An exploration of the use of Web 2.0 to enhance teaching and learning in an Australian Catholic Secondary School.

Submitted by

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A thesis submitted in partial fulfilment of the requirements of the degree of

Doctor of Education

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February 29th 2012

Statement of Authorship and Sources

This thesis contains no material published elsewhere or extracted in whole or in part from a thesis by which I have qualified for or been awarded another degree or diploma.

No other person's work has been used without due acknowledgement in the main text of the thesis.

This thesis has not been submitted for the award of any degree or diploma in any other tertiary institution.

All research procedures reported in the thesis received the approval of the ACU Human Research Ethics Committee on June 15th, 2009. Register Number: V2009 24

Abstract

The rapid development of Information and Communications Technology (ICT) over recent years presents educators with significant challenges. There are many options emerging to enhance the process of teaching and learning, particularly through the use of Web 2.0 Internet sites. These have become part of the lifestyles of today's students yet schools are struggling to come to terms with the effective use of these emerging technologies. Although Web 2.0 offers significant potential to enhance learning this is proving to be difficult to implement effectively. The general research question is

What factors influence Secondary School teachers to use Web 2.0 effectively to enhance learning?

This research was conducted in the interpretive paradigm using a case study methodology involving me as researcher in the role of senior secondary school teacher with a position of leadership as learning technology facilitator. The study was conducted in the Years 10 to 12 Sandhurst Diocese co-educational campus of a Catholic Secondary School of approximately eight hundred students.

The contextual characteristics of the case study at the college were identified through a questionnaire distributed to teachers and source documents relating to the curriculum and the ICT resources in place at the college. Teachers participated in interviews and a series of workshops to promote the advancement of pedagogy with Web 2.0 leading to enhanced student learning. Data analysis was done manually which resulted in the production of a series of conclusions and recommendations.

The research highlighted the importance of the formation and articulation of a vision of the place of Web 2.0 in schools. Having this vision can lead to an improved understanding amongst teachers of curriculum frameworks for teaching and learning with Web 2.0. The promotion of a collegial and collaborative environment amongst teachers was found to be

important in enabling them to improve their practice. This collaboration includes the cultivation of on-line personal learning networks for teachers. Teachers' effective use of Web 2.0 was found to depend largely on a pedagogical focus to foster higher order thinking, individualised learning and information literacy in students. The research involved an exploration of the effectiveness of senior leaders and teachers in leading whole school change in promoting the effective use of Web 2.0 to enhance teaching and learning.

Recommendations based on these findings have been made for professional learning leaders, curriculum leaders, school leadership teams and systemic authorities.

The research findings have implications for further research into improvements in effective teaching practice with Web 2.0 to enhance learning. More research is needed to investigate personal learning networks for students and teachers, semantic aware applications, the re-definition of the mission of schools in this digital age and drivers for sustainable technological change in schools.

Acknowledgements

Although the reflections, writings, research findings and recommendations of this thesis are my own, the production of this work would not have been possible without the support, encouragement and assistance of a number of people throughout this research journey.

The role of research supervisor is a complex one and requires a diverse range of skills if it is to be done well. I shall be forever grateful to my principal supervisor, Dr Annette Schneider and to my co-supervisor Dr Helga Neidhart for the role they carried out. Their affirming nature, well grounded and rigorous approach to academic research and wise counsel were a constant source of support, encouragement and professional learning for me.

The first phase of this research involved the completion of three semester units to generate the research questions, literature review and design of research. Contributions were made over this time by academic staff at Australian Catholic University to both design and teach the academic coursework units that were involved. They gave me important direction for this research during these lectures. Helpful feedback on my progress was provided at the research proposal defence and update seminars. I would like to thank Annette, Helga, Associate Professor Denis McLaughlin, Professor Kath Engebretson, Dr Lyn Carter, Dr Donna Gronn and Professor Philip Clarkson for the important input they provided to guide the direction of this research.

I would like to thank my colleagues who participated in and contributed to this research. They volunteered their time to make responses to questionnaires and interview questions and participated in workshops and discussions to improve their teaching practice with Web 2.0 technologies. This research would not have been possible without this generosity of spirit.

I am particularly grateful to the leadership team of the college where this research was conducted. Their support and encouragement, particularly in terms of giving me the opportunity to work in positions of leadership over many years and for time release over the course of this research, has been of vital importance in enabling me to complete this project.

Proof-reading a thesis is a difficult, time consuming and sometimes onerous task. The work done by Annette and Helga in their role as research supervisors in the continual process of re-drafting of the thesis through the years of the research was always timely, clearly explained and matched to my personal development as a doctoral student. I am also grateful to my father, Dr Martin Sharkey, for his conscientious and diligent efforts in detecting revisions and making constructive comments and to Professor Michael Gaffney for his advice on the final drafts of this thesis.

As an educator in Catholic and Ecumenical schools over many years I acknowledge the important role that schools play in the education of children but recognise that my parents Martin and Denise have been my primary educators. I will be forever in their debt for what they have left for me – a love of family, a strong sense of social justice within a Christian perspective and a respect for and life-long dedication to education.

Finally, I would like to express my deep gratitude to four people without whom this thesis would not have been possible. To my cherished children, Judith, Vincent and Gabrielle, I dedicate this thesis in the hope and confidence that they will each continue to enjoy rich learning throughout their lives. Last, but certainly not least, I give my sincere gratitude and appreciation to my wonderful wife Trish for her moral support, work at home to facilitate time for my study and ongoing friendship and love.

Table of Contents

Chapter Six – Conclusions and Recommendations

Index of Figures

Index of Tables

Abbreviations and Terms

Abbreviation	**Full Title**
ACEC	Australian Council for Computers in Education
ACU	Australian Catholic University
CAD	Computer Assisted Design
CECV	Catholic Education Commission of Victoria
CEO	Catholic Education Office
CRT	Casual Relief Teacher
DEET	Department of Employment, Education and Training
DER	Digital Education Revolution
ICT	Information and Communication Technology
ISTE	International Society for Technology in Education
LATTiCE	Learning and Teaching with Technology in Catholic Education
LOTE	Languages Other than English
NETS	National Educational Technology Standards
SSIF	Sandhurst School Improvement Framework
VCAA	Victorian Curriculum and Assessment Authority
VCAL	Victorian Certificate of Applied Learning
VCE	Victorian Certificate of Education
VELS	Victorian Essential Learning Standards
Web 2.0	Internet sites such as blogs, wikis and forums that allow an interactive medium where the user may publish content in addition to accessing information

Chapter One
Introducing the Research

1.1 Introduction

Although the use of Information and Communication Technology (ICT) has permeated all endeavours of society, the extent to which this has changed teachers' practice in education has not been as widespread and profound as it has been in many other fields of endeavour. There has been an ongoing struggle to provide the necessary resources and infrastructure for teachers to use ICT to further their teaching practice. Many teachers do not appear to have embraced the notion of using ICT in the classroom or have been unable to develop their craft with the technology. There has been insufficient focus given to effective pedagogy to integrate ICT and thereby enhance learning across the curriculum. There are also difficulties in providing a climate for teachers to work together to improve their approach to the use of ICT through a collective effort. Leadership at the school and systemic level has been identified as a crucial element in addressing the place of technology in education. This research offers a way forward for teachers and school leaders to realise this potential to enhance student learning.

1.2 Research Context

Of particular relevance to this research project are my experiences in several secondary schools in regional Victoria over the past twenty five years. Over that time, I have been a teacher of Religious Education, Mathematics, Information Technology and Science subjects and have held various positions of leadership in the use of ICT in the curriculum.

As a leader in the use of ICT in schools since the mid 1990s, I have been immersed in an evolution which has seen a shift in focus in how ICT is utilised in schools. There has been a transition from ICT involving a minority of teachers and students in technology based subjects to it becoming a mainstream activity involving all teachers and students across the

curriculum. This experience is typical of those of my colleagues in other schools. I have striven to meet an ongoing series of challenges to keep up with the latest trends in the use of ICT and education, to set a strategic plan for the deployment and allocation of resources and to provide support and professional learning for teachers in their use of ICT.

My initial interest in and involvement with ICT in education came about through the possibilities for innovative, collaborative and engaged learning that it appeared to offer. Electronic mail, the Internet and Educational Learning Communities were being developed and used by a few teachers with whom I worked. The surge in recent years in the possible means that teachers have to both engage students and enrich their learning outcomes through the use of Web 2.0 (Crawford & Ratcliffe, 2010) has led to an increase in my professional interest in the area. Fostering the use of this technology has continued to be the main focus of my work.

Web 2.0 technology, which is also known as the read-write web, enables teachers and students to publish content as well as to retrieve it. This has become the focus of this research. These technologies enable teachers and students to access information globally and interact with each other collaboratively in the creation of knowledge (White, 2008) and offer the potential to engage students in their learning more than ever before (Reynen, 2009). Although issues such as the effect of ICT on society and the economy and projections for the development of ICT and its possible capabilities over time are recognised and continue to affect education in the future, they are not central to this research.

The major impetus for this Doctoral research was my desire to most effectively carry out my work at the case study college as Learning Technology Facilitator. The primary purpose of this role is to facilitate teachers' use of ICT in their work through day to day assistance and the provision of professional development opportunities for teachers with their

use of learning technologies. The case study college is a senior secondary campus of approximately eight hundred Years 10 to 12 students within the Catholic Diocese of Sandhurst in Victoria, Australia. Significant change has occurred at the college in recent years in relation to the use of ICT in the curriculum. Teachers and students' access to ICT resources has been improved substantially at the college. Up until 2009, these resources were available only to technology based subjects and the library. From the beginning of 2012, teachers and students will each have a laptop or tablet computer to use, both at school and at home. Further description of the development of the use of ICT in the curriculum at the college is provided in Chapter Two of this thesis. I believed that by conducting this research I would be able to perform my role as Learning Technology Facilitator in the most effective possible manner. It would place me in a sound position to explore factors of relevance to the formation of a contemporary vision of the place of Web 2.0 in education. I would then be in a position to provide insightful leadership about the effective development of its use into the future. I believe that the production of this thesis has been instrumental in enabling me to achieve these goals.

1.3 Research Problem

The research problem stems from the reality that the current practice of teaching and learning with ICT in secondary schools does not appear to be aligned with the stated philosophies and curriculum frameworks of the Victorian State and Australian Federal Governments and the Catholic Education Commission of Victoria.

Formulating a vision or rationale for the use of this technology and then meeting the associated professional development needs of the teachers to teach effectively with it has proven to be a difficult and complex task. This is due to a number of factors. First, there has been a lack of awareness and understanding amongst teachers of curriculum frameworks that

give a rationale for the use of ICT in education (Dutt-Doner, Allen & Corcoran, 2006). This has resulted in a failure on the part of many teachers to make the transition from viewing ICT as an object of study in its own right to treating it as a cross curriculum tool or environment for learning. Second, there has been a resistance or inability evident in many teachers to embrace the notion of using technology and to become fluent with its use so as to foster enhanced learning outcomes for their students (Vanderlinde, van Braak and Hermans, 2009). This has hampered the development of their practice in this area. Third, there has been insufficient quantity and quality of ICT resources in place for teachers and students to use at many schools, including the case study college. This has created barriers that have prevented the development of its effective use in an integrated manner in many schools (Di Bello, 2005). Too often the technology has either not been available for teachers to use or has not worked reliably, even for the most proactive, proficient and innovative teachers with ICT. This highlights the critical importance of effective leadership to plan for and deploy ICT resources in schools to improve learning outcomes (Keane, 2008)

It is my belief, as researcher, from my own experience and from the anecdotal evidence obtained from colleagues with whom I have worked at various schools, that the approach taken to teaching and learning in most classrooms does not match the construed reality of the interdisciplinary learning model for ICT and education in a consistent and coherent manner, as expressed in contemporary curriculum frameworks for the use of ICT in education such as the Victorian Essential Learning Standards (VELS) or the International Society for Technology in Education (ISTE) standards. An outline of these standards is given in Chapter Two of this thesis. A significant tension is created by the dissonance between the expectations of the VELS and ISTE curriculum frameworks for ICT and the means that teachers have at their disposal to achieve them. Despite the recent infusion of technology into

society and schools, for too many educators, teaching with ICT remains in the 'too hard basket.'

1.4 Research Purpose

The research purpose is to engage in critical reflection about factors that lead to improvements in teaching and learning through the use of Web 2.0 technologies. The critical reflection has been undertaken with teachers and teacher-librarians at the case study school.

1.5 Research Questions

The general Research Question is:

What factors influence Secondary School teachers to use Web 2.0 effectively to enhance learning?

There is a need to establish a culture amongst teachers where there is a common understanding about the overall purpose of the place of Web 2.0 in education. This involves the encouragement and facilitation of questioning and debate between teachers on an ongoing basis. Effective approaches to professional development which allow teachers access to necessary support to facilitate their skills and attitudes towards ICT and teaching are required. Collegial collaboration amongst teachers to improve their practice may offer the most potential for facilitating this process. This leads to the **first research question**:

RQ1. How might teachers' willingness and capacity to effectively use Web 2.0 to enhance learning be cultivated?

Teaching pedagogy with ICT across the curriculum has revealed several issues worthy of further research. In many instances there is a resistance to change on the part of teachers from the teaching methods with which they are familiar. Pedagogy with ICT and its potential to enhance the learning process often seems to receive insufficient attention and appears to be overshadowed by other factors. There is a common preoccupation with mastering the

technology, how it works and its place in the world. This has overshadowed thinking about the potential of technology to enhance the learning process and efforts to modify and refine teaching practice accordingly.

Issues that relate to pedagogy provide the focus for any process of change regarding the use of technology in schools (Vallance & Towndrow, 2007). Instead, the technology often dictates what the pedagogy will be. Considerations regarding the physical layout of the classrooms and the equipment to be used in them are important aspects of developing pedagogy with technology. The technologies used by the students in their life beyond school are viewed by many teachers as a threat or distraction to their learning rather than having the potential for incorporation into approaches to enhance teaching and learning outcomes. These include improvements in information literacy, higher order thinking and global citizenship. This leads to the **second research question**:

RQ2. Which pedagogies with Web 2.0 effectively enhance learning?

The approach taken by school leadership towards technology integration is of vital importance. Leaders such as the Principal, teacher-librarians, ICT coordinators and information managers have a special role to play in this process. Shared approaches to leadership with the proactive involvement of a wide cross section of the school community in decision making appears to offer these leaders great potential to effectively lead whole school change with technology. This leads to the **third research question;**

RQ3. What approaches from school leadership foster sustainable change in teachers' practice with Web 2.0 to enhance learning?

