in their class environment. They were encouraged to form teams, to meet on a regular basis, to plan outcomes-based activities which used ICT as a means of structuring the activities and to reflect on the process.

The context of their environment and the form of their activities were examined in detail through multiple research perspectives.

8.2 What Has Been Learned From This Study and its Implications

The major findings revolve around three research questions. These were:

How does collaborative activity support teachers' ICT adoption?

How does an outcomes orientation support teachers' ICT adoption? And

What typology of ICT adoption best discloses teachers' feelings, understandings and activities?

Each is summarised in order. As well as answering the research questions, there were further findings from this study. These are described as theory building, in that they are extensions or additions to the existing literature and were deduced during the research or the development of the thesis. The first was the extension of Fishbaugh's three types of collaboration into four. The second was the proposition of a model of ICT uptake that accorded better with the data presented in this research. Both of these were included within each of the research questions in which they arose as issues.

8.2.1 RQ 1:How does collaborative activity support teachers' ICT adoption?

The first research question aimed to look at the ways that teachers used collaborative activity to support their ICT uptake. There were four sub-questions used to draw attention to the value of collaboration:

- What forms of collaborative activity were identified?
- How did these forms affect teachers' willingness towards and views about ICT usage?
- How did these forms affect their teaching ideas/pedagogies?
- How did these changes manifest themselves in the use of ICT?

Answers to these sub-questions are summarised by the two figures (Figure 8-1 and Figure 8-3) and the following discussion.

After reviewing the data and considering ways of presenting the variations in collaboration which were identified, the continuum from Fishbaugh was chosen as an organiser. Fishbaugh's three types of collaboration were then extended into four, as shown over the page at Figure 8-3. A series of assertions were presented and argued for, each of which was intended to both answer the sub-questions and draw attention to some specific facets of the data collected. The assertions are collected below at Figure 8-1 below and then discussed in the next section.

Assertions on collaboration

Assertion ID	Assertion
5.1 Multiple collaboration types needed	Teachers using a combination of types of collaboration demonstrate significantly better ICT uptake
5.2 Formal teams may be counter-productive	Formalised teams may work against collaborative ICT activities rather than support them
5.3 Teachers can progress despite school settings	Teachers can make progress with ICT uptake regardless of collaboration or systemic support within their school

Figure 8-1: Assertions on collaboration and ICT uptake

Forms of Collaboration

Fishbaugh's three forms of collaboration seemed to fall into four types. As described in Chapter 5, essentially her Consulting form of collaboration divided into two types, Advising (requiring low commitment) and Mentoring (requiring a higher commitment). The four types of collaboration were then represented as a 2x2 table with one of the four types of collaboration in each of the four cells (see Figure 8-3). Two of the types involve high commitment and two involve low commitment. On the other axis are collaborations defined by the equality of the relationship.

Relationship / Commitment	Inequality/Non-peers (Consulting)	Equality/Peers (Sharing)
Low	Type1: Consulting- Advising	Type3: Coaching
High	Type2: Consulting –Mentoring	Type4: Teaming

Figure 8-3: Four asserted types of collaboration evident from the dataset and the factors which determine them

Perhaps unexpectedly, these collaborations can be with the same person. Sometimes a person can be the knowledgeable partner, and other times they can be an equally interested but un-knowledgeable collaborator.

The four types of collaboration identified in the figure are fluid and a person could use all or none of them in their interactions with others. Hence the interest was not on which type any single case teacher used but the variety, even though they may have a preferred type.

The thesis found that collaboration has both a process-oriented side—collaborating with someone—and a task-oriented side—collaborating around a task—and both were important. This research focussed on both the process side to help ease the stresses and the content side to encourage collaboration on the topic of ICT usage.

The effect of these forms on teachers' attitudes, understandings and ICT usage

It seemed self-evident that those with higher commitment were those who used the higher commitment types of collaboration. Less self-evident was the fact that the more successful ones were also those who were involved simultaneously in both peer and non-peer collaboration. For example they might use both Mentoring and Teaming collaboration. These issues were addressed by the assertions 5.1 to 5.3.

The consequences and significances of these assertions about collaboration

Assertion 5.1: Teachers using a combination of types of collaboration demonstrate significantly better ICT uptake

It was noted that the more successful teachers with ICT uptake were always involved in more than one type of collaboration, and particularly this included a peer-based and a non-peer based relationship. This could have consequences for colleagues, friends, peers and consultants working in ICT uptake who might need to attend to

building richer more multifaceted types of collaboration to ensure that they can provide multiple levels of support for each other and hence better ICT uptake.

Assertion 5.2: Formalised teams may work against collaborative ICT activities rather than support them

This assertion was based on the data that pre-existing teams (tandem pairs in this study) did not appear to help focus on collaboration over ICT activities, which may have been expected of them. The observation was unexpected but seemed significant as many administrators might expect them to be a satisfactory starting point.

A possible reason could be the fact that the sharing time that they spend together is already focussed on lower level administrative, record-keeping and student management issues. Thus there may be insufficient time to spare for the more developmental collaborative activities which are proposed as important or necessary for higher level issues like ICT uptake support. A theoretical model that assumes that tandems are fertile bases for collaboration seems not readily sustainable based on this study's data.

Assertion 5.3: Teachers can make progress with ICT uptake regardless of collaboration or systemic support within their school

It is not easy to predict who will make progress and who will not with ICT uptake. There are many factors constantly impinging on the working and personal life of any professional, and teachers are no different. As professionals, teachers may feel the need to make progress on the topics that are brought to light by DoE(WA) initiatives, their Principals and so on. The circumstances that determine ICT uptake are not easily categorised.

8.2.2 RQ 2: How does an outcomes orientation support teachers' ICT adoption?

The second research question aimed to identify any connections between a teachers' outcomes orientation and their ICT uptake. Again four sub-questions were addressed:

What forms of outcomes-based activities were identified?

How did these forms affect teachers' willingness towards and views about ICT usage?

How did these forms affect their teaching ideas/pedagogies?

How did these changes manifest themselves in the use of ICT?