1.6 Research Design

This research adopted an interpretive approach which involved subjective analysis of my interactions with teachers in several settings. These included in-depth interviews, discussions and seminars to develop practice with Web 2.0. The purpose of this was to arrive at understandings and interpretations of how teachers construct and maintain their social world (Neuman, 2006). The focus was on how teachers might effectively develop their practice with Web 2.0 and recognises that leaders in schools today must ensure that the networked school community that they lead is well placed to meet the educational and social demands that are presented to it in this post industrial age (Gaffney, 2009).

Data collection for this research was undertaken through the use of four separate yet complementary means:

1. Document collection and analysis
2. Structured questionnaire
3. Individual semi-structured interviews
4. Research journal

The methods for data collection facilitated thick description (Atkinson & Hammersley, 1994) giving in-depth information to address the research issues. A questionnaire was given to all teachers. A copy of this questionnaire is included in Appendix B. The content of the questions addressed various issues which were generated from the research questions and literature review themes. These questions related to their attitude towards and professional experiences in teaching with ICT and Web 2.0. Nine teachers and the team of six teacher-librarians accepted an invitation that was given to all teachers to participate in interviews where these issues were explored in further depth. A research journal was used to provide further insights into these issues through critical reflection in my role as Learning

Technology Facilitator. In this work, I adopted the approach of a participant observer (Kemmis & McTaggart, 2000). Workshops to develop teachers' practice with Web 2.0, conversations with teachers and descriptions of interactions with others in positions of leadership to develop teaching practice with ICT formed the major focus of entries in the research journal.

Data were examined and analysed manually according to the three research questions. An iterative process (Anfara, Brown & Mangione, 2002) involving the refinement of categories, rejecting data that are irrelevant and the development of concepts to explain emergent issues. In the final chapter conclusions are made based on this analysis and recommendations that reflect these conclusions are presented.

1.7 Significance of the Research

This research is significant for a number of reasons:

1. The research into teachers' understanding of curriculum frameworks for the integration of ICT and associated pedagogy is significant because it addresses the lack of attention that is commonly given to this area (Mishra & Koehler, 2006). By giving attention to this area teachers are able to develop higher order thinking skills and positive habits of mind in their use of ICT (Vallance & Towndrow, 2007).

2. This research explored the potential for Web 2.0 technologies to enhance learning. This is seen in a variety of ways including increased student engagement (Crawford & Ratcliffe, 2010), transformation of pedagogy (Cochrane & Bateman, 2010) and improvements in students' motivation and ability to communicate with others (McCullough, 2009). This exploration is timely because teachers' pedagogy

has not advanced at the same rate as the emergence of these technologies (Keijo, 2011).

3. The research into pedagogy with Web 2.0 to facilitate individualised or personalised learning in students is significant because it responds to the challenge for schools to find pedagogies that are more personal, social and participatory (McLoughlin, 2010). This provides a foundation for building personalised learning networks involving students and their teachers, parents, siblings, friends and other mentors (Zagami & Finger, 2010).

4. The research delves into teachers' development of personal learning networks through the use of on-line communication with one another. This is significant because this activity offers significant potential benefits for the professional development of the teachers' involved (McGloughlin & Lee, 2010). This research promotes the uptake by teachers of Web 2.0 sites such as blogs, social networking and wikis for sharing and discussing practice which have been marginal so far (Conole, 2010).

5. This research investigates leadership in schools in the development of teaching and learning practices with ICT and Web 2.0 in particular. This investigation is significant because although shared or distributed approaches to leadership have been found to be the most effective in leading technological change in schools (McInerney, 2003; Gurr & Broadbent, 2004 and Divaharan & Ping, 2010) the acceptance of this amongst teachers requires considerable cultural change (Duignan & Bezzina, 2006).

6. The research focus on the proactive use of Web 2.0 technologies in schools has been recognised as an issue of fundamental importance for school leadership (Gaffney, 2009). Effective leadership in this area is needed to ensure that schools remain relevant to students and that students are not disadvantaged in living in an increasingly digital and networked world (Lee, 2010).

7. The underlying intention of the research to provide key input into the School Development Plan of the case study college is important because it meets the need to ensure that the large amount of expenditure given to ICT resources in schools is strategically linked to improvements in teaching pedagogy which enhance students' learning outcomes (Reading & Daly, 2009).

1.8 Structure of the Thesis

Chapter One *Introducing the Research*

In this chapter the research context is introduced. It includes a description of my experiences as a teacher and leader in ICT in schools and my motivation for carrying out this research. The research problem and purpose are introduced followed by an exploration of the general research question and the three research questions underpinning this thesis. A summary of the research design, an outline of the significance of the research and an overview of the thesis are also included.

Chapter Two *Exploring the Context of the Research*

This chapter begins with a brief description of the evolution of the use of ICT in education over the past forty years. The proliferation of Web 2.0 use in society in recent years is described, along with an outline of the potential that these technologies appear to offer teachers to engage students in personalised and collaborative learning. A description is given

of developments in the use of ICT in education at the global, Australian and Victorian levels. Contemporary curriculum frameworks for the integrated approach to teaching and learning with ICT are outlined. Finally, a perspective is provided on how teaching practice is being developed at the case study college through the deployment of ICT resources, professional development of teachers and the development of the school development plan for enhancing learning with ICT.

Chapter Three Reviewing the Literature

This chapter begins with a description of the conceptual framework through which the research questions are explored. The relationships between each of the three major themes of the literature review, teachers' ICT literacy, pedagogy and Web 2.0 and school leadership and Web 2.0 are represented. Each of these themes is explored in depth through an examination of contemporary literature.

The development of teachers' ICT literacy is reviewed through a description of how it is influenced by their culture and attitude towards ICT, their professional development and an environment of collegial collaboration. This forms the basis from which teachers may develop their pedagogy with Web 2.0. This encompasses personalised learning where higher order thinking and critical literacy are promoted. The presence of technology in students' lifestyles and the challenge for teachers to explore proactively its potential as a resource for their learning is highlighted. Consideration is then given to effective approaches that may be adopted by school leadership to foster enhanced learning with Web 2.0. The potential of distributed leadership where all teachers have a role to play in developing and improving practice is highlighted, whilst the importance of specialist leadership roles such as those of the Principal, teacher-librarians and ICT co-ordinators is recognised.

Chapter Four Research Design

This chapter outlines the design of the research. The appropriateness of an interpretive epistemology to this research is explained and the reasons for my choice to conduct the research within a case study methodology are outlined. I describe the relationships that I sought to foster between myself as researcher and the participants of the research, the teachers and members of the school leadership group. I acted as a mentor to my teaching colleagues and was committed to promote learning and growth through inquiry to improve teaching practice with Web 2.0. The three stages of data analysis: data reduction, data display and conclusion drawing and verification, are all described in detail.

Chapter Five Exploring the Data

Data from each of the collection methods are described according to the three research questions. Common aspects that emerged across each set of data are presented and provide a foundation from which an analysis of the data was carried out.

Chapter Six Conclusions and Recommendations

The final chapter reviews the initial Research Purpose and the overall Research Design. Each of the three research questions is examined through an analysis of the data relating to each question. Conclusions are presented based on this. A number of recommendations are made as a result of these conclusions. These include suggestions for sustainable change that would enable the recommendations to be followed through effectively. Suggestions for further research are included, along with some personal notes to conclude the thesis.

1.9 Summary

The first chapter introduced the research problem explored in this thesis and provided the background context of the problem, together with a description of the case study college

and my experiences and motivations as researcher. From this a research purpose was identified. Three research questions were generated from this research purpose. This provided the basis for the questions included in both a questionnaire and interviews to which participants in this research were asked to respond. A brief outline of the design of the research was presented which described the administration of this questionnaire and interviews, along with an ongoing process of critical reflection in a research journal. The chapter concluded with a rationale for the significance of the research and an overview of the structure of each chapter within the thesis.

The following chapter explores a number of contexts of relevance to the research problem. A précis of the development of the use of ICT in secondary school curricula is provided at the international, Australian national, Victorian state and case study college levels. The large scale proliferation of Web 2.0 technology of recent years is highlighted. Contemporary curriculum frameworks for the use of ICT in education are described and the rich potential of Web 2.0 to facilitate enhance learning outcomes within these frameworks is articulated.

Chapter Two

Exploring the Context of the Research

2.1 Introduction

In this chapter, the contexts that form the background to this research are identified and explored. Initially the perspective is given of the global developments in teaching and learning with ICT which have occurred in secondary schools. The context is progressively narrowed in the sections that follow with a description of developments at the Australian national and Victorian state levels. Finally, developments in the case study college are described.

The advent of Web 2.0 technologies of recent times is highlighted and the potential of the use of this technology to achieve the goals of contemporary curriculum frameworks is elaborated upon. A description is given of the activity of recent years at the case study college as part of its school development plan to increase the deployment of ICT resources available for teachers and students and the professional development of its teachers. Finally this research is linked to the goal of the school's development plan to enhance learning with technology.

2.2 Global Developments for Integrating ICT in the curriculum in secondary schools

In recent years there has been a quiet revolution occurring in education. The permeation of ICT into all areas of modern society has seen our students become increasingly immersed into a culture of ever changing technologies. In my teaching I have observed that students typically have a mobile phone, podcast player and computer connected to the Internet with an ever expanding repertoire of interactions involving Web 2.0 technologies including *Wikipedia, You Tube, My Space,* and *Face Book.* Young people's world of entertainment and communication revolves around the use of ICT. The rate of change is

clearly evident when it is considered that their lifestyle is significantly different from that of their peers ten years ago as a consequence of this recent explosion in options for using ICT.

Ringstaff and Kelley (2002) described ICT as a tool or environment which enables the facilitation of learning of all students across the curriculum. In accordance with this, the integration of ICT learning experiences into classroom activities and teaching approaches is a key element in preparing students for life and work in a globalised world (Hayman, 2008). This represents a major shift from its initial place in education some forty years ago as a specialist pursuit involving a minority of students who had an interest in technology as an object of study in its own right. It represents an emerging interactive media that offers tools in the service of richer curricula, enhanced pedagogies, stronger links between schools and society and the empowerment of disenfranchised learners (Dede, 2000; Crawford & Ratcliffe, 2010). Throughout the past twenty years governments across the western world have recognised this by investing large amounts of expenditure into providing ICT resources for schools (Beastall, 2006). It is questionable whether this expenditure had led to enhanced learning outcomes on a comprehensive basis, as evidenced in a study of twenty-six New Zealand secondary schools. It was found that although there were positive effects on teaching and learning with the introduction of ICT, these were mainly on the surface or indirect and did not involve changes in pedagogical beliefs or practices to any significant extent (Lai & Pratt, 2008). The focus of leading schools in the digital age today involves addressing this issue and encompasses an informed appreciation of the application and potential of new technologies to enhance learning (Gaffney, 2009).

The International Society for Technology in Education (ISTE) National Educational Technology Standards (NETS) provide teachers, students and school administrators with a framework for the use of ICT in the curriculum. The ISTE advocates to ensure that

technology is used to improve learning and teaching to help more students achieve their full potential (ISTE, 2011a). The NETS allow teachers, students and school administrators to work towards key standards and performance indicators in their work with technology. For teachers, these standards are designed to:

- Facilitate and inspire student learning and creativity
- Design and develop digital-age learning experiences and assessments
- Model digital-age work and learning
- Promote and model digital citizenship and responsibility
- Engage in professional growth and leadership (ISTE, 2011b).

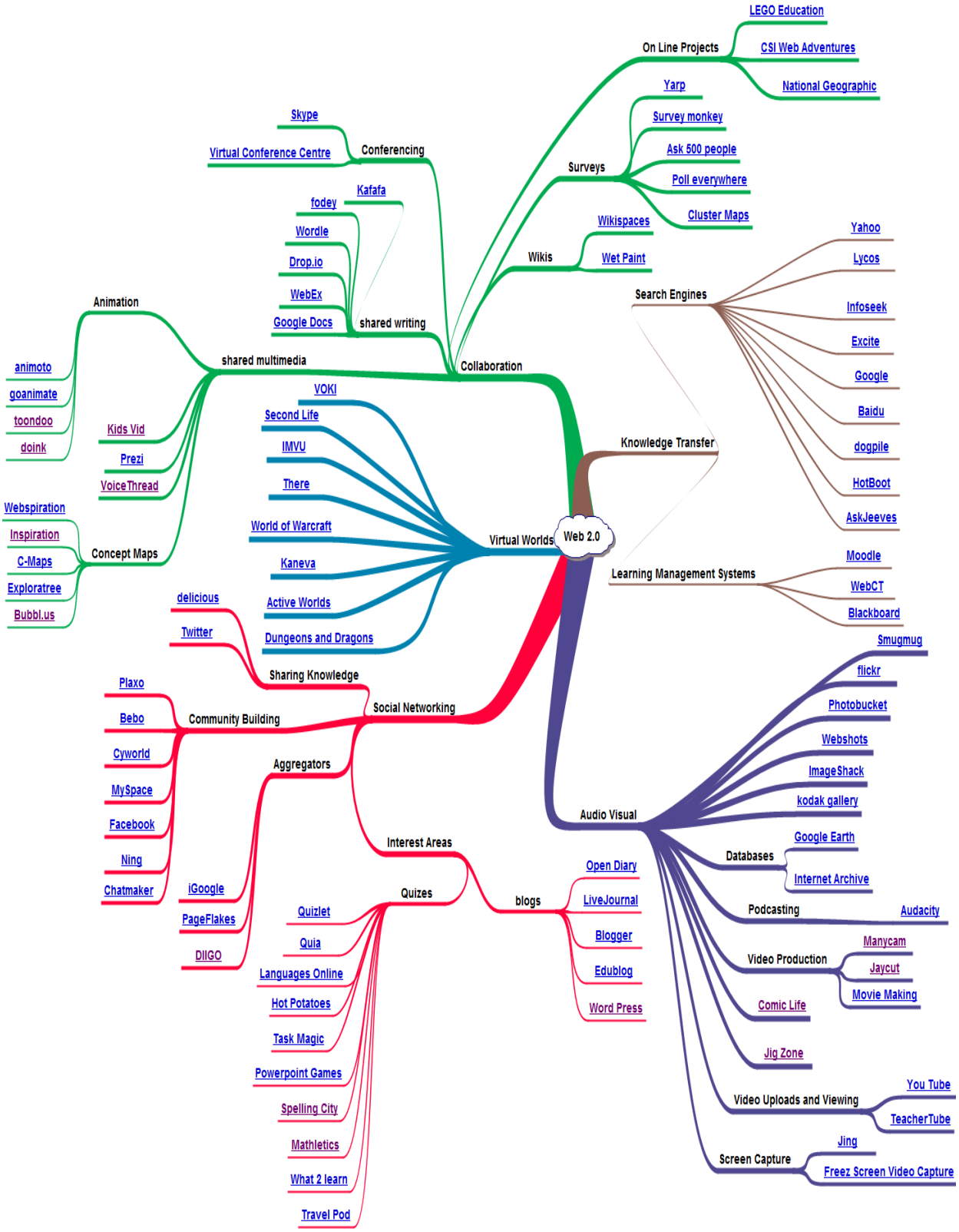
The introduction of Web 2.0 technologies appears to offer teachers a wide array of learning environments within which they may adopt an approach that is consistent with the NETS. They are able to employ this technology to foster creativity, digital citizenship, collaboration and communication in their students by acting as an information guide, rather than by assuming the more traditional role of a teacher as a gatekeeper of knowledge (Wells & Brooks, 2008). The ISTE standards provide teachers with guidelines to ensure that the educational application of these technologies is based on sound pedagogical principles to allow for meaningful learning experiences for all students (Huijser, 2008).

Rapid changes in the ICT landscape, particularly the Web 2.0 developments, are opening up exciting and challenging opportunities for schools (Todd, 2009). Web 2.0 sites are interactive and allow the user to contribute content, rather than just read or print off information (Way, 2008). They may be grouped into five broad categories according to their most commonly used purpose. These are audio visual, knowledge management and transfer, collaboration, social networking and virtual worlds (Hanevald & White, 2008). A concept map representing examples of Web 2.0 sites within these categories is presented in Figure 1.

Figure 1

Concept map representing examples of Web 2.0 sites within categories.

(Hanevald & White, 2008)



The rapid emergence of Web 2.0 technologies presents educational communities today with the challenge of analysing the impacts of adolescents' engagement with Web 2.0 spaces on their learning and then reconceptualising schooling and educational practices accordingly (Shuck & Aubusson, 2010). The question of how to use these new technologies to enhance learning is perhaps the biggest challenge of the next decade (Collins, 2010).

2.3 Developments for Integrating ICT in the curriculum in Australian Secondary schools

The evolution of the use of ICT in Australian schools parallels the developments that have been seen in education globally. The beginnings of ICT in Australian schools in the late 1970s involved those with an interest in the technology or the careers associated with its use. The curriculum focus was on how the technology was put together and worked or its specialist applications, such as computer programming. This was a reflection of the need to produce an ICT skilled workforce in order to ensure national competitiveness in globalised economic conditions (Thomson, Nixon & Comber, 2006).

Leaders and teachers in Australian schools pioneered the introduction of one to one laptop computers for students in the early 1980s (Stager, 2006). This reflected a shift from a narrow curriculum focus that was based on technical or vocational concerns to one which encompassed the promotion of enhanced learning in all students across the curriculum with this technology. Though specialist subjects involving the study of ICT are still taken by some students, it is now commonly recognised that ICT, in particular Web 2.0 technologies, offers teachers and students in all curriculum areas the potential to enhance learning outcomes (Crawford & Ratcliffe, 2010).

The transition of ICT in the curriculum of Australian secondary schools from a specialist activity involving a minority of students to a mainstream tool for learning that all

students utilise is clearly evident in the Digital Education Revolution (Australian Government: DEET, 2008). This has involved the commitment by the Australian Government of new funding of $1 billion across Australia over four years from 2008. The funding is to provide new or upgraded ICT resources for Years 9 to 12 students to access at their school, broadband connections for schools to the internet, on-line curriculum content and information portals for parents' participation in their child's education.

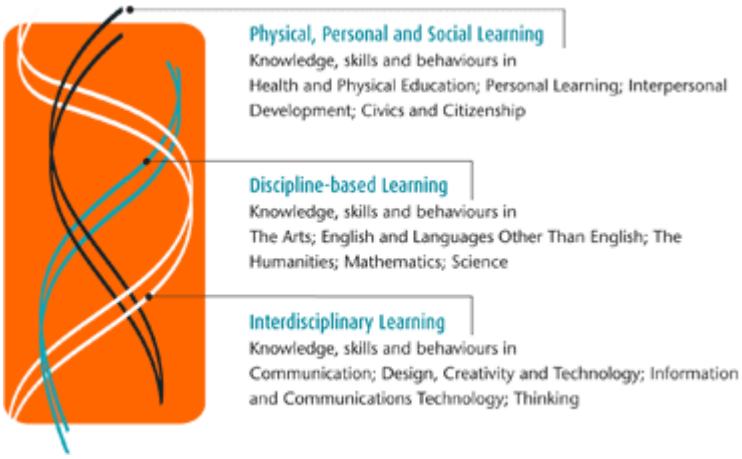
2.4 Developments for Integrating ICT into the curriculum in Victorian secondary schools

The shift in emphasis from learning about technology within specialist subjects to learning with technology in all areas of the curriculum has been formalised in the Victorian Essential Learning Standards (VELS). The methodology adopted in these standards is consistent with the curriculum policy of the Catholic Education Commission of Victoria (CECV) which calls for a broad, balanced and integrated approach to learning that is dynamic, relevant and caters for different approaches to learning (CECV, 1994).

The VELS have been developed by the Victorian Curriculum and Assessment Authority (VCAA) through extensive collaboration with education sectors and the broader community (VCAA, 2006). The standards identify three core and interrelated strands for the Preparatory to Year 10 curriculum. These strands and their relationship to each other are represented visually in Figure 2. The VELS strands are Physical, Personal and Social Learning, Discipline Based Learning and Interdisciplinary Learning. A more comprehensive description of these strands is provided in Appendix A.

Figure 2.

Interdisciplinary learning strands of the VELS. (VELS, 2011).



A core goal of learning within the VELS ICT strand is for students to focus on the task to be accomplished rather than on the technology they are using to do the work. In consultation with their teachers, students utilise a variety of ICT applications including concept maps to facilitate a visualisation of their thinking, spreadsheets and databases for the modelling and testing of hypotheses and Web 2.0 sites to research, collaborate with others and communicate their learning.

2.5 Developments for Integrating ICT into the curriculum in the case study college

The 2010 School Development Plan of the case study college has given a high priority to the improvement of teaching and learning practices with ICT. One of its central questions is:

'How can we best use ICT to enhance student learning?'

A process to facilitate finding answers to this question has been put in place by the Catholic Education Office in the Diocese of Sandhurst, where the case study college is located, through The Sandhurst School Improvement Framework (SSIF). The intent of this

framework is to combine the shared wisdom and knowledge of current teachers with research and literature on renewal and development practices and processes in education. A cyclic process of school review involves schools improving their practice over a four year period. The general question of this research was developed to allow me to provide key input into this process.

During the timeframe of this research there has been a great deal of expenditure placed into upgrading the technology present in the classrooms at the case study college. At the beginning of this research in 2007, almost all of the ICT resources that students were able to access were contained in three classrooms used for teaching Information Technology subjects, each equipped with thirty computers, and the library. A minority of general teaching classrooms were equipped with ICT equipment. This included video players and monitors, calculators, between one and six computers and an interactive whiteboard. By the end of 2009, all classrooms had been fitted with a data projector. In 2010 all teachers were issued with tablet computers for their professional work. Six class sets of laptops were deployed throughout the college for students to access. In 2011 students in Years 9 and 10 were each issued with a tablet computer to facilitate their learning. By the beginning of 2012 it is planned that every student in Years 9 to 12 will be issued with a tablet or laptop computer. This change is a reflection of the dramatic increase in societal expectations of what students should learn in contemporary society (Roschelle, Pea, Hoadley, Gordin & Means, 2000) and (Collins, 2010).

The infusion of ICT resources for use by teachers and students has been accompanied by a program of professional development for teachers throughout 2011. During Term One the focus was on teachers improving their technical skills in operating and using computers. Throughout Term Two teachers were trained to use *DyKnow*, a student management and

interactive learning program. During Terms Three and Four teachers from across all teaching areas volunteered to offer professional learning sessions to their colleagues, based on programs that the volunteer presenters found enhanced the learning of their students. This included the use of spreadsheets, *One Note*, *Photoshop*, *Powerpoint* and Web 2.0 sites such as *Glogster*, *Edublogs*, wikis and *Prezi*. Teachers were mandated to complete fifteen hours of professional development over the course of 2011. It is expected that a continued emphasis will be given to this program in future years.

2.6 Summary

This research explores the capacity of teachers adopting Web 2.0 technologies to enhance the learning of their students. An examination of the contexts within which these teachers work situates this research in the world of secondary education at the global, Australian, Victorian and case study college levels. In particular, the apparent potential of Web 2.0 to enable teachers to achieve the goals of contemporary curriculum frameworks such as the VELS and the ISTE standards was described in detail. The chapter concluded with a description of how leadership at the case study college is attempting to address this situation and how this research is central to my role at the college of facilitating and leading this work.

The following chapter is a presentation of the literature review, outlining the three central themes of this research, namely; teachers' ICT Literacy, pedagogy and Web 2.0 and school leadership and Web 2.0.

Chapter Three

Reviewing the Literature

3.1 Introduction

ICT leadership in schools has evolved from a focus on the operation of hardware and software to a much broader view of ICT in the teaching and learning context (Keane, 2008). In my experience this shift in a focus on technology as an object of study to technology being used to enhance teaching and learning outcomes has proven difficult to implement. Pockets of brilliance in teaching and learning seem to exist alongside abject mediocrity when it comes to reaching the stated goals of the VELS and the NETS; of utilising ICT to transform teaching practice and to enrich learning across the curriculum. The ideals of cross curriculum teaching and learning with ICT have been difficult to translate into practice. Much remains the same since before the introduction of computers into schools in terms of curriculum design, teaching pedagogy and the learning environment (Elliott, 2004).

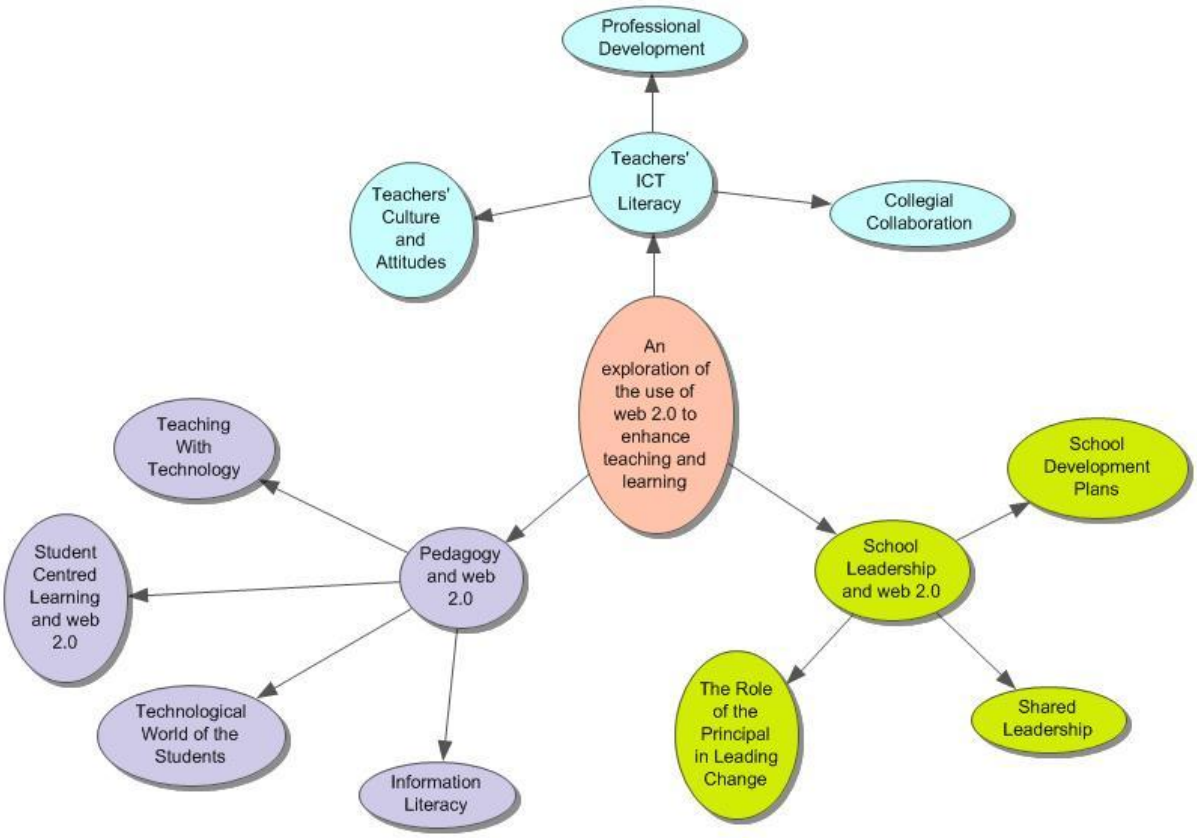
In this chapter the three themes which have emerged from the Literature Review are described in detail. The three themes are: Teachers' ICT literacy, Pedagogy with Web 2.0 and Educational Leadership and Web 2.0. These themes, which are central to each of the research questions, form the conceptual framework for the study. The research questions are addressed in a concluding section which leads into the theoretical framework in the Research Design in Chapter Four of the thesis.

3.2 Conceptual Framework

Figure 3 is a concept map that represents the conceptual framework by providing a visual relationship between the three themes emerging from the literature review. A series of sub themes are also identified in Figure 3.

Figure 3

Conceptual framework



The major theme of this research, enhancing teaching and learning with Web 2.0, is a hub from which the three major themes radiate. There is an interchange of ideas between each of these themes.

The theme of teachers' ICT literacy provided the foundation from which an examination of the first research question was carried out:

RQ 1. How might teachers' willingness and capacity to effectively use Web 2.0 to enhance learning be cultivated?

Teachers' ICT literacy may be proactively developed through an exploration of teachers' culture and attitudes towards ICT (Albirini & Abdulkafi, 2006), the professional development they are undergoing with their use of ICT (Fletcher, 2005) and their

collaboration with others in developing their teaching practice with ICT (Koszalka & Tiffany, 2003). If teachers are able to develop their ICT literacy then it is likely to impact on their teaching pedagogy in a number of ways (Passey, 2006). Their experiences in trying new teaching methods using ICT and then reviewing the results of these attempts and their successes and failures may lead them to further growth in their ICT literacy (Glazer, Hannafin & Song, 2005). The process is a cyclic one. This process could be facilitated by further collaboration with their colleagues and ongoing professional development (King, 2002).