The forms of learning outcomes-based activities and associated evidence of an outcomes orientation were summarised using a typology from Costa & Garmston (1998). Then as an organiser for the analysis section, a set of assertions about outcomes orientation were developed and argued for. These assertions summarise the answers to the issues raised by the sub-questions listed above

Forms of outcomes-based activities

The first of the sub-questions concerned the various forms of outcomes-based activities identified. Costa & Garmston (1998) provided the basis for the classifying of outcomes into types. Their basic hierarchy is provided as Table 8.1.

Table 8.1: A hierarchy of outcomes (Costa & Garmston, 1998)

1	outcomes as activities
2	outcomes as content
3	outcomes as processes
4	outcomes as dispositions and
5	outcomes as mind states.

Criteria were identified to help locate the teachers on this hierarchy. Overall at NW there were more process-classified case teachers than any other type. At RS the distinctions were not as clear, as there are roughly equal numbers of people rated as Content-outcomes oriented, Process-outcomes oriented and both.

The effect of these forms on teachers' attitudes, understandings and ICT usage

The division of outcomes into different forms allowed some investigation of the differences between the teachers in the two case schools. Some of the differences were attributable to wider or systemic characteristics of the school and its environment; others were more obviously related to the teachers themselves.

more of the teachers classified as process or both outcomes users chose content-free software tools;

process outcomes users seemed to make more use of ICT at school than at home—a relatively counter-intuitive observation worthy of investigation;

software usage scores are often associated with what were defined as Content-free software tools rather than the content-rich educational software;

The software type a teacher used seemed to be largely determined by the structure of the school they worked in or the support system they had available to them.

Assertions on outcomes activities

These and related issues were addressed by the assertions of Figure 8-5, which were used to highlight the major trends in the data. They are summarised below.

ID	Assertion
6.1 stability of orientation	Teachers' outcomes orientations are relatively stable.
6.2 process-centric preference	Teachers perceive a more process-centric outcomes orientation to be desirable
6.3 support determines software	The level and quality of support influences software types chosen
6.4 software affects outcomes	Use of content-free software/hardware encourages more (process-centric) outcomes thinking
6.5 resourcefulness	Teachers using process-centric approaches overcome impediments to their ICT usage more easily

Figure 8-5 Outcomes orientation assertion list

The consequence and significances of differing outcomes orientations

The assertions about outcomes orientation were used to present and examine the consequence and significance of differing outcomes orientations of the case teachers.

Assertion 6.1: Teachers' outcomes orientations are relatively stable:

The study provided consistent data that teachers' outcomes orientations are relatively stable or change relatively slowly. There were many examples that demonstrated little change, and the few apparent changes were shown to not be substantial contra-indications. It was originally expected that some changes in outcomes orientation may be detected over the study, and even though many changes in other related factors were noted, nevertheless no major changes in outcomes orientation were identified.

Assertion 6.2: Teachers perceive a more process-centric outcomes orientation to be desirable:

Findings from the study suggest that teachers regard a process-centric outcomes orientation as more desirable than any content-centric one. There was both top-down pressure as well as some bottom-up pressure to consider the advantages of such a

process-centric outcomes orientation. The pressure had been sufficiently successful for even some content-oriented teachers to re-cast their own activities in a more outcomes oriented light. It was obvious that every teacher in both case schools detected a strongly sanctioned desirability for their teaching style to embody a process-centric outcomes orientation.

Assertion 6.3: The level and quality of support influences the software types chosen:

Good support systems and support staff can influence the types of software that teachers learn to utilise, and poor support or lack of support can throw teachers back onto their own, possibly very limited, resources. It would seem that the breadth and strength of support provides opportunities for teachers to re-evaluate the types of software they use, and increasingly to consider more open-ended and process-rich types of software. No other factor seems as likely to be the reason for teachers to reconsider or reflect on their usage of something as complex as ICT, as rich and collaborative support systems.

Assertion 6.4: Use of content-free software/hardware encourages more (process-centric) outcomes thinking:

The use of content-free software was associated with greater variety in the way such teachers approached their work. At the same time teachers who made greater use of content-free software were also making greater use of outcomes thinking in their teaching and learning programs, and it seemed reasonable to deduce a connection between these factors. Most of the available evidence suggested that, for most teachers, it was the usage of the content-free software that preceded the changes towards a more outcomes oriented thinking approach.

Assertion 6.5: Teachers using process-centric approaches overcome impediments to their ICT usage more easily:

When difficulties occurred with ICT, the different levels of resourcefulness were instructive. There seemed to be evidence that their different reactions were to some extent determined by their outcomes orientation, specifically that content-centric teachers were much more likely to be flustered or stressed by even quite small problems with ICT. Process-centric teachers on the other hand were much more

likely to demonstrate flexibility and resourcefulness when they had to overcome some impediment to their progress with ICT.

8.2.3 RQ 3: What typology of ICT adoption best discloses teachers' feelings, understandings and activities?

The third research question aimed to identify a typology concerned with ICT uptake that was credible and simple. The sub-questions posed were two:

- How do teachers describe their sequence of ICT uptake?
- What observable behaviours indicate teacher progress?

The collected data were presented in Chapter 7 to address these sub-questions, and is summarised below.

Teachers' descriptions of sequence in ICT uptake: Of all the teachers, only one described an ICT uptake sequence of consequence—a three stage hierarchy simply called the 'Me, Them and Us' stages. Few teachers described any sequence to their ICT uptake, which was taken as an indicator that most of them had either not made significant progress, or else they had not reflected upon it sufficiently to suggest any patterns in their ICT uptake process. Although much data was available, it probably represented teachers in the process of moving through only a single stage or two of some hypothetical model, and so perhaps the transitions were not yet obvious to them.

This suggestion led to the reconsideration and finally the rejection of the uptake hierarchy introduced in the original literature review. The original was based on one of the ACOT models from Sandholtz, Ringstaff, & Dwyer (1997) . It was rejected, as it did not seem to accord with the data as well as the proposed model. By this stage it was felt that the others' development may not have accorded well with the originally proposed ACOT model. This led to a further review of the literature, this time focussing on the adult learning rather than technology uptake, and that review led to the model described in Chapter 7 as the TIU model, based on typologies like that proposed by Boud (1988). Eventually the proposed three stage hierarchy was incorporated into the final four stage typology which was judged as more consistent with the collected teacher dataset.