The theme of pedagogy with Web 2.0 provided the focus for an exploration of the second research question:

RQ2. Which pedagogies with Web 2.0 effectively enhance learning?

The evolution of pedagogy or teaching practice with ICT may be the catalyst for a move away from teacher-centred classroom practice to a student-centred learning approach (Vrasidis, Charalambos & McIsaac, 2001). Ryan (2009) describes an astute teacher with e-learning as adopting this constructivist approach to learning. The astute teacher is also able to incorporate, where appropriate, an instructivist, teacher-centred approach and, a connectivist approach through the use of Web 2.0 resources to enhance student engagement and learning.

The design of classrooms that might better facilitate the use of ICT (Fisher, 2004) and a recognition of the technologies that students possess and habitually use as part of their lifestyles (Hirsch, 2004; Cochrane, 2010) are important factors for teachers to consider as they refine their pedagogical approach to teaching with ICT. The development of information literacy skills in students has been identified as a crucial aspect of current teaching pedagogy (Boeckhurst & Britz, 2004; Hay, 2009).

The theme of school leadership with Web 2.0 has been used to frame the third research question:

RQ3. What approaches from school leadership foster sustainable change in teachers' practice with Web 2.0 to enhance learning?

Approaches to educational leadership which foster a culture of teachers assuming responsibility for their professional learning has been promoted by MacNeill, Cavanagh and Silcox, (2005) and appears to be appropriate to the successful integration of ICT in the curriculum. Mirtschin (2009) articulates a way for teachers to assume responsibility for their professional learning through the use Web 2.0 technologies to form personal learning networks. This provides teachers with a voice, an expansion of knowledge and the ability to call upon their colleagues in other places for help when needed. Educational leaders have significant potential to encourage teachers' collegial collaboration through the adoption of a shared approach to leadership and it is likely that this will involve cultural and organisational change if it is to lead to effective and sustainable change (Duignan & Bezzina, 2006; Shuck & Aubusson, 2010; Lee, 2010).

The dynamic relationship between teachers' development of their ICT literacy, pedagogy and educational leadership with Web 2.0 arises from the interplay of the underlying factors within each of these themes.

3.3 Teachers' ICT Literacy

3.3.1 Teachers' Culture and Attitudes Towards Teaching with ICT

The culture of schools and the attitudes and underlying assumptions of the teachers who work in them have a significant influence on the integration of technology into the curriculum. Having technology present in schools in itself does not guarantee its effective use (Kadel, 2005). Developing a rationale and positive attitudes towards its use is a necessary

first step. In pointing out that some teachers regard technology with a utopian idealism whilst others are cynical about its place in education, Wellington (2005) recommended that teachers should adopt a healthy scepticism with regard to their attitude to technology. An effective approach involved teachers who progressively weighed up the pros and cons associated with ICT use and recognised and avoided any hype or gimmicks that might be associated with the technology. The teachers evaluated ICT in their educational context rather than treating it as an isolated tool.

Teachers' attitudes towards ICT are largely shaped by their vision of the technology itself, their experiences with it and the cultural conditions that surround its introduction in schools (Albirini & Abdulkafi, 2006). As they learned to change strategies and utilise technology, unless they constantly engaged in critical reflection about their underlying beliefs, they were likely to continue with outdated educational practices (Churchill, 2006). This was highlighted in a study of thirty-two American teachers who readily integrated technology into their classrooms (Judson, 2006). These teachers were found to be more likely to possess a belief in constructivist teaching styles. Their aim was to maintain dynamic student-centred learning environments in their classrooms where technology was used as a powerful learning tool. These beliefs were not necessarily carried over into their practice however. In an earlier study, Tyack and Cuban (1995) attributed this type of failure to transfer educational beliefs into practice not so much due to shortcomings in the approach of the teachers but rather, to the structures, established practices and ingrained culture of schools. This difficulty has continued to hinder teachers' attempts to use technology. Many teachers and administrators in schools still do not believe that the basic structure of schools requires change, despite the dramatic changes seen in an increasingly digital and networked world (Lee, 2010). It appears that innovations such as ICT often wither and die upon contact with the institutional reality of schools. It is my experience as leader of technology use in

schools that this type of failure often causes a negative impact on teachers' attitude towards the place of ICT in education.

Schools that are well equipped with technology for learning in the classroom and whose teachers are confident and competent in using it still appear to have struggled to foster positive attitudes within their teachers to the use of this technology. In a study of technologically-rich schools in the Silicon Valley California, it was found that individual teachers were not the determinants of technology integration into K-12 classrooms, rather other contextual and technology-specific factors such as the availability of technical support played a critical role in shaping what happens in the classrooms (Hernandez-Ramos, 2005). In a study in American secondary schools of thirty teachers who were highly educated and skilled with the technology and were innovative and adept at overcoming obstacles, it was found that teachers did not integrate technology on a consistent basis as both a teaching and learning tool (Bauer, 2005). The two key issues that led to this outcome were that students did not have enough time using computers and that the teachers needed extra planning time for technology based lessons.

The lack of capacity for schools to facilitate teaching with ICT arose from inappropriate classroom architecture and a lack of emphasis on recognising differing student skill levels and learning styles (Watson, 2007). In a study of the first Australian Schools to introduce one to one laptop computers to students, teaching practice was transformed only when class schedules, curriculum, assessment and architecture were modified to realise the potential of the technology (Stager, 2006).

It is common for teachers not to use ICT in ways that are consistent with their pedagogical beliefs (Bate, 2010). A greater emphasis on the connection between the technological and pedagogical domains would allow teachers to make greater progress with

the integration of ICT into the curriculum. Some teachers continue to believe that schools should work much more proactively with businesses and industries for guidance in terms of developing appropriate technologies that will be relevant and meet workplace demands (Simon, 2005; Okojie & Olinzock, 2006). This approach leads to an over emphasis on ICT to promote an enterprise-based culture and is an erosion of the time honoured goals of education to promote equity, fairness and social justice (Brown, 2005). These qualities remain essential for teachers. This is in addition to their ability to utilise technology with fluency so as to nurture and model digital citizenship for their students so that they may collaborate with and care for others (ISTE, 2011b).

If teachers do not have a coherent understanding of the place of ICT in education then a likely consequence of this is a lack of focus or common ground about curriculum objectives involving the use of ICT. Research in Queensland State Schools has found that policy decisions, infrastructure programs and curricular decisions have been made in relation to computer education that are based on mythic assumptions which teachers are called upon to challenge on an ongoing basis (Lloyd, 2004). The importance of teachers working well together to face this ongoing challenge to reach a common understanding about the place of ICT in teaching and learning and develop their practice accordingly is highlighted in a later section of this thesis: *Collegial Collaboration.*

The concerns raised here go to the core of how schools are organised and operate. In many schools, the use of technology has been superimposed onto traditional school structures and teaching approaches with only limited success and often with a negative impact on teachers' attitudes towards the place of technology in education (Reynolds, Treharne & Tripp, 2003; Norris, Sullivan, Poirot & Soloway, 2003). This leads me as researcher to question how it might be possible to overcome negative experiences and attitudes towards the

professional use of ICT amongst teachers and establish a clear rationale that provides them with an effective framework within which to work. Some possibilities which have emerged that might present a way forward for the integration of technology across the curriculum are presented in a later section on *Teaching Pedagogy with ICT.*

3.3.2 Professional Development

The need for professional development in technology integration for teachers has been well recognised (Fletcher, 2005). Teachers appear to progress through different stages of technology use in their teaching as their experience with it evolves from basic levels of operation to increasingly sophisticated activities. Two models that represent transition stages along this continuum are:

- Entry, adoption, appropriation and invention (Ringstaff & Kelley, 2002)
- Dabbling, doing old things in old ways, doing old things in new ways and doing new things in new ways (Prensky, 2006).

A third model of professional development in teaching with ICT as a progression along a continuum is a metaphor, where teachers experience a transformative journey through four phases that are intermingled with critical reflective practice (King, 2002). King's model of professional development has been chosen to analyse teacher's progress in developing their practice with ICT in the conclusion to the first research question in Chapter Six of this thesis. This has been chosen to facilitate a description of the development that is typically made by teachers in their practice with Web 2.0.

The four phases of King's (2002) professional development continuum are briefly described here. Initially fear and uncertainty result from a disorienting dilemma that involves existing teaching practices and a potentially new paradigm involving technology. A stage of testing and exploring of options for new roles, relationships and actions follows. Teachers

then move to a third stage of affirming and connecting what has been learnt to date. This leads to the final phase where new perspectives are achieved and integrated into professional practice. For such an evolution to occur, the environment at the school should facilitate and not hinder progress (Swan, 2005). Adequate access to reliable resources and development of ICT as a school priority, a supportive organisational culture and a collegial environment play a critical role in the processes of developing and disseminating new practice (Deaney & Hennessy, 2007).

A study of American K-12 schools found that many teachers have used technology for low-level tasks such as word processing and Internet browsing, drill and practice routines and free time. Higher level uses such as spreadsheets, presentation software or digital imaging to enhance their lessons were much less common (Ertmer, 2005). This is consistent with my experience as researcher, that a large proportion of teachers are at the earliest stages of professional development – namely, survival, entry stage or dabbling. They often seem to have a negative perception about their ability to use ICT. There seems to be an underlying assumption that an 'expert' or someone 'good with technology' will have any answers to their questions. These are usually based on technical rather than educational concerns. There is often a sense that technology has been imposed upon them, an unwanted addition to their already complex role. For a school community to respond effectively to the provision of ICT resources for learning, teachers needed to move from being dependent learners to become proactive, take risks, share knowledge and skills and engage in individual learning (Roe, 2004).

Teachers' views of the effectiveness of training to integrate the use of ICT into their practice highlights the need for a flexible structure to tailor individual needs and for professional development activities to become more relevant to the context of classroom

practices (Karagiorgi & Charalambous, 2006). Intensive seminars have been criticised as a means for achieving this because the experiences that are gained are seldom transferred to instructional practices (Peterson, 2005). A study of teachers integrating ICT into their classroom practice at a Victorian Navigator and Learning and Teaching with Technology in Catholic Education (LATTiCE) schools found that effective professional development occurred when the process was collaborative, embedded in practice, ongoing over time and had effective support from the Principal and ICT Coordinator (O'Donnell, 2002). This process involves teachers modelling good ICT practice and using this to help their colleagues to improve their practice (Kitchen, 2008). Teachers learn best within the context of their teaching so that they can practise, reflect and modify their approach. This is a social process that involves teachers progressively designing technology rich lessons from a system of mentoring from their peers who are proactively developing their practice with technology (Glazer, Hannafin & Song, 2005).

From my experience as a teacher, it seems that the approach to professional development based on peer collaboration is too idealistic because it does not appear to match the present reality. In the daily grind of teaching, such collegial dialogue and exchange of ideas does not seem to flourish as much as it could. Searching for avenues to promote this mindset amongst teachers to collectively and creatively develop practice with technology looms as a major challenge facing school leadership. This approach is explored further in the following section.

3.3.3 Collegial Collaboration

Reflective practice involving collegial collaboration has great potential to help teachers to explore the possibilities and challenges of their surroundings in order to construct knowledge of how they might integrate educational technologies into their teaching practices (Koszalka & Tiffany, 2003). Study groups, demonstration lessons, professional journals and peer coaching (Royer, 2002) and personal learning networks (Connell, 2009) can provide teachers with ideas for best practices in teaching.

Finding the time for teachers to collaborate with each other may productively include the use of students as their mentors. Students have much to offer their teachers because of their skills and proficiencies with technology (Chuang & Thompson, 2006). Rather than feeling threatened by knowing less than their students about ICT, teachers are encouraged to regard their students as a resource for their own learning. The approach of proactively utilising students' experiences and knowledge as an important aspect of reflective practice is presented as a way forward in developing teaching pedagogy with technology (Wall, 2005). Examples of this approach include *GenY*, where peer mentors assist technology teachers in American schools to bring technology literacy to all students (Generation Yes, 2006) and *Tech Angels*, a New Zealand initiative to encourage students to act proactively as technicians in operating information systems in schools (Feltham, 2007).

Professional learning communities which include ICT enthusiasts and use of an integrated pedagogic approach to ICT enhance the capacity of teachers to engage positively, collaboratively and critically with the growth of learning technologies (Unwin, 2007). Membership of virtual learning communities has been found to allow teachers to transform their learning careers and to make significant life changes (Allan & Lewis, 2006). Teachers not only work with learners but should themselves be learners in a situated and social process

that is dependent on ongoing interaction and communication in learning communities (Leach & Moon, 2000, McKenzie, 2010).

In addition to the drive and initiative of the teachers involved, the success of approaches in the use of ICT amongst teachers has been found to depend largely on the support obtained through school leadership and organisation and state wide technology infrastructures and funding (Hartnell-Young, 2006). An example of this working in practice emerged from the United Kingdom research project: InterActive Education; teaching and learning in the information age. The focus is on the dissemination of professional knowledge as it relates to teaching and learning. It incorporates ICT as a tool through the setting up and promotion of virtual communities interconnecting to create settings for improved professional growth (Triggs & John, 2004). A Victorian Catholic School in the LATTiCE program found that the curriculum delivery was enriched through the formation of partnerships of this type through the use of ICT (Colla, 2004).

The process of teachers collaborating with one another through the medium of ICT to develop their practice is described as 'Cyberinfrastructure' (Bement, 2007). At the heart of the cyberinfrastructure vision are cultural communities that support collaboration amongst peers and new modes of education. They are virtual organisations that work across institutional boundaries and ultimately around the globe. Long term change is more likely to be achieved when a critical mass of teachers is enabled to work collaboratively in developing common understandings of e learning and its implications for teaching and learning (Dabinett, 2006). Cyberinfrastructure is known today as Web 2.0 and allows teachers to operate within an environment of social networking to develop their own personalised learning network to enhance their own learning and that of their students (McGloughlin & Lee, 2010). In my experience, a minority of teachers are engaged in this practice. The data in

the Research Chapter reveal much work done during the course of this research to promote and encourage teachers' involvement in personal learning networks.