Observable behaviours and teacher progress: It was concluded that it was advantageous to categorise more than just teachers' behaviours in the model of

uptake, and that one should be developed which considered feelings and understandings as well. These three domains—feelings, understandings and behaviours—had been identified already and were already coded into the NUDIST® database. They also represented three domains of human activity identified by Benjamin Bloom and his associates over four decades ago (Bloom, Engelhard, Furst, Hill, & Krathwohl, 1956), updated many times and arguably still relevant (Krathwohl et al., 2001).

The final model was an extension of models of learning from the adult learning literature (eg. Boud & Griffin, 1987; Brundage & MacKeracher, 1980; Russell, 1995) interpreted and adjusted for the current situation, and adding phrases where appropriate to give voice to the teachers' expression.

The model, summarised in Figure 8-7, is an easily used and readily identifiable model of teacher development with which teachers themselves could identify.

STAGE / DOMAIN		Dependence	Counter-dependence	In-dependence	Inter-dependence
Feelings	Feelings, attitudes				
Understandings	Pedagogical concerns				
Behaviours	Observations, practices				

Figure 8-7: Layout for theoretical model of teacher ICT uptake development

A process of member checking was undertaken in September 2001, when all the available case teachers were asked by post to place themselves on the model. Their returned ratings were compared with the researcher's own estimates and—as described in Chapter 7—found to be reasonably consistent, with an average of 70% agreement with the returned teachers' ratings.

8.3 Significance Of The Study's Results

During the period of this research there appears to have been no reduction either in the pressures for schools to provide more computers and related ICT or on teachers to show increasing facility with them. The purpose of this study is still relevant, namely to reaffirm the value of a professional development approach that justifies the use of collaboration and a focus on outcomes as one means to develop teachers' ICT usage and hence improves their uptake in an educational setting.

8.3.1 Factors contributing to ICT uptake

This study has shown that a number of factors can contribute to the successful use and sustained uptake of ICT in schools namely collaboration and an outcomes orientation. Each of these factors is examined in more detail.

Collaboration

Considering collaboration and its value as a support for teachers and other school staff, three factors identified by this study as important were:

the school environment;

the personal characteristics of the individuals involved; and

the breadth and depth of collaborative types used.

Also the study observed that Fishbaugh's (1997) three forms of collaboration could be usefully extended in this set of school environments to become four types. These were re-assembled as a 2 x 2 table whose underlying characteristics were described as the Level of Commitment (High or Low) and the Type of Relationship involved (peer or non-peer). Specifically it was found in this study that:

those teachers who were able to use both peer and non-peer collaboration in their day-to-day ICT work were much more likely to make progress than others;

that collaboration in this research seemed to involve a stress-reducing component as well as support structure component for ICT uptake; and

the greater their level of collaboration the greater was their likely success in ICT uptake.

The second of these observations may be self-evident but as Lin et al reminds us in Wilson [, 1996 #377], collaboration is so pervasive that it is easy to overlook its importance and simply presume its existence. By highlighting the spoiling role that unsupportive teachers can play, this study illustrated how ephemeral presumed collaboration could be.

An outcomes orientation

The use of an outcomes orientation was seen as a subtle factor akin to a fish not seeing the water in which it swims. Two teachers could run the same activity but achieve different ends depending on their outcomes orientation. Considering the

value of a focus on outcomes for teachers attempting ICT uptake, the identified factors which contributed were:

the need for recognition of the stability of teachers' outcomes orientations;

the existence of a hierarchy of outcomes leading to more process-centred outcomes;

the contribution that outcomes-oriented support can provide;

the value of content-free software;

the increased confidence to address local and specific problems that develop as a consequence; and

the perhaps counter-intuitive result that process-centric teachers (in other words those with a greater process-outcomes orientation) were identified as those whose classroom use was greater than their personal use.

8.3.2 A model of ICT uptake

This study developed a model of ICT uptake called the TIU (or Typology for ICT Uptake) model. It was a simple tool that used the three domains of feelings, understandings and behaviours to suggest:

that four stages were identifiable in the longitudinal process of ICT uptake;

that increasing stages represented increasing development in two attributes simultaneously, namely a learning attribute and an ICT skills attribute. The specific learning attribute was a process-centric outcomes orientation;

that a change of stage occurred when a dual readiness had developed in skills towards increased autonomous ICT usage simultaneously with improving skills in supporting students towards their own autonomous learning;

that the type of support needed at each stage was qualitatively different;

that teachers more concerned with process outcomes seemed to make more use of ICT at school than at home—a relatively counter-intuitive observation worthy of further investigation;

that it was possible for teachers to seriously overestimate their own location on the stages; and

that because consistency across feelings, understandings and behaviours would suggest stability within a stage, then a corollary was that simultaneous membership of multiple stages would imply that they were in the process of changing stages. Such teachers would also need different support structures at such times.

8.4 Limitation and Recommendations For Further Research

In the course of this study there have been questions raised which were beyond its scope; nevertheless they are either relevant as extensions of this study or useful as confirmation possibilities. These are listed below as issues that could be investigated for further research. The end of the study is also a time for reflection upon its limitations, both methodological and practical.

8.4.1 Limitations

Lincoln & Guba (1985) take the view that trustworthiness in research represented findings that do not claim to be able to be replicated, nor are they samples of a general population, simply a purposive sample that does not claim generalisability. Such a restricted view of the value of qualitative research is less rigorously enforced in more recent literature.

Miles & Huberman (1994) argue that because the sampling in qualitative research is theory driven, then one could expect that generic processes could be generalised towards new or existing theories (1994, p. 28). Under these circumstances the results from this study could be considered as contributing to our understandings about the research problem about collaboration, outcomes orientations and ICT uptake, without necessarily expecting them to represent the exact proportions or the issues in the same proportions as the populations of elementary school teachers involved in ICT uptake.

Ultimately researchers and readers have a challenge when interpreting qualitative research that does not apply to quantitative research, since ‘there are no operationally defined truth tests to apply to qualitative research’ (Eisner, 1991, p. 53). In the end each reviewer of qualitative research has an opportunity to make a pragmatic judgement about its value, or natural integrity, which the quantitative research paradigm tends to hide by its emphasis on quantification. This will not be a generalised conclusion but a personal or even a joint one, suggests Patton.