3.4 Pedagogy and Web 2.0

3.4.1 Teaching With Technology

Whilst the incorporation of ICT into teaching has largely been as a supplement to existing classroom practices, there is a call for fundamental shifts in the core activities of schools to include new teaching methods (Hayes, 2007). Computer courses have traditionally involved teachers leading their students in the acquisition of basic computer skills in lock step fashion, moving from one technology to the next, emphasising the different software applications. The observation made by Hirumi, (2002) that this approach fails to lead to students becoming independent computer users with an ability to create innovative solutions to real world problems has been endorsed by McLoughlin and Lee (2010). Technology integration in education is described as not so much a technical endeavour as it is a pedagogical one (Dutt-Doner, Allen & Corcoran, 2006). First and foremost, teachers are encouraged to see themselves as educators who are able to discern the place of ICT in their teaching. Vanderlinde, van Braak and Hermans (2009) advocate that all teachers become involved in using ICT through the establishment of technology curricula which shifts the current focus on technical considerations such as funding and resources, to a pedagogical rationale which is based on student competencies and their learning.

The high level of diversity of options for the use of ICT in schools creates significant challenges for teachers. They are challenged to select appropriate uses of ICT to support learning in specific situations and to take into consideration the behavioural, social, emotional and cognitive needs of pupils (Passey, 2006). In analysing this complex interplay, a model of learning environments is presented by Mishra and Koehler (2006). This model consists of

three aspects-, namely content, pedagogy and technology. They found that it is common that insufficient attention is paid to pedagogy. When a consideration of pedagogy is leading the use of technology in education, the supporting and integrated use of ICT allows individual space to be created around learning tasks. Teachers are then able to develop higher order intellectual thinking skills and positive habits of mind. This allows them to respond positively to the unexpected when they and their students are involved in information gathering and knowledge construction (Vallance & Towndrow, 2007).

A critical enquiry into how teaching might be carried out effectively with technology seems to be beyond the reach of most teachers, whose resources are stretched through the very busy and complex nature of their work. The provision of appropriate support is vital (Carey, 2006). An example of this support occurring effectively was a review of the role and characteristics of virtual learning objects in selected Finnish classrooms. These objects are computer programs designed to convey concepts to students in selected subjects. The review sought to understand how these learning objects could support the development of advanced pedagogical practices in schools. It was found that the learning objects were mostly used as exploration tools, information sources, assessment models and objects of discussion. Some learning objects were found wanting in delivering these aims (Ilomaki, 2006). In a similar Australian study of the use of *The Learning Federation* curriculum resources, the importance of teacher-centred and student-centred design as the driving philosophy in the development of learning objects was highlighted. Consultation between teachers and *The Learning Federation* in both the pre design and updates and improvements stages of construction of the learning objects was found to be the key to bring ICT and education together (Macleod, 2006).

In discussing learning with ICT, there is often no consideration given to the physical configuration of the classroom. This has remained virtually immutable since the industrial revolution, a situation that is inappropriate in the 'Knowledge Age' where there is a need to relate space to changes in pedagogy, curriculum and ICT by placing spatial literacy firmly on the agenda of teachers own learning (Fisher, 2004). In a study of English Language Arts teachers and their use of laptop technology in American Secondary Schools, the social and material spaces of the classrooms with cumbersome furniture, limited space and poor technology infrastructure were found to hinder or prevent the effective use of ICT in the classroom (McGrail, 2007). Associated with this, the design of school libraries to become a fully functional, dynamic and flexible learning hub in this digital age has been pointed out as being a vitally important factor in the design of schools today (Hay, 2006).

3.4.2 Student-centred Learning and Web 2.0

The use of ICT in the curriculum potentially provides teachers with the means to move from the traditional teacher-directed classroom to a more student-centred or individualised learning environment (Vrasidis, Charalambos & McIsaac, 2001; Crawford & Ratcliffe, 2010). This involves students being placed at the centre of the learning process, enabling them to construct their own meanings based on their prior experiences. The teaching focus is shifted from being solely based on knowledge transmission from teacher to student to a process of knowledge building within students. Teachers continually build their network of knowledge sources and access them whenever they need them. This enables them to combine a rich foundation of knowledge with the capability to connect to new sources of knowledge at a moment's notice (Ryan, 2009).

Wheeler (2001) observed that through the use of ICT, learners can be empowered to drive their own learning through interaction with their peers, collaboration, discussion of

ideas, debate and negotiation of meaning. Over the time since this observation was made the number of choices that teachers and students have to achieve this type of learning has grown enormously (Lee & Mitchell, 2009, Mirtschin, 2009). Students may be engaged to use technical tools to create presentations, posters, videos, podcasts, blogs and other forms of representations. The use of digital portfolios at Essendon North Primary School in Victoria was found to promote personalised learning and provide students with avenues to create new ideas and represent the knowledge that they acquire (Apple, 2004). A Grade 4 class at Hawkesdale Primary School in Victoria, Australia used social networking to enhance their learning of Maori language and culture through communication with students in New Zealand (McCullough, 2009). The emergence of Web 2.0 technologies enabling the dynamic production of information on websites such as blogs appears to offer significant potential for a wider audience to be reached and with which students can engage. This is an important factor in their learning. This process also involves the application of emerging understanding through strategic decision making as well as engaging in thinking and reflection (Brown, 2007).

The presence of technology provides teachers with the opportunity to alter their pedagogical repertoire through its use. The traditional formats of lecture presentations, notes, quizzes or worksheets can now include a set of tools for students to allow their thinking and creative expression to emerge through consumption of information, knowledge construction and application (Churchill, 2006). Working with ICT, children can become self directive and active exploratory learners in a very short period of time (Watts, 2004). Students who struggle with academic tasks can be provided with support in their learning by building literacy and language skills and independence through use of technologies such as text to speech, speech recognition, graphic organisers and e resources (Silver-Pacuilla &

Fleischman, 2006). A clear implication of this is that opportunities for improved learning in students may be lost if alternative pedagogical approaches such as these are not proactively developed by teachers and schools.

Teachers' understanding of how learning might be enhanced through the use of digital technologies does not imply that they need to have all the answers. Rather, they are given a greater capacity to act as co-learners with their students. Their approach could involve actively determining the skills with ICT so that they have to collaboratively design learning tasks (Kimber & Wyatt-Smith, 2006). This is an echo of the earlier theme of collegial collaboration. A major incentive for teachers to adopt this approach is that personal computing offers unprecedented opportunities for more children to learn what teachers have always valued more efficiently, a greater chance to learn things impossible to learn a few years ago and, most importantly, the capacity to learn to learn (Stager, 2006).

3.4.3 Adapting Pedagogy to the Technological World of the Students

In refining approaches to teaching pedagogy with technology, due consideration should be given to students' access at school to those technology resources and methods they use in their personal life away from school. To accomplish this task, educators should be recognising that in the area of technology resources the students are well educated consumers whose knowledge is invaluable for future educational planning (Hirsch, 2004). Mobile technologies can provide a platform for active learning, collaboration and innovation in education. This requires educational institutions to take this potential into account in creating more effective learning, teaching and user experience strategies (Fisher & Baird, 2007). This would allow recognition and realisation of the potential of the recent evolution of mobile handheld computing devices into powerful and affordable learning tools (Franklin, Sexton, Young & Hongyan, 2007). The use of third generation mobile phones which provide

functions such as information management, email, web browsing, basic word processing, spreadsheets and basic *Powerpoint* editing capabilities is becoming increasingly common. More effort needs to be made to find out the effects of these new technology tools on student attitudes, engagement in the learning process and learning outcomes (Moallem, Kermani & Chen, 2006, Cochrane & Bateman, 2010).

Wireless local area networks can provide students with access to their network resources through their mobile phones, Personal Digital Assistants or computers (Caverly, 2005). Wireless enabled tablet personal computers have been successfully deployed at Charles Darwin University in Australia to facilitate a more student-centred and active learning approach. This has arisen because of the increased level of interaction between staff and students and amongst the students themselves through the use of this technology (Tutty & White, 2006). Mobile Web 2.0 technologies have transformed pedagogy and facilitated New Zealand university students' engagement in their learning in a variety of course contexts (Cochrane & Bateman, 2010). For schools, the question of how to utilise these new technologies to enhance learning is perhaps the biggest challenge of the next decade (Collins, 2010).

3.4.4 Pedagogy and Information Literacy

An important aspect of teaching pedagogy with technology is information literacy, the ability to access, filter and use information effectively. It has been identified as a higher priority for educators to address than ICT literacy, the basic computer skills and the cognitive abilities to use these skills for learning and communication (Boeckhurst & Britz, 2004).

Information literacy is promoted as one of the most important skills for schools to foster in the information society, with libraries playing a crucially important role in this process. This claim was endorsed in a study of several thousand U.S college students. It

found that, though the students were proficient with using the technology, they were not developing the critical thinking skills necessary to perform information management and research tasks required for academic success (Katz, 2007). A similar study of six thousand three hundred American university students found that 52% of students could correctly judge the objectivity of a website and 65% could correctly judge its level of authority, while a minority of students showed a capacity for any level of sophistication in web searching (Schroeder, 2007). It was found that primary school students in Dunedin, New Zealand were able to successfully locate information from the Internet when search questions were clearly defined but were much less proficient at evaluating and synthesising information and questioning its authenticity (Pratt, 2009). The effectiveness of lifelong-learning competences depends on the learner's ability to intelligently deal with constantly changing information and knowledge structure. As a consequence of this, any pedagogy for e learning must be underpinned by a fully fledged information literacy education (Andretta, 2005). In a similar finding in a study of United Kingdom Open University students, teachers often over estimated their learners' effective networked learning competencies involving intellectual components (Kirkwood, 2006).

3.5 School Leadership and Web 2.0

3.5.1 The Role of the Principal in Leading Change with Web 2.0

School leaders face significant challenges in determining the direction that their schools should take in the use of ICT. Government policies in the USA, Canada, England and Australia (Australian Government: DEET, 2008) have promoted the need to produce an ICT skilled workforce in order to ensure national competitiveness in globalised economic conditions (Thomson, Nixon & Comber, 2006). Whilst this need should not be ignored, the focus of leading schools in the digital age is much broader than this and should encompass an

informed appreciation of the application and potential of new technologies to enhance learning (Gaffney, 2009). This challenges Principals and other leaders to think differently and proactively about how the networked school community may be organised to meet the educational as well as social demands that have been brought about by the transition to the post-industrial or digital age (Lee, 2010).

Though school principals' proactive involvement and proficiency in the use of ICT has been shown to have an effect on how well ICT is integrated into their schools' curricula (Dawson & Rakes, 2003) there is a danger in placing an over reliance on the principal to lead this process. Principals who must prove themselves as efficient, technically capable and entrepreneurial (Angus, 1994) often focus on building an impressive information system at the expense of developing the curriculum in using it (Hayes, 2006). The shortcoming of this approach, where knowledge creation and development is dependent on one person, highlights the need to widen the base of knowledge finding and sharing throughout the school by teachers assuming responsibility for their own learning and assisting that of their colleagues (MacNeill, Cavanagh & Silcox, 2005).

Parallel leadership appears to offer significant potential for school revitalisation to improve student learning outcomes where teachers and their principals engage in collective action to build school capacity (Crowther, Kaagan, Ferguson & Hann, 2002). An emphasis on collaboration amongst teachers to develop their skills and pedagogy in teaching with ICT, as described in a preceding theme of this literature review, will have greatest effect if it is modelled by those in positions of leadership at schools in the development of whole school technology plans (Morehead & LaBeau, 2004). This approach is consistent with key aspects of transformational leadership. This is much more complex and profound in nature than a transactional leadership approach (Bass, 1990). A transactional leader would put the

technology in place, having made decisions based on limited information and tell people in the school to use it. A transformational leader would consult widely, discern the needs of the education workers; teachers, parents, administrators and students before decisions are made upon a course of action. The nexus between home and school would be proactively developed for the student to realise the potential for social networks to be transformed to become personal learning networks (Zagami & Finger, 2010). The stakeholders involved in this network are given a legitimate voice and ownership in the educational and organisational changes involved with technology integration (Abrami, 2001). Student outcomes are more likely to improve where leadership sources are distributed throughout the community and where teachers are empowered in areas of importance to them (Harris, 2004).

3.5.2 Shared Leadership and Web 2.0

A shared approach to leadership in schools' technology planning is democratic by nature. It is likely to lead to teachers and others with curriculum knowledge and skills to maximise the intellectual resources of the school community and ensure ownership of the schools' educational programmes (McInerney, 2003). Initiatives such as the Strategic Leadership in ICT scheme for secondary school teachers in Great Britain that have been taken with the aim of facilitating the development of clear strategies for school leadership to embed ICT throughout their schools (Kenny, 2005) are viewed in this context. Leading technology mediated environments in schools, 'e-leadership', can be regarded as a form of dispersed leadership where leadership is based on community endeavour (Gurr & Broadbent, 2004).

ICT coordinators are defined as leaders who empower teachers to harness the power of technology integration for student learning (Hofer, Chamberlain & Scot, 2004). An analogy is made by Bleed (2006) comparing the role of ICT coordinator to an alchemist, combining

valuable commodities in the form of academic and enterprise applications to promote 21st century learning spaces and literacy. The role of ICT coordinator is critical in the complex process of school reform in integrating ICT into the curriculum (Tondeur, Cooper & Newhouse, 2010). These coordinators have a primary responsibility to provide vision to develop the school culture regarding ICT and the professional development of its teachers (Lai & Pratt, 2004).

Changes may be needed to counter the compartmentalised nature of curriculum in secondary schools where leadership is typically organised into subject domains to ensure a common purpose amongst these curriculum leaders (Smyth, McInerney & Hattam, 2003). For this change to occur, the ICT coordinator must be an educator with an interdisciplinary teaching and learning role with a clearly defined position within the school leadership team (Keane, 2008).

The focus of the leadership role of ICT coordinator needs to be on the provision of professional development for the integration of technology into teaching and learning (Keane, 2011). What too often happens, particularly when technical support for this curriculum leadership role is lacking, is that too much time is spent addressing issues related to technical support for teachers (Lai & Pratt, 2004). This highlights the need for good information management that is responsive to the needs of teachers in a timely fashion (Lee, 2006).