> Pragmatic validation {of qualitative research} means that the perspective presented is judged by its relevance to and use by those to whom it is presented: their perspective and actions joined to the {researcher's} perspective and actions (Patton, 1990, p. 485).

It is the researcher's belief that individuals will take as much from their reading of qualitative research as they want. This research suffers from the same weaknesses as any real research but no more, and will be a useful contributor to teachers' ICT uptake if a reader finds it personally believable. As Donahoe (1993) argued about schools, 'Nothing we do causes change, it just makes it possible' (p. 303). This research could extend the possibilities.

8.4.2 Recommendations for further research

A total of seven issues that could be investigated further are described.

1 To investigate whether it was an artefact that the highest rating process-outcomes teachers, who were rated as exhibiting the most desirable of teaching traits, were seen to be the only ones to make more use of ICT at school than at home.

2 The restricted timeline of this study was considered both an advantage and a disadvantage at the beginning. A beneficial next step could be to investigate whether more time would strengthen the useful findings. As intimated in earlier chapters, this may reflect on the types of support that collaboration provides, but it hasn't been resolved in this research.

3 To investigate the applicability of the TIU model to teachers in other schools, districts and institutions. It seems likely that there is nothing unique about the model other than its adaptation to an ICT environment, so it may be that the model could help classify ICT-adopting educators in different situations including secondary and tertiary institutions and therefore help identify their likely training and support needs.

4 To investigate whether it may be easier to translate the TIU model as an instrument from its current table form into a questionnaire. By presenting the items in random order rather than the obvious structured pattern currently used one could reduce the opportunity for guessing and perhaps the willingness to overestimate their location, which was surmised for a few teachers in this study.

5 To investigate the consequences of the classification of collaboration into types based on the two factors Levels of commitment and Equality of relationship and their individual usefulness as predictors of ICT uptake progress. Earlier chapters

suggested that this may reflect on the type of support that collaboration provides but the issue has not been resolved in this research.

6 To investigate whether details of the types of support needed can be clarified for teachers during their change journey. We already knew that their needs were different at different stages, but it may be that specific support structures relevant to the stages of ICT uptake that are not commonly used in schools, will prove necessary.

7 This research considered the two discrete elements of collaboration and outcomes orientation and carefully ignored any interaction effect between them. Further research could investigate whether this ignored some possible significant consequences. For example there may be some useful symbiotic effects involved because they are treated together.

8.5 Concluding comments

It has been my privilege to work with a small group of committed teachers who would like to make a difference in their students' lives and who were prepared to share their work, their thoughts and their attempts at improving their ICT uptake. In their interests and the interests of those who follow them, we have a challenge to make teachers lives easier as well as their students. The stresses that they perceive are not diminishing and their own expectations can make their lives difficult or bearable. By considering the questions addressed in this research we may be able to improve their environment, with consequences for both teachers and their students.

Like any research, this study has raised more questions than it has answered, but it has achieved its aim of illuminating some of the development processes for teachers undergoing ICT uptake in elementary schools in Western Australia. The process of disseminating the valuable parts of these findings is the next challenge, using approaches already identified by Miles & Huberman (1994, p. 306).

The aim of this research was to encourage teachers to take an active role in their adoption and increased usage of ICT as a tool in their classrooms, not because of outside pressures but because they wanted to. If the experiences of the teachers from this study are any guide, the process of ICT uptake is difficult and long. Good

support, however, based around collaboration and a focus on learning issues like Outcomes, seems destined to build more success for teachers.

APPENDICES

(see separate document for appendices 1 to 7)

APPENDICES

1. Ethics clearance forms
    a. Cover letter
    b. Permission & preferences form
2. The Seven Big Principles (suggested approach for this PD initiative).
3. Final Survey Questionnaire form – attitudes, usage and summary views on ICT
4. Suggested team program ideas
5. Quantitative data collection summary
    a. Base data including EoC scores
    b. Software usage (Q1-8 responses)
    c. Views on ICT (Q9-12 responses)
6. Semi-structured interview schedule
7. ICT uptake via ADL model: member checking September 2001
    a. Instructions
    b. ICT uptake table full version

APPENDIX 1 a
ETHICS COVER LETTER

EDITH COWAN UNIVERSITY
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Research project: Teachers, teams and technology
Researcher: Barnard Clarkson
Supervisor: Dr Rob Oliver
August 1999 - June 2000

Dear colleagues

Participant Approval of Research Project

As you know I am conducting research with teachers who are adopting technology.

My research project wants to investigate whether computers and information technology can make schools better places for students to learn, and teachers to work. We are interested in the myriad ways computers are used and could be used in schools to help you do your job, and to look for ways to reduce the stresses of the job at the same time.

In a nutshell, the project can be summarised like this: we are asking a few schools to join together for a two or three terms, and see if the Education Department's priorities of learning technology and outcomes can be combined with some overarching principles to reduce the stresses and increase the satisfaction for teachers and their pupils.

This research will follow approved ethical procedures. The survey form and permission slip below are the first steps in the data collection process which has been approved by the Edith Cowan University Ethics committee. Your individual survey results will not be released to any third party without your consent; they will simply be combined with others to give summaries. Pseudonyms will be used to protect you and your school, and collected data will be kept in a locked office. Ring me any time if you have questions.

With your permission it would be useful to arrange interviews and some observations of you and your teams over the next few months. If you change your mind at any time and wish to withdraw for any reason, then that is fine. There is absolutely no obligation to participate in this research.

Since you are already asked to give your professional service in your school, this project wants to help you and your school focus your efforts more fully on the priorities of outcomes and technology. In large measure it will be your research where you as teams choose the topics and activities.

Could you please complete and sign the following approval document, so that I can allocate you a research member code.

Barnard Clarkson
School of Communications and Multimedia. Phone 9370 6069

JOONDALUP CAMPUS
100 Joondalup Drive, Joondalup
Western Australia 6027
Telephone (08) 9400 5444

MOUNT LAWLEY CAMPUS
2 Bradford Street, Mount Lawley
Western Australia 6050
Telephone (08) 9370 6111

PERTH CITY CAMPUS
Pearsall Building, Third Floor
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CLAREMONT CAMPUS
Bagshaw Road, Claremont
Western Australia 6010
Telephone (08) 9442 7333

BUNBURY CAMPUS
Robertson Drive, Bunbury
Western Australia
Telephone (08) 9780 7777

APPENDIX 1 b
PERMISSIONS AND PREFERENCES FORM

Participation in Research Project Form

Teachers, teams and technology

Name:_____ Forename:_____

School:_____

Year group taught:___ Full-time or tandem? F or T If tandem, proportion (%)? ____

Specialisations (eg Art or IT specialist)?_____

I understand that it may involve an extra time commitment of up to a few hours a week or fortnight. I will apply to have these count towards my Professional Development for this year. My best days are (please number your choices from 1, best, to 5, worst)

	Monday	*Tuesday*	*Wednesday*	*Thursday*	*Friday*
Before school					
During school					
After school					

Although it may not be possible, I would be happy to have on my learning team some of the following:

_____, _____, _____

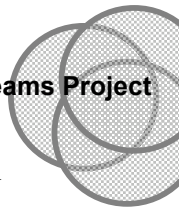
My preferred learning team size would be (circle one): 2 3 4 5 other:____

I have been informed about this research aimed to help teachers adopting technology in their classrooms. I am interested in participating (please sign here).

_____ Date:_____

APPENDIX 2
SUGGESTED APPROACH TO PD DESIGN

THE SEVEN BIG PRINCIPLES



Here are the ‘’seven ‘big principles’ of the SpokesTeams Project. They are usually explained at the introductory presentation, so the notes below are intentionally brief — reminders rather than explanations. Ask or email if you would like to discuss them or improve them!

1 We are on a journey - make it fun

Don’t postpone gratification ‘til the end — it’s too far away

Change as a gap is misguided, reality is more developmental; a series of steps

Understanding develops as we progress; let it flow

2 PD should reduce needless pressures

Our expectations set pressures, so do not evaluate too much in the beginning

We all need some pressure (— but not this much?)

Collaborating provides both SUPPORT and PRESSURE

Look for overlaps between your learning teams and your student activities, eg. seek more‘congruence’ between your activities.

3 Learning (and assessment) FIRST

We are all doing this for different reasons, but there is one underlying purpose

For motivation, constantly remind yourself of all the reasons you are doing this…

4 Aim high, but start small and local

You need to fix on both short and long term goals

This is too complicated to expect a single approach to work

Celebrate your progress, no matter how large or how small

5 Embrace complexity AND simplicity

Look for rich but simple explanatory tools (eg hopefully the ‘3 Spokes’ are)

Consider both the learning and also the meta-learning, together

Welcome both practical and philosophical thoughts as you progress. Consider adding them to your reflective journal

6 Collaborate with your communities

Reach out to your ‘publics’

Collaboration is **not** just working as a group, but supporting, acting interdependently, sometimes listening, sometimes encouraging, always caring

7 Find time for someone else in all this

If you have multiple aims, let them include others too

Consider both your professional and personal needs

APPENDIX 3
FINAL SURVEY QUESTIONNAIRE FORM

Name:_____ School: _____ Date:

Final Survey

Our attitudes towards, as well as our usage of, learning technologies are important. Regular sampling can help track our progress. This survey should again take only a few minutes. First reactions please.

For each question, first circle Y or N, then place TWO letters for each question: use a **P** to indicate your personal usage, and **C** to indicate your classroom usage of the tools mentioned on each line below.
An example with pencils is answered already for some random teacher.

USAGE OF…	Appropriate for my grade	No access	Not trained	Once a term	Once a month, more	Once a week, more	Many times a day
Pencils (example)	(Y) *N*				*P*	*C*	
1 Word processing	Y N	____	____	____	____	____	____
2 Spreadsheet applications	Y N	____	____	____	____	____	____
3 Educational software	Y N	____	____	____	____	____	____
4 Using Internet for research	Y N	____	____	____	____	____	____
5 Using Internet for banking etc	Y N	____	____	____	____	____	____
6 Using Internet for games	Y N	____	____	____	____	____	____
7 Sending e-mail	Y N	____	____	____	____	____	____
8 Designing web pages	Y N	____	____	____	____	____	____

Place **both** a P personal use, and C (class) usage on **each** line

Views on technology and learning (tick one box per line)

	Strongly agree	agree	disagree	strongly disagree	*unable to comment*
• 9 It is important that IT is a regular part of the way students learn.	❑	❑	❑	❑	❑
• 10 My personal use of IT is changing my assessment practices.	❑	❑	❑	❑	❑
• 11 I believe that access to sufficient technology will change the way I teach .	❑	❑	❑	❑	❑
• 12 Learning teams of teachers seem a satisfactory way to help adopt technology.	❑	❑	❑	❑	❑

Summary (tick one box per line)

	Enthusiastic	Positive	Tentative	Negative
My attitude towards Information Technology (IT) is	❑	❑	❑	❑
I estimate my students' attitudes overall are	❑	❑	❑	❑
	Considerable	Satisfactory	Limited	None
The level of progress I have made with IT since JULY 1999 is…	❑	❑	❑	❑
The level of progress my school has made with IT recently is…	❑	❑	❑	❑
My view is that the proportion of teachers making good use of IT in WA schools is…	90%	70%	30%	10%

Please elaborate below on any answer or comment on any changes you've noticed:

APPENDIX 4
SUGGESTED TEAM PROGRAM IDEAS

Micro activities

Some for teachers, some for students. You decide. If they are rather cryptic, just ask your librarian, your ICT coordinator or me for more detail. Modify them to suit!