If a shared leadership approach is taken in leading technological change in schools, a balance is needed between a promotion of the expertise of technology leaders and a respect and valuing of the more traditional skills and knowledge of educators in schools. ICT leaders in the U.S.A have been successfully mentored with technology integration and leadership skills through courses such as the Maryland Technology Academy Leadership Program (McPherson, Wizer & Pierrel, 2006). The University of Minnesota has designed a similar

academic program to address comprehensively the need for effective technology leaders in K-12 schools. It provides a bridge across the no man's land between technology and leadership that gives coverage to school leadership and emerging technologies which encompasses communication, policy and ethical issues (Dikkers, Hughes & McLeod, 2005). Having recognised the potential benefits of this approach, a note of caution is appropriate. In the utilitarian atmosphere that is increasingly being found in education today, it becomes more and more difficult to defend hiring an historian of education over an expert in technology. This points to the need for a new conception of leadership that is critical, moral, local, redemptive, caring and critically reflective while also politically proactive in pursuing social justice (Anderson, 2004).

Effective leadership which promotes collegial reflection and collaboration amongst teachers in order to facilitate effective technology use in schools may be running counter to leadership approaches that are typical of contemporary education in countries such as Australia. The key teacher professional standard of the 1940s to 1980s was social democracy, characterised by norms of professional autonomy, trust and the educative potential of innovation in education (Bottery, 1999). Teachers had strong power and autonomy in the classroom, engaged in educational debate with other stakeholders, sought collegiality, curriculum innovation and the assertion of good collegial practice. Such social democratic teacher norms were displaced in the late 1980s and 1990s by norms associated with being an outcomes oriented teacher (Bottery, 1999). The market teacher of recent times was pressured to operate within market norms, including service competition, entrepreneurialism, responsiveness to customers and financial flexibility. Any collegiality was likely to be contrived rather than genuine, with an overriding feeling that 'big brother' is watching (Thomson, 2003). Many teachers appeared to opt out of leadership, believing it to be not

worth the effort in becoming involved in concerns other than the teaching of their classes (Gronn, 2003). From my experience this remains the case today.

While the language of leadership is replete with the jargon of sharing and collaboration, there is a need to make this rhetoric a reality for all school leaders, especially teachers, because in a complex organisation such as a school, leadership requires the energy, commitment and contributions of all who work there (Gaffney, 2009). The general acceptance of genuine shared or distributed leadership in schools may require considerable cultural change, especially amongst teachers. There is a need to articulate a new value set and vision that are lived on a daily basis (Duignan & Bezzina, 2006). This need for cultural change resonates with my experiences over many years in attempting to lead the development of the use of ICT in the secondary school curriculum.

3.5.3 School Development Plans and Web 2.0

The availability of so many powerful choices in technology raises many questions for schools. The struggle to provide appropriate access to technology for all educators and students is typical in schools (Di Bello, 2005). One computer in a classroom does not provide sufficient access for students and will not have any positive impact on the educational process (Norris, Sullivan, Poirot & Soloway, 2003). The lack of a widespread and effective instructional infrastructure in schools has delayed progress made in teaching with technology (Maddux & Johnson, 2006). Keane (2008) calls for a carefully guided process for change which addresses this shortfall in resources, but is driven by the attainment of improved learning outcomes.

The general research question guiding this research project; '**What factors influence Secondary School teachers to use Web 2.0 effectively to enhance learning**?' is a key

component of the case study college's school development plan. Fullan, Cuttress and Kilcher (2005) suggest a framework for educational reform and innovation which include eight drivers for effective and sustainable change. These drivers are engaging people's moral purpose, building capacity, understanding the change process, developing cultures for learning, developing cultures of evaluation, focusing on leadership for change, fostering coherence making and cultivating tri-level development. This framework has been utilised to generate recommendations from the research findings for school leadership, as outlined in Chapter Six. It is hoped that this will provide important insights into how practice involved with teaching and learning with ICT might be advanced in a sustainable and effective way.

3.6 Summary

This chapter has attempted to review the different themes underlying the research purpose of this thesis: to engage in critical reflection about factors that lead to improvements in teaching and learning through the use of Web 2.0 technologies. A conceptual framework was developed to visually and symbolically represent these themes which broadly correspond with the three research questions articulated in Chapter One.

Teacher's ICT literacy was examined in the first theme. The importance of developing a rationale for the use of ICT in education was highlighted. This involves teachers working together to remove myths and hype about technology to reach a common understanding about its place in schools. Part of this process involves the provision of good support and resources for teachers to use and the removal of barriers to its effective use. Effective approaches to professional development which lead to high levels of sophistication in teachers practice were investigated. The importance of teachers becoming proactive in trying new approaches with Web 2.0 that are underpinned by sound principles of teaching and learning was highlighted. An environment for collaborative learning amongst teachers

with the provision of ongoing support was found to be a crucial element for the advancement of their craft. This collective effort includes the development of personal learning networks which enable teachers to communicate with colleagues in schools elsewhere.

Teachers' pedagogy with Web 2.0 was examined in the second theme. Commonly, pedagogy is not given the attention it deserves. Instead the focus is given to technical competence and mastery. With a sound focus on the art of teaching with Web 2.0 many potential benefits to students' learning include improved engagement, personalised learning, critical literacy and higher order thinking. A proactive discernment of the place of technology in the lifestyles of students was promoted to leverage this as a learning resource rather than it being treated as an unwanted distraction as so often happens in schools.

Effective approaches to leadership in developing teaching practice with Web 2.0 were explored in the third theme. Although specialist leadership roles such as the Principal, curriculum leaders, teacher-librarians and ICT co-ordinators are important, the proactive involvement of all teachers in shared or distributed leadership appears to be an important factor in successfully achieving whole school change with web 2.0. This involves all teachers playing an active role in the development of a school's vision for the role of ICT and Web 2.0 and providing ongoing input into future planning. The reluctance of many teachers to become involved in this process was acknowledged as an ongoing challenge for school leadership to address.

Having established the theoretical framework and the context for the study in previous chapters, the next chapter describes the research process underlying this thesis. In particular, the epistemological, theoretical perspective and methodological issues underlying the research are explored. The four methods of data collection are identified and justified within the broader research methodology. The data analysis process is also described.

Chapter Four

Research Design

4.1 Introduction

This research acknowledges that knowledge is constructed between the researcher and the research participants, with this partnership producing thick descriptions through data collection techniques that included a questionnaire, interviews and the use of a research journal.

The major part of this data collection was through interviews conducted with nine teachers and the team of six teacher-librarians at the case study college. The questions posed in this interview were generated from the three research questions and the thematic framework of the literature review. A copy of these interview questions is included in Appendix C. The participants in the interview volunteered their time after the questionnaire was administered to all teachers at the case study college. This contained an invitation to all teachers to participate in an interview. The reflections of the research journal provided an important means of further exploration of the issues to have emerged from the questionnaire and interviews. As researcher, in my role as a teacher and learning technology leader, I was continually on the lookout for corroborating evidence to observations made by interviewees and questionnaire respondents. This evidence was compiled throughout the period of data collection in a research journal. As detailed in the Methodology Section of Chapter Four, I carried out this research as a participant observer engaged in a collaborative enterprise with teachers to develop their professional practice. The research journal entries were made within this perspective. The purpose of this was to search for multiple sources of evidence in the presentation of the data (Creswell & Miller, 2000).

Data were stored and referenced and then discussed in the light of the literature review to produce the findings of the thesis discussed in Chapter Six. This follows the three

stage approach to data analysis of data reduction, namely display and conclusion drawing and verification outlined by Miles and Huberman (1984).

The chapter initially explores the theoretical framework and the interpretive epistemological basis which underpins it. It gives a justification for the case study methodology and the role I adopted. The data analysis model is described and the chapter is concluded with an examination of the ethical issues associated with the research and an identification of the limitations and delimitations of the research.

4.2 Theoretical Framework

One of the clearest ways to construct a theoretical framework is to attend to the literature relating to the topic of interest (Merriam, 1998). The three themes that were identified in the literature review, namely Teachers' ICT literacy, Pedagogy and ICT and School Leadership and ICT, have each been used to frame the research questions. A dynamic relationship among all of these themes was described in the conceptual framework. The three research questions underlying this dynamic relationship were explored using an interpretive approach.

Table 1 provides a summary of the theoretical framework for this research project.

Table 1

Theoretical framework

An exploration of the use of Web 2.0 to enhance teaching and learning in an Australian Catholic Secondary School..

Theory	Definition	Chosen Approach	My Research Study
Epistemology	Philosophical assumptions about what is knowledge, its possibility, scope and general basis.	Interpretivism. Subjective analysis of socially meaningful action through the direct detailed observation of people in natural settings in order to arrive at understandings and interpretations of how people create and maintain their social worlds.	The direct, detailed observation of teachers to arrive at understandings and interpretations of how they create and maintain the world of practice in teaching and learning with Web 2.0
Methodology	A rationale for the choice of research methods employed in relation to the kind of knowledge or understanding that the researcher is seeking.	Case Study Participant observer	Facilitation of a collaborative enterprise in which teachers engage in exploratory action to further the practice of teaching and learning with Web 2.0
Methods	Research evidence or data gathering techniques.	Asking questions, observing events, reading documents.	Questionnaire Focus Groups Research Journal Document analysis

4.3 Epistemology

Epistemology deals with the nature of knowledge, its possibility, scope and general basis (Crotty, 1998). The theoretical framework described above is an attempt to look at the world of teaching and learning with Web 2.0 and to identify the relationships between its major components. This process necessarily involves the question of knowledge and embodies an understanding of what is entailed in knowing. Giving due attention to philosophical assumptions about what constitutes knowledge is deemed as a core element of the research process (Creswell, 2002). In doing so the researcher is able to choose an appropriate lens through which to view the exploration of the research issue.

Educational research can be underpinned by one of four 'big theories'. These are positivism, interpretivism, critical theory and postmodernism (O'Donoghue, 2007). A brief description of interpretivism, the epistemology underpinning this research, is given below. In the following sections, a theoretical perspective and methodology to be adopted within this epistemology are discussed.

Central to the work of interpretive theorists is the belief that human behaviour is not governed by inviolable laws so much as by agreed rules which are consensually validated by people (Candy, 1989). As a result, the social world can only be understood from the standpoint of the individual actors. In contrast to positivism, this process is subjective by nature. The aim of inquiry is to develop an understanding of individual cases rather than universal laws or generalisations. In general, the interpretive approach involves the systematic analysis of socially meaningful action through the direct detailed observation of people in natural settings in order to arrive at understandings and interpretations of how people create and maintain their social worlds (Neuman, 2006). Rather than starting with a

hypothesis and proceeding to test its validity, interpretive inquirers generate or inductively develop a theory or pattern of meaning through this subjective process (Creswell, 2002).

4.4 Theoretical Perspective

The theoretical perspective is a description of the philosophical stance that lies behind the chosen methodology (Crotty, 1998). A number of assumptions are brought by the researcher to the chosen methodology. These assumptions need to be explained. This is precisely what is done when a theoretical perspective is elaborated on. It is a description of the human world and social life within that world wherein such assumptions are grounded within a research paradigm (O'Donoghue, 2007).

Wagner (1993) maintains that an understanding of research as the reduction of ignorance rather than the production of truth is more likely to lead to the generation of new knowledge about education. A fundamental assumption of mine, as researcher, is that education should, at the very least, go a long way to reducing ignorance, the want of knowledge or the state of being uneducated or uninformed. Research as the reduction of ignorance is a useful criterion for framing research in education because it focuses attention on users (Gough, 2002), who are in this study, teachers and school leaders.

Truth claims tend to be framed in terms of their generalisability and their independence from historical contingency and context. However, statements about ignorance refer to particular locations, times and contexts. This ignorance takes the form of 'blank spots', what we know enough to question but not to answer, and 'blind spots', what we don't know well enough to even ask about or care about (Gough, 2002).

The participants in this research project are teachers and school leaders, the location is a Catholic Secondary School in the Sandhurst Diocese, the times cover the period 2009-2011

and the context is teachers' practice in enhancing the process of teaching and learning with Web 2.0. The promotion of conversations amongst these teachers through which each other's blind spots and blank spots are illuminated and subsequently resolved has been highlighted in the Literature Review in Chapter Three of this thesis.

The approach taken to this research recognises that if teachers and school leaders are picking up blind spots and blank spots, they are in a better position to improve the way things are with more focused effort into the future. Whilst recognising that good things are happening in teaching and learning with ICT in the case study college, as a researcher, I recognise that we are faced with big challenges, as are people in schools the world over. We have a long way to go in exploring and applying the potential of ICT to enhance our work.

The adoption of an interpretive approach to research involving the direct, detailed observation of teachers in their work with students at schools to arrive at understandings and interpretations of how they create and maintain their social world of practice (Neuman, 2006), has been chosen as the most appropriate epistemology for this research project. Especially in the context of critical thinking about education, unless we make a transition to more sophisticated ways of thinking, our civilisation will decline and decay as a result of ecological devastation, human and social fragmentation and spiritual impoverishment (Reason & Bradbury, 2001). Gaffney (2009) describes this transition in the context of this research when he asserted that leaders in schools today need to ensure that the networked school community that they lead is well placed to meet the educational and social demands that are presented to it in this post-industrial age.

Reflexive science states that social research should be a dialogue between the researcher and the people being studied (Neuman, 2006). The purpose of this research, to engage in critical reflection about factors that lead to improvements in teaching and learning

through the use of Web 2.0, is a characteristic of a reflexive science approach (Gibbons & Sanderson, 2002). This approach involves inter-subjectivity, not only amongst scientists as in positivism, but also between the researcher and the people under study, primarily through interactions between the researcher and the subject-participants, in this case, teachers. Disruptions or disturbances which develop out of their mutual interaction help to expose and better illuminate the issues inherent in the research problem. The researcher adopts the subject participants' view of the world in specific situations but does not stop there. The researcher aggregates many views from individual subjects and specific situations into broader social processes. The researcher sees the social world simultaneously from inside outward, from the subjective viewpoint of the people being studied and the outside inward, from the viewpoint of external forces that act on people. This takes place in a dialogue with the people studied and in a dialogue with other researchers in the field (Neuman, 2006). The researcher is acting as a mentor and ideally promotes a shared commitment to learning and growth, excellent interpersonal relationships, clear and shared standards of performance, regular feedback and review of practice, the identification of development strategies, balance of challenge and support and a long term strategy (West-Burnham, 2004).

4.5 Methodology

A summary of the research purpose, methodology and methods employed in this research is given in Table 2.

Table 2

Research purpose, methodology and methods

Research purpose:

To engage in critical reflection about factors that lead to improvements in teaching and learning through the use of Web 2.0.