- Writing: Generate three supportive media releases about the school for the Principal to send to all the local newspapers. Then ask the Principal to send them…
- Design an activity for your class that uses a content-rich computing tool (eg. Encarta; Dinosaurs database; Swan River Settlers database; SimCity simulation game)
- Debate: Take the topic *Schools - Factory, babysitter or tribal centre?,* gather some critical readings, and arrange a class debate
- 'Fold your way to the Moon'. Ask your librarian about this problem-solving activity, which motivates introductory spreadsheet use.
- Ask your librarian for an activity that uses a content-free computing tool (eg. spreadsheet, word processor)
- Arrange to visit another teacher's class at the time they are doing some pen-pal activities (eg. a CUseeMe video camera session) with their partner class overseas.
- Visitors: Invite the Minister for Education to your school to see your latest learning technology project. Plan the visit. Then do it.
- Cross-marking of student scripts. Spend some time reflecting on the errors students make in their work. An outsiders view can be very useful for both parties.
- Workshop: How to collaborate (Notes from Catholic Education Office, ask for a copy)
- Ways to use e-mail for collaboration in class.
- Visitor – Have a teacher visit and talk about their experiences arranging overseas pen-pals for their class
- Design a presentation for a parents evening on a recent class project, or the Outcomes initiative or Constructivism.
- Web searching Skill level 0: Design an activity to show what you know to some novices, about web searching.
- Use reflective journals in class for a week
- Ways to use XYZ software (pick one of your favourites) to address deep learning and problem-solving in your class

Macro activities

Divided into categories *SelfStudy, BookClub, Community of Practice (CoP)* and *WebHunt*. These are suggestions meant to provide guidance not a straitjacket; re-arrange the activities anyway you like to follow the overarching principles, to achieve the purposes of improving self-knowledge, and your collaborative team. At all times you are trying to extend your technological and pedagogical boundaries.

Book club: Read the recent research article Effect of collaborative action research on the knowledge of 5 Canadian teacher-researchers. Reflect on the results with your team.
CoP: Find out how to subscribe to a ListServer. Subscribe to a education-oriented maillist, eg. EdSightings; e-chalk; blueWebn; FunBrain; Planet Innovations. Introduce yourself and participate for a month or more.
SelfStudy: Take the technology profiler test at http://profile.scrtec.org/profiler; reflect and discuss with your team.
WebHunt: Research the generation www.Y (see http://www.4teachers.com ?). What are its principles and how relevant are they for 'modern' teachers and 'modern' technology?
CoP: Research about them then join a CoP who will send you regular updates of PD and online activities (eg Tapped-In; SRI, PlanetTech, etc. Make notes in your reflective journal about the experiences.
BookClub: Get together and read McClintockës Power and Pedagogy: Ch. 1. (Search for ILTweb and Robert McClintock). Design a class activity based on this material.
SelfStudy: Read the EdWA book 'The teacher-researcher' for ideas on action research.
CoP: Do a survey on collaboration and learning style (eg I found one recently at this site: http://www.howtolearn.com/cgi-bin/list.pl). Review the results with your team.
WebHunt: On whether the spell-checker should be on or off during writing for your grade level of students.
CoP: Research 'Writing your own pointers' using the literature eg. Hannan & Ashendon, Curriculum Corp., 1996.

APPENDIX 5 a
BASE DATA INCLUDING EoC SCORES

Base Data including EoC scores

Base data collected, including EoC scores

Pseudonym	at	Form	Yrs Tch?	Interview date	Intv'w ~length	Init Survey date	Final Survey date	Final (re-test)	Diary entries (various)	Journal handed-in	Jnl size	EoC1 score	EoC2 score	Con't or Student-centred? 0- 10+	my est-imate /10
Leanne	nw	IT & 5	20	29/10/99	4 pages	Sep-99	17/12/99	y	y	Jan-00	1 pa.	4	-	est. 8	8
Maya	nw	IT&Art	8	20/8/00		Sep-99	20/12/99	n	n			19	14	9	7
Nora (aD/P)	nw		3	20/12/99	5 pa.	Sep-99		y	y	Dec-99	3 or 5	3	-	7	7
Olwyn(D/P)	nw		1	30/12/99	2 pa	Sep-99	17/12/99	n	n			6	-	5	2
Paula	nw	3/4	28	20/12/99	5 pages	Aug-99	Dec-99	Dec-99	y	Dec-99	3 or 5	6	-	10	9
Ross(aP)	nw	6 >a/P	25+	13/10/1999	3 pages	Sep-99	17/12/99	n	n	-		0	-	5	
Wendy	nw														
Sam	*nw*	*Principal (2000+)*					*1/7/00*								
												Avg	6.3		15
												I-Q range	2.75		
Ann	rs		2	35	29/10/99	6 p.	21-Oct-99	17-Dec-99	yy		Dec-99	25 pa.	-4	10	est 8	8
Brenda	rs		4	18	15/12/99	2 pa			y		Dec-99	-	9	-	5	4
Christine(aD/P)	rs		7	30	22/11/99	4 pages	11-Oct-99	11-Dec-99	yy		Feb-00	11+ pa.	6	10	7	3
David	rs		3	14	8/12/99	5 pages	12-Oct-99	17-Dec-99	y				-14	-15	est 3	3
Evelyn	rs		1	23	10/11/99	4 pages	11-Oct-99	01-Dec-99	y		Dec-99	2 pa.	-1	4	est 7	7
Fiona	rs		6	13	26/11/99	5 pa	12-Oct-99	17-Dec-99	yy		Dec-99	2 or 3	8	18	est 6	6
Gail	rs		6	16	24/11/99	5 pa	11-Oct-99	17-Dec-99	late dec9	yy	Dec-99	3 - 5	3	15	est 6	6
Heather	rs	lib		27	2/12/99	4 pages	12-Oct-99	28-Jun-00	y				11	7	est 5	5
Jerry	rs	prin		22	3/11/99	3 pages	12-Sep-99	17-Dec-99	yy		Dec-99	1 pa.	4	14	est 5	5
Iain	rs		5				12/11/99	17-Dec-99	n							
Lewis	*rs*	*D/Principal (2000+)*														
												Avg	2.4	7.9	-3
												I-Q range	9	8	

NOTE: New staff (in italics) are not included in calculations

Appendix5a-Raw data

APPENDIX 5 b
SOFTWARE USAGE (Q1-8 RESPONSES)

Software Usage (Q1-8 responses)