Methodology:

Case Study

Research Question	**Methods**	**Participants/ Resources**
1. How might teachers' willingness and capacity to effectively use Web 2.0 to enhance learning be cultivated?	Questionnaire Focus Groups Research Journal Curriculum Audit	All Teachers on the campus Teachers who volunteer Researcher School Policies and documentation
2. Which pedagogies with Web 2.0 effectively enhance learning?	Questionnaire Focus Groups Research Journal Curriculum Audit	All Teachers on the campus Teachers who volunteer Researcher School Policies and documentation
3. What approaches from school leadership foster sustainable change in teachers' practice with Web 2.0 to enhance learning?	Questionnaire Focus Groups Document Analysis Research Journal	All Teachers on the campus Teachers who volunteer School, CECV & Government Policies Researcher

Methodology refers to a theory of producing knowledge through research and provides a rationale for the way a researcher proceeds (Gough, 2002). This involves more than particular techniques, such as administering a questionnaire or interviewing students. These

techniques are research methods, ways of proceeding in gathering evidence and are described in the following section. Most evidence gathering techniques fall into one of the following three categories: questioning and listening to informants, observing behaviour or examining historical traces and records. In this sense there are only three methods of social inquiry (Harding, 1987). The methodology provides reasons for using such techniques in relation to the kind of knowledge or understanding that the researcher is seeking.

This research was done as a case study with me, as a researcher and school leader, facilitating teachers' professional development of their practice with Web 2.0 technologies. It was a democratic process concerned with developing practical knowing in the pursuit of worthwhile human purposes, grounded in a participatory world view. I sought to bring together action and reflection, theory and practice, through participation with my colleagues in pursuit of practical means to enhance the learning of their students and building of their communities (Reason & Bradbury, 2001). This research was about working towards new understanding, since action without reflection and understanding is blind-, just as theory without action is meaningless. It was an evolutionary and developmental process as individuals developed skills of inquiry and as communities of inquiry developed within communities of practice.

Three particular attributes are often used to distinguish participatory research from conventional research. These are shared ownership of research projects, community based analysis of social problems and an orientation toward community action (Kemmis & McTaggart, 2000). The intention of this research was to foster an educational process of engagement of teachers improving their professional practice with Web 2.0 technologies. This involved collaboration with their colleagues, both at the college and in the wider educational community, over a sustained period of time (Reason & Bradbury, 2001).

This research was intended to be a social process of collaborative learning realised by groups of teachers who join together voluntarily in changing their current practices in teaching with ICT. It was my intention, as researcher, to be a facilitator of this communication, and that I should not be understood as a supervisor whose primary function is to offer technical guidance to members of the group. The approach adopted is an engaged subjectivity (Schram, 2003). I endeavoured to be understood as someone aiming to establish or support a collaborative enterprise in which people can engage in exploratory action as participants in forums constituted for communicative action and public discourse. As a leader of this discourse, I was attentive to and even highlighted the baggage that I brought to the research enterprise in my interactions with the research participants (Scheurick, 1997).

4.6 Participants and Data Collecting Strategies

This research was conducted within the Years 10 to 12 campus of a co-educational Catholic Secondary College in the Diocese of Sandhurst in Victoria, Australia. The campus has approximately eight hundred students and seventy-five teachers. I conducted the research while I was the Learning Technology Facilitator and teacher of Year 10 and 11 classes at this campus. The data collection techniques and participants employed were presented in Table 2. In addition, three methods of data collection: asking questions through questionnaires and interviews, observing events through a research journal and document analysis (Bassey, 1999) were employed in this study.

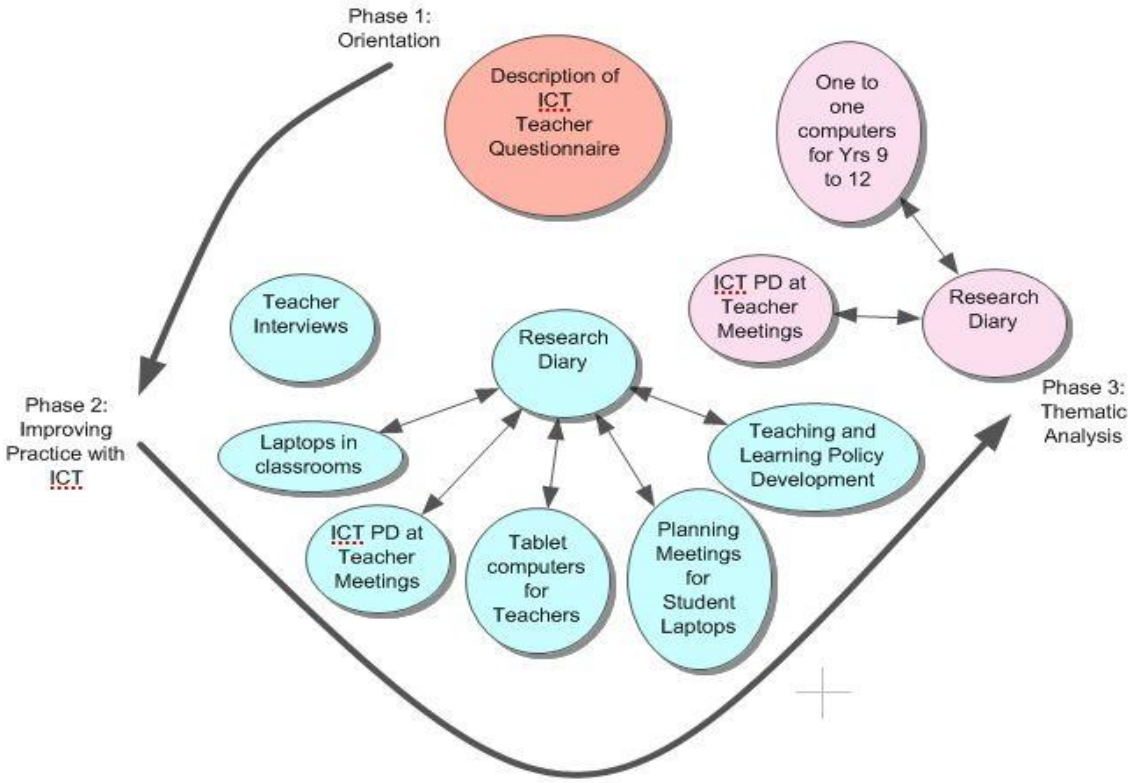
Since the research was conducted within one site at one school, it is unlikely that generalisations are possible for any findings reached. Particular effort was made to provide thick description (Atkinson & Hammersley, 1994), giving in-depth information to address the research questions. This was assisted by the extensive knowledge I had built up over the last ten years working at the school. Documentary analysis provided a detailed description of the

nature of the school, its historical background and the physical, social and educational context (Stake, 2005). Extensive reference was made to empirical research in contexts elsewhere to inform the methodology employed and to make meaningful comparison to any findings. This addresses the limitations inherent in conducting the research in a single site and minimises their impact on any findings.

The data collection occurred in three phases, as shown in Figure 4.

Figure 4

Phases of research



Phase 1 of the research provided an orientation of the factors that are relevant to each of the research questions. Seventy-five teaching staff at the senior campus of the school were invited to complete a questionnaire. A copy of the questionnaire is included in Appendix B. The questions were developed after the themes were generated in the literature review. Issues that were highlighted within these themes were made the subject of the questionnaire questions.

The questions were designed to provide a profile of the teachers in terms of their teaching area and experience, current practices, attitudes towards ICT, pedagogies employed and perceptions of leadership with ICT. Thirty eight teachers responded to the questionnaire.

In addition to this data, reference was made to curriculum documents and established ICT teaching practices.

The second phase of the research project involved my collaboration with teachers in my role as Learning Technology Facilitator, informed by my experiences as a teacher and researcher. The purpose of this phase of data collection was to reflect upon current practice of teaching with ICT and to attempt to proactively improve it. I adopted the approach of a participant observer (Kemmis & McTaggart, 2000) in conducting this research. This perspective has allowed me the best opportunity to achieve the necessary balance between being able to observe and comment on an issue or situation and a personal agenda of advocating for change to improve practice.

The primary data for the second phase of research have been drawn from interviews with nine teachers and the team of six teacher-librarians at the school. A copy of the interview questions is included in Appendix C. The interview questions were generated after the responses to the questionnaire were compiled. They were devised to provide the opportunity for respondents to give further insights into trends that were evident in the questionnaire responses. The Principal and other senior leaders did not accept the invitation that was extended to them to participate in the interview. As a consequence, the interview questions pertaining to leadership in teaching and learning practices with web 2.0 focused on teachers' experiences and involvement in shared or distributed leadership. These people accepted an invitation to participate in this research. The invitation was given to all teachers at the conclusion of the questionnaire in Phase 1 of the research. Purposeful sampling (Merriam, 1998) was used to obtain participants in this second phase. As researcher, I believe that this allowed the richest sources of data to be created because the interview participants volunteered their time for the interview with the intention of improving their practice into the

future. A major issue highlighted in the literature review was the reluctance of many teachers to become involved with collegial collaboration and work beyond the confines of their classroom teaching. Rewarding schools and the teachers in them for their efforts in participating in research of this type is identified as an important issue to consider when framing a research proposal (Lovey, 2000). During the course of the research, I have endeavoured to provide teachers with an incentive to be involved through an ongoing offer of support and encouragement for them to develop proactively their pedagogy with ICT. This offer did not amount to coercion however, as I made it clear to each research participant, their participation was completely voluntary and they were free to withdraw from this research at any time. The research data reveal nine teachers and six teacher-librarians participated and provided a wide range of perspectives.

The interview questions were designed to obtain individuals' insights and perspectives on their experiences in teaching with ICT. The responses from both the questionnaire and interviews have been grouped into the themes generated from the literature review. Data, obtained from the research journal entries, have been compiled alongside the interview responses. They include references to conversations, emails, meetings, and workshops in which I have been involved as Learning Technology Facilitator at the college.

The data for the research journal entries during the second phase of the research throughout 2010 came from the following sources:

- professional development sessions with ICT at teacher meetings
- tablet computer deployment to all teachers
- introduction of six classroom sets of laptops
- working party to develop a teaching and learning policy

- planning meetings for a one to one computer program for students

As a teacher, I have offered to act as a role model in proactively developing my pedagogy with ICT by adopting features emerging from the literature review that appear to enhance learning with students. These include consideration of individual learning styles, information literacy, collaborative learning and the promotion of student engagement. Implicit in this process is that I, as researcher, do not know what is present and cannot determine what needs to be known or found out without eliciting the account of teachers' experiences and what they think and feel about them (Gillham, 2005). Despite the open ended nature of the process, an interview guide (Stewart and Shamdasani, 1990) developed from the research questions was used to frame the initial questionnaire for staff, and guide subsequent discussions. Casual interviewing (Lofland & Lofland, 1995) involving conversations with participants were recorded with permission. A representative sample of transcripts of three participants' responses is included in Appendix D, Appendix E and Appendix F.

The third phase of data collection aimed to complement the data collected from phases 1 and 2 and to provide a foundation on which to complete the analysis of this data. The source of data for the third phase is research journal entries which provide descriptions of the following activities in which I was involved as Learning Technology Facilitator during 2011:

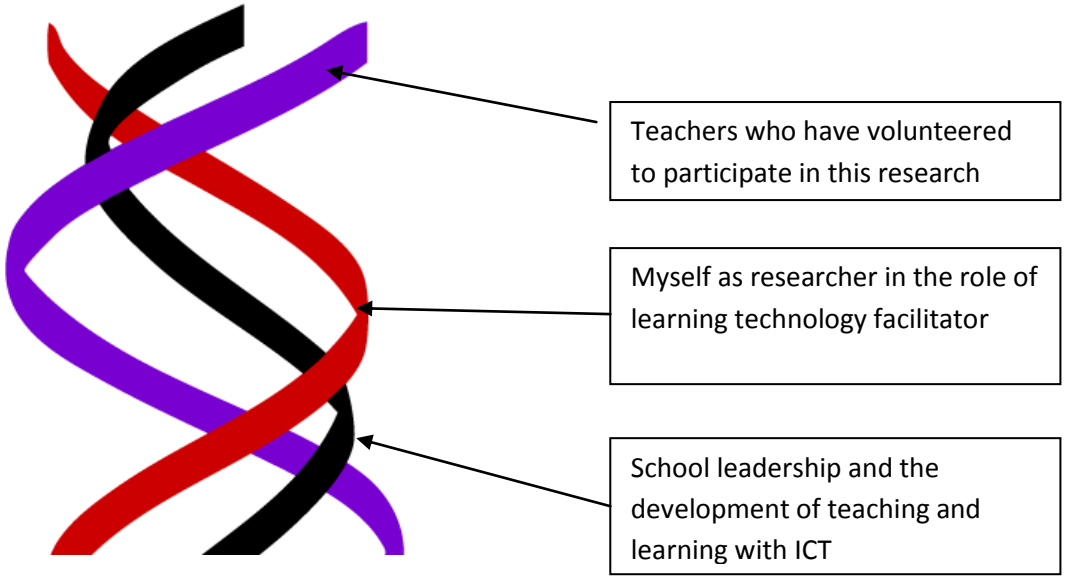
- professional development sessions with ICT at teacher meetings
- implementation of a one to one computer program for students in Years 9 to 12

The narrative emerging from these three phases of data collection has a series of detailed descriptions woven into it, including those relating to my own journey as researcher, the experiences and insights of my teaching colleagues and the approach taken by school leadership with ICT. This relationship is represented in Figure 5 as three strands of a helix or a three dimensional coil. These strands are interconnected by one or more of the three themes

from the literature review. The subsequent analysis is contained in Chapter Six of this thesis.

Figure 5

Interwoven strands of research activity



4.7 Analysis of Data

As researcher, confronted with a vast number of impressions, documents, transcribed interviews and field notes, I had the complex task of making sense of what has been learned. The third layer of the research occurs when information gained from this data analysis in the second research layer is brought together with that obtained in the first layer of research in the literature review. New information is generated as propositions are confirmed, rejected and extended through this interchange. Gibbons and Sanderson (2002) represent this process as the interplay of three worlds. I applied their approach in this research. World one is the case study college with its people, entities, physical objects, curriculum, organisational structures, groups, traditions and activities. World two is my mind-, with subjective experiences, mental states, conscious thought and psychological disposition, unconscious states of mind and wisdom. World three is outlined in the Literature Review. It is an objective

domain comprised of the propositional knowledge concerned with causal explanations related to ICT and education. The analysis phase of this research project can be seen as an interaction between the first two worlds which is continually informed and influenced by the third world.