Responses Q1-8, Software usage

		Type most used w. students	WP	ss	Ed sw	Inet rsrch	Inet bank	Inet game	e-mail	web site dsgn	Total: students' usage	
NW1	Leanne	WP	5	3	4	4	n	n	3	4	23	
NW1	Nora	WP	5	3	5	4	n	0	4	2	23	
NW1	Maya	WP	5	3	3	3	n	n	0	3	17	
NW1	Paula	WP	4	3	4	3	n	n	2	0	16	
NW1	Olwyn	Ed sw	3	2	4	2	n	n	1	n	11	
NW1	Ross(a/P)	WP	3	1	2	3	n	1	2	1	10	
NW1	Wendy	-									0	
											14.3	avg
NW2	Leanne	WP	5	3	4	4	n	n	3	4	23	
NW2	Maya	WP	5	4	5	4	n	n	2	3	23	
NW2	Nora	WP	5	3	4	4	n	0	4	2	22	
NW2	Paula	WP	4	1	3	3	n	n	2	2	14	
NW2	Olwyn	Ed sw	3	2	4	0	n	n	1	n	9	
NW2	Ross(a/P)	-	0	n	n	0	n	n	0	n	0	
NW2	Wendy	none									0	
											15.2	avg

		Type most used w. students	WP	ss	Ed sw	Inet rsrch	Inet bank	Inet game	e-mail	web site dsgn	Total: students' usage	
RS1	Christine	Ed sw	4	0	5	4	n	n	4	n	17	
RS1	Gail	Inet rsrch	4	1	4	5	n	n	0	1	13	
RS1	Fiona	Inet rsrch	3	n	3	4	0	n	2	n	12	
RS1	Iain(w/d)	Ed sw	0	0	4	3	0	0	4	0	11	
RS1	David	Ed sw	2	1	3	1	n	1	2	1	7	
RS1	Ann	Ed sw	2	n	3	n	n	n	n	n	5	
RS1	Evelyn	Ed sw	0	0	5	n	n	n	0	n	5	
RS1	Jerry(P)	none	0	0	0	0	0	0	0	0	0	
											8.8	avg
RS2	Christine	Ed sw	4	0	5	4	n	n	4	n	17	
RS2	Ann	Ed sw	4	0	5	3	n	n	4	n	16	
RS2	Iain	e-mail	3	n	4	3	n	0	5	n	15	
RS2	Fiona	Inet rsrch	3	n	3	4	n	n	2	n	12	
RS2	Gail	WP	4	1	4	4	0	n	0	1	12	
RS2	David	Ed sw	2	n	3	0	n	1	0	0	5	
RS2	Evelyn	Ed sw	1	1	4	0	0	0	0	0	4	
RS2	Jerry(P)	none	0	0	n	0	0	n	0	1	0	
											10.1	avg

APPENDIX 5 c
VIEWS ON ICT (Q9-12 RESPONSES)

Views on ICT (Q9-12 responses)

Responses to Q9-12, Views on ICT

Round 1, NW	Leanne	Maya	Nora	Olwyn	Paula	Ross (a/P)	AVG	Zeros?
9 It is important that IT is a regular part of the way students learn	3	4	4	4	4	4	3.8	ok
10 My personal use of IT is changing my assessment	3	4	4	3	4	3	3.5	ok
11 I believe access to suff. technology will change the way I teach	3	4	4	4	4	4	3.8	ok
12 Learning teams of teachers seem a satisfactory way to help adopt technology	4	2	4	3	4	4	3.5	ok

Round 2, NW	Leanne	Maya	Nora	Olwyn	Paula	Ross (a/P)	Avg	
9 It is important that IT is a regular part of the way students learn	4	4	4	3	4	4	3.8	ok
10 My personal use of IT is changing my assessment	3	4	4	2		0	3.3	1
11 I believe access to suff. technology will change the way I teach	4	4	4	2	4	4	3.7	ok
12 Learning teams of teachers seem a satisfactory way to help adopt technology	3	1	4	3	4	4	3.2	ok

Round 1, RS	Ann	Christine	David	Evelyn	Fiona	Gail	Iain (w/d)	Jerry(P)	AVG	Zeros?
9 It is important that IT is a regular part of the way students learn	2	4	4	3	4	3	3	4	3.4	ok
10 My personal use of IT is changing my assessment	1	4	0	0	0	3	3	3	1.8	3
11 I believe access to suff. technology will change the way I teach	1	4	3	3	3	4	4	3	3.1	ok
12 Learning teams of teachers seem a satisfactory way to help adopt technology	0	3	3	4	4	3	2	3	2.8	1

Round 2, RS	Ann	Christine	David	Evelyn	Fiona	Gail	Iain (w/d)	Jerry(P)	AVG	
9 It is important that IT is a regular part of the way students learn	4	4	4	0	4	4	4	3	3.4	1
10 My personal use of IT is changing my assessment	3	4	2	3	3	3	4	3	3.1	ok
11 I believe access to suff. technology will change the way I teach	3	4	3	3	4	4	4	3	3.5	ok
12 Learning teams of teachers seem a satisfactory way to help adopt technology	4	3	3	3	3	3	2	2	2.9	ok

APPENDIX 6

Semi-structured Interview Schedule – Case teachers

Welcome: Thank you for coming. I know you are busy, time is at a premium etc.

Ethical participation: May I confirm that you signed a permission form indicating your willingness to participate, that it will be audio taped and that you appreciate that you can withdraw at any time?

We are going to talk about **your teaching** and your **technology background**, and how you want to progress.

- Q What sort of **background with computers** do you bring to this project?
- Q What sort of **background preferences for teaching and learning** do you bring with you?
- Q I'd like to construct a **timeline** for you. What are the big milestones along the way of your **technology development**?
- Q What are your **plans for your teaching** in the next few years?
- Q What are your **plans for technology** in your class in the next few years?
- Q What are your **views** on the **three spokes** of this SpokesTeam project that is Outcomes, IT and Teams? (explore)
- Q Who is in your team and **how will your team meet and plan** its activities?
- Q How will you use **the Seven Principles** to contribute to your team and personal development?
- Q What is going to be the **hardest part** for you?
- Q What is going to be the **best part** for you?
- Q **Confirm background**: years teaching, range of schools and preference for year groups.
- Q Is there **anything else** you would like to comment on?
- **Thanks, close**: Thank you for your time, Ill drop the transcript off to you shortly so you can check that I have recorded you accurately, and not made any mistakes.

APPENDIX 7 a

INSTRUCTIONS FOR COMPLETING THE TIU CHART

Instructions

Filling out the draft 'ICT uptake table'.

How did you feel when you were first introduced to computers at school? What sort of things did you do at the start with ICT in your class?

Close your eyes for a moment and put yourself back to that time — How long ago was it? Do you remember a lot about how it was THEN? Are they good memories or not so good?
And these days, how do you feel about computers and ICT in your classes? How would you describe things NOW? What else has changed as well?

Name: _____ School: _____

Please record how things were THEN and are NOW, on the two (identical) coloured sheets attached. Start on the THEN sheet. When was it? What was it like for you? What did you do with computers?

i) record that approximate date or year on the top of the sheet

ii) circle phrases that describe how your progress was with ICT. I suggest you proceed left to right across the whole first row, Feelings and Attitudes, before starting on the Understandings and Philosophy row, for example.

iii) circle any phrases that seem to describe your progress for that time period;

iv) put a wiggly line under any phrase/s that don't make sense

v) Feel free to add any additional comments on the back

Please repeat this process with the NOW sheet to reflect on where you are now. Note that there are no right or wrong answers; you may mark any phrase in any column.

Any further comments:

Thank you in advance. The stamped addressed envelope will make it easier for you to return the sheets; your confidentiality is assured. **May I ask for your feedback by 30 September please?**

Please return these three pages to:
Barnard Clarkson,
Lecturer
School of Communications and Multimedia
Edith Cowan University
Bradford St
Mt Lawley 6050

APPENDIX 7 b
Typology of ICT Uptake (TIU) chart

Table: Indicators and typical reactions during ICT uptake by teachers *DRAFT version. Sep 2001* (b.clarkson@ecu.edu.au)

(v1.7)	Column A	Column B	Column C	Column D
Feelings & attitudes	Feels lack of control over self and situation Perceives novelty of ICT, or threat Needs support to progress	Frustrated by control issues but improving Desires autonomy, independence May resent or even refuse support	Begins to feel in control, comfortable with ICT Independent of old support needs More accepting of differences btw team members	Feels in control of situation using ICT Willing to give, share and develop ICT ideas and practices with others
Under-standing, pedagogy	•hesitant, disoriented; seeking support; challenged; frustrated; feels uncommitted; lack of ownership; isolated; guilty or even ashamed at lack of progress •defensive; or willing but unable; lacks time; perhaps nervous; talks in monologue; even sceptical •looks for support systems with clear unequivocal guidance, known consequences; seeks stability during challenging times	•attaining sense as independent actor; may feel independent, autonomous; perhaps pioneering, "don't look down" excitement; but may feel forced, w/out choices, even resentful •may express negative feelings; argues and engages in conflict; or describes the support system as confused, incompetent, restrictive or less/unsupportive •will share if it provides specific support or minimal pressures; doesn't demand or seek adherence to standards	•largely in control, more concerned for students than self; sense of achievement, pride; satisfied; self-acceptance and hence increasing acceptance of others in team •values team activities as mutually beneficial; able to cooperate with other teachers; less arguments, fewer individual activities •expects to give and receive support; appreciates immediate, descriptive feedback about progress; seems likely to be highly productive time for whole group/team	•feels that control issue irrelevant; sees value in joint development with students/ staff; thoughtful, often contented, competence unthreatened; confident; some pride; feels valued as ICT user/ model; fulfilled, even self-actualising; relaxed •able to integrate others' perspectives with own; perceives balance between self and others •confident to help or support others, understands frustration of others; acts as co-learner; values individual and group simultaneously; maintains interpersonal relationships
Observat-ions & practices	Survival issues with ICT; concerns are with own mastery and learning Regards ICT as object (of torture) eg *'Internet as Incomprehensible'* •minimal teaming; shares mainly for personal needs; unguided parent involvement; PD minimal or avoided •uses traditional approaches with ICT eg rosters, worksheets; prefers closed tasks, topic-specific or easy-to-use software; challenging PD ideas vy rarely implemented	Limited/local thinking about ICT Teaching rather than learning oriented •wary of ICT's flexibility, instability; questions own role; cannot yet comprehend ways to use ICT broadly; ICT is external-object to be examined, learned, taught about; wonders about value of ICT for students •seeks explicit standards, single solutions, specific advice Treat ICT as instrument eg *'Internet as Maze'* •may be self-focussed or less concerned for others; perhaps unwilling or unable to support others; often chooses individual activities over team ones •starting to use ICT in multiple ways; can find PD complex, confusing; tends to add ICT on top of existing activities or as add-on to curriculum; will use others' activities with minimal or no adaptation	•comprehension of ICT use is slight, linear; able to verbalise integration of ICT arguments at unsophisticated level; occasionally confused about ICT and the outcomes achievable using ICT •may seek high level of self-understanding; may feel need to take increased responsibility for perceived lack of direction around them Uses ICT as tool eg *'Internet as Library'* •chooses group activities, dialogue; may displace old feelings of dependence onto others including students; may be dismissive of outsiders; may defend own 'patch' •tends to use structured/closed activities; may prefer look-up or searching activities to open-ended ones; starting to use mastery principles; willing to implement relevant PD; can/does adapt ICT activities independently	Directed, focussed ICT thinking Teaching and learning oriented •teaching and ICT issues at forefront; increasingly concerned for their students; ICT may not be transparent, but beginning to see it as tool •can see ways to meet outcomes and standards with ICT; able to create tasks to meet needs; shares principles, often seeks broad rather than specific advice; confident enough to adapt most ICT activities to needs Uses ICT as catalyst eg *'Internet as communications tool'* •seeks out PD, groups for support, guidance, advice thoughtfully and without reservation •uses ICT to address varied needs; able to integrate it into work seamlessly; designs activities to carry educational outcomes; chooses open-ended student tasks; ensures students in control; encourages team and collaborative tasks	ICT thinking, usage, become second nature Learning oriented, student-focussed •makes time to consider learning issues; aware that both they and their students are developing; aware of role model status; able to consider both student needs and software roles in activity design •less concerned about absolute standards or fixed skills with ICT; advocates value of self-determined, internal standards; believes that multiple perspectives are acceptable

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