The research questions led to the generation of raw data which were then stored and referenced and from which propositions or empirical findings were generated. These were brought to the third layer of the research project where they were discussed in the light of the literature review to produce the findings of the research. Miles and Huberman (1984) describe this iterative approach to data analysis as three concurrent flows of activity; data reduction, data display and conclusion drawing and verification. This iterative process reflects the approach taken to data analysis in this research project.

The third phase of the research involved efforts to make meaning of what was being said through a thematic analysis of the data. Of particular importance was my need, as researcher, to have sufficient knowledge of the research questions to enable me to identify with the participant during the conversations (Van Maanen, 1988). A list of tentative themes was generated continuously throughout each of the three parts of the second phase of research. The issues concerned in qualitative research of this type are complex, situated problematic relationships (Stake, 2005). The categories identified within the issues being researched were formulated from the themes of the literature review. Over time these tentative themes were grouped in classification schemes or typologies as more data were analysed. An example of this is included in Appendix G where a list of tentative themes is presented. These were grouped, over time, into each of the four sub-themes within the theme of Pedagogy and Web 2.0.

An iterative process involving the refinement of categories, rejecting data that are irrelevant and the development of concepts to explain emergent issues was involved in this thematic analysis. Anfara, Brown and Mangione (2002) present a three stage process which was followed to bring order, structure and interpretation to the mass of collected data. In the first iteration, reams of data were brought into manageable chunks and meanings and insights were interpreted to the words and acts of the participants involved. Several themes were generated in the second iteration. The third level of iteration identified underlying patterns that influenced important relationships involved in issues related to the research questions. Data collection and analysis occurred in a simultaneous process for generating categories and building theories (Creswell, 1994). Creative and reflective thinking about the data items led to draft analytical statements which were in turn tested against the data item and amended or discarded as necessary. Once this process was exhausted the analytical statements were expressed as research conclusions (Bassey, 1999). These conclusions are provided in Chapter Six of this thesis.

A coding system was developed to allow an efficient cataloguing of the research themes that have been identified. The need for a balance between the coding of data and an analysis of it has been identified (Hollway & Jefferson, 2002). An over reliance on the clerical coding features of computer packages can lead to a fragmentation of data where intuition and subtleties of interpretation are lost because the information has been broken down into its constituent parts or themes and taken out of its original context. These contexts were examined as they are often important in making relationships between the major themes of the research understandable (Stake, 2005). The coding scheme that was employed is included in Appendix H.

This analysis has led to the individual pedagogical preferences of teachers being brought together into a school wide approach. As researcher, I acted as a teacher leader by assuming responsibility for identifying commonalities in the most successful individual practices and then either aligned those common practices with the school's vision or attempted to negotiate meaningful changes in the vision (Crowther, Kaagan, Ferguson & Hann, 2002). This process was consistent with guidelines developed by the Catholic Education Commission of Victoria for schools to follow in the development of a strategic plan for ICT (Catholic Education Office, 2008).

4.8 Verifications

The concepts of validity and reliability have their origins in positivist research such as surveys and experiments (Bassey, 1999). Reliability is the extent to which a research finding can be repeated, given the same circumstances. Internal validity of research is concerned with the trustworthiness of the conclusions reached in terms of how they match the reality of the subject of the research in terms of cause and effect. External validity is concerned with how this relationship may be generalised to other contexts (Anfara, Brown & Mangione, 2002). The nature of this interpretive research means that data were interpreted or translated subjectively. In the context of this interpretation, notions of validity and reliability can be problematic. External validity is not meaningful since the case study is not chosen as a typical situation that can be generalised. In addition, clear cut cause and effect relationships may not exist to search for and report on (Bassey, 1999). This does not mean that validity is not relevant to this research paradigm but rather, that it has a different meaning from its application in traditional scientific research. Instead of focusing on a presumed external and objective reality as in the positivist paradigm, the focus of this qualitative research was to

match the constructed realities of the participants in the research and the realities as represented by the researcher (Guba, 1989).

Interpretive research needs to be as transparent as possible to the reader so that the integrity of its findings can be established. In conducting interviews this research project was held accountable through a disclosure to the research participants of the methods that were employed to establish validity (Anfara, Brown & Mangione, 2002). Each stage of the research project reveals issues that need to be addressed to ensure trustworthiness. These are described further in Section 4.9 Ethical Issues.

During the collection of raw data there was prolonged engagement with the data sources, persistent observation of emerging issues and close checking of data with its sources. This enabled sufficient trust and rapport to develop between myself, as researcher, and the teachers, as participants, to focus in detail on the characteristics and elements that seemed most important to the study (Guba, 1989).

During the analysis of data there was triangulation of raw data where each data source was clearly identified when making analytical statements (Bassey, 1999). Triangulation is a validity procedure where researchers search for convergence among multiple and different sources of information to form themes or categories in a study. In this study, corroborating evidence was collected through multiple methods (Creswell & Miller, 2000). The use of data from research journal entries was an important method of triangulation. Perceptions and views that were gained from various forums including conversations, meetings and workshops were included to allow further insights to be made to those obtained from interview and questionnaire responses. Several examples of this appear in the exploration of results in Chapter Five of this thesis.

Member checking occurred continuously throughout the data collection and data analysis stages. This is the single most crucial technique for establishing credibility in research (Guba, 1989). This involved me establishing that the multiple realities that I presented were indeed those of the research participants. Participants in the research were given a summary of their interview responses and asked to authenticate what was presented and point out any differences in their perceptions about what occurred and what was presented.

4.9 Ethical Issues

Bassey (1999) maintains that research ethics can be discussed under three headings; respect for democracy, respect for truth and respect for persons. Respect for democracy was observed through the acceptance and encouragement of a divergence of viewpoints amongst the participants in the research. As researcher I have shown respect for truth by being honest in the collection and analysis of data and in the reporting of its findings. Participants in the research were not deceived, either intentionally or unintentionally. I respected the truth in the research process by constantly building and rebuilding theory from multiple perspectives. My respect for persons led me to ensure that those involved in the research owned the data being collected initially. Member checking as a means of establishing credibility, as previously discussed, reflected this. My relationship with the research participants was based on their inherent right to dignity and privacy. This was consistent with the approach expected of teachers in general as part of their professional responsibilities. Respect for confidentiality was observed by not discussing with anyone the specifics of what was seen or heard. The discussion of general concepts or themes involved balancing the need to inform people interested in the findings of the research and the commitment to respect the privacy of the subjects (Glesne, 2006). I was conscious of removing any perception the participants may

have had of me as an authority figure who might react in an adverse manner to anything they said they felt I would not agree with or could be seen as a negative perspective about the work of teachers or leaders at the case study college.

Ethical clearance to proceed with this research was granted by the Human Research and Ethics Committee of Australian Catholic University on June 15th, 2009. A copy of this ethics approval is given in Appendix I. This clearance ensured that, as much as possible, this research did not result in physical or emotional injury to the human subjects of the research (Berg, 2004). This research is a form of social contract in the tradition of relationships that are already in place in the teaching profession.

Consent was sought and granted from both the Director of the Sandhurst Catholic Education Office and the Principal of the case study college to proceed with this research. Copies of these are included in Appendix J and Appendix K. A comprehensive letter was provided for each participant and consent forms were obtained from the teachers and teacher-librarians who participated in the research. This ensured that informed consent for participants was attained. A copy of this consent form is included in Appendix L.

Given that the research was conducted on one site in one school, as researcher, I was particularly aware of the difficulties inherent in maintaining the anonymity and confidentiality of the participants. The participants completing the questionnaire were guaranteed anonymity by having no identifiers present on the questionnaire. Where individual responses or observations were made by including narrative quotes and observations, the confidentiality of the interview participants was ensured through the use of pseudonyms.

Decisions were continually made in this research about what data to incorporate or reject, what to emphasise and what to disclose about the analysis process (Doucet & Mauthner, 2002). Authentic engagement with participants in the study and how much and what types of information to share with them were important considerations for me as researcher to ensure that appropriate ethical standards were observed (Schram, 2003).

Issues related to privacy and the Internet are a relatively new concern for the ethics of research. This is relevant for this project because of the focus on the use of Web 2.0 technologies in the school curriculum. In my work in mentoring the research participants with the use of Web 2.0 technologies I attended to ethical codes for doing social science research and also to codes of conduct, or netiquette, developed by on-line communities (Glesne, 2006).

4.10 Limitations and Delimitations

The limitations of the research are the factors over which I have no control as researcher, factors unavoidably present in the research (Punch, 2000). In relation to my research, these limitations outlined below.

1. The data obtained from the case study college were specific to this context and therefore generalisations may not be made to other schools or contexts that are based on this data with any level of certainty.

2. The ICT resources available to the research participants and their students influenced their attitudes towards the technology and the pedagogy that was adopted. Access to these resources, the development of Government and school based policies for its use and the program adopted for the professional development of teachers were all beyond my control as researcher.

3. The preparedness or interest of teachers in completing the questionnaire and participating in interviews and focus groups was beyond my control as researcher. I was proactive in encouraging people's involvement and tried to facilitate a worthwhile experience for them but was ultimately reliant on their professional interest and good will.

The delimitations are the decisions that I made as researcher, to ensure the project remained manageable (Punch, 2000).

1. I decided to extend an invitation to participate in the questionnaire and focus groups only to teachers at the campus at which I taught and where I had responsibility as Learning Technology Facilitator. This allowed for efficient access to people for ongoing communication of ideas and mutual support. I believed that extending the reach of the project to teachers at the other campus, or even further afield, would make the project too difficult to implement and would not be conducive to the climate of collaborative learning development being sought.

2. Though the fostering of on-line communication between school and home has rich potential to create personal learning networks for students (Zagami & Finger, 2010), I chose not to explore this home-school nexus in this research. Instead I proactively facilitated the development of teachers' and students' use of ICT in the classrooms of the college of research. In my role as Learning Technology Facilitator, I believed that this focus was needed before we could extend this work to the effective development of personal learning networks for the students.

3. I chose not to include classroom observations or students as research participants in this research so that I could keep the amount of data collected at manageable levels and to focus the research on teaching practice and leadership approaches employed.

4. The length of interviews was limited to one hour. This allowed me to collect a manageable amount of thick data whilst I avoided taking too much time from the busy working day of the participants and producing interview transcripts that were too lengthy.

5. My relationships with the research participants were clearly detailed in the information and consent letters. I believe that the data collection and analysis within this research remains objective notwithstanding these pre-existing relationships. My deep understanding of the research context and participants helped me to make insights into both the teaching practice and leadership approaches employed.

4.11 Summary

This chapter initially explored the issues related to the choice of an interpretive epistemology and case study methodology for this research.

I provide the approach I took as researcher as a participant observer intending to foster a social process of collaborative learning involving groups of teachers who have joined together voluntarily with the intention of improving their current practices in teaching with ICT.

Each of the four data collection methods was identified and its role within the broader research methodology clarified. The data collection methods included:

- Document analysis from the case study college and their systemic authorities

- The responses of thirty eight teachers at the case study college to a questionnaire with questions that were generated from the themes of the literature review
- Interview responses which provided further insights into questions generated from the research themes. The interview participants were nine teachers and the team of six teacher-librarians at the case study college
- Reflections made in a research journal that were based on activities in which I was involved as Learning Technology Facilitator at the case study college. These included professional development workshops, daily interactions with teachers and members of the leadership team

The chapter included a detailed description of the process of data analysis involving data reduction and display, conclusion drawing and verification. Reference was made to the importance of triangulation of data and an explanation of how this was carried out. The chapter is concluded with an acknowledgement of relevant ethical issues and an outline of the limitations and delimitations of the research.

The following chapter explores the data generated by the research methods. Responses are organised and reviewed according to the three Research Questions that framed this thesis.

Chapter Five

Exploring the Data

5.1 Introduction

This research was designed to explore how secondary school teachers can use Web 2.0 effectively to enhance teaching and learning. This chapter presents questionnaire and interview responses together with entries from my research journal which give further insights into the issues raised in the questionnaire and interview responses.

The data have been organised according to the three research questions. Table 3 shows the questionnaire and interview questions that relate to each of the themes from the literature review. A copy of the Questionnaire is provided in Appendix B and a copy of the Interview Questions is contained in Appendix C.

As Table 3 indicates, responses to Research Question 1 have been organised around three themes. Four themes are investigated in the discussion of responses to Research Question 2 while responses to Research Question 3 have been organised around three themes.

Table 3

Research themes in questionnaire and interview data

Literature Review Theme	Questionnaire Items	Interview Questions
Teachers' ICT Literacy		
Teachers' Culture and Attitudes of Teaching with ICT	2.2, 2.3, 2.4, 2.5 3.3, 3.5, 3.7, 4.1	1.1
Professional Development	2.6, 2.7, 3.10, 4.4	1.2, 1.3, 2.12
Collegial Collaboration	2.8, 3.2, 3.4, 3.11	
Pedagogy and Web 2.0		
Teaching with technology	2.1, 3.1, 3.4, 3.8, 3.9, 3.23, 3.24, 3.28	2.1, 2.2, 2.3, 2.10, 2.11
Student-centred Learning and Web 2.0	3.12, 3.13, 3.15, 3.16 3.26	2.5, 2.6, 2.7, 2.8
Adopting Pedagogy to the Technological World of the Students	3.6, 3.14, 3.17, 3.18, 3.19, 3.20, 3.27, 4.2,	2.4
Pedagogy and Information Literacy	3.21, 3.22, 3.25,	2.9
School Leadership and Web 2.0		
Shared Leadership and ICT	3.28, 3.29	3.1, 3.2, 3.5
School Development Plans and ICT	3.30, 3.31, 3.32	3.3, 3.4

5.2 Research Question 1

How might teachers' willingness and capacity to effectively use Web 2.0 to enhance learning be cultivated?

5.2.1 Introduction

This research question was designed to explore factors that affect teachers' willingness and capacity to incorporate Web 2.0 technologies into their teaching practice. A major focus of this research question was issues related to teachers' literacy with ICT.

The main themes emerging from this research question were:

- Teachers' Culture and Attitudes of Teaching with ICT
- Professional Development
- Collegial Collaboration

These themes are explored below.

5.2.2 Teachers' Culture and Attitudes of Teaching with ICT

The questionnaire and interview responses relating to this theme are presented in Table 4. Further discussion is provided from entries in the research journal that provide further insights into the issues raised in these responses.

Table 4

Teachers' culture and attitudes of teaching with ICT

Literature Review Theme	**Questionnaire items**	**Interview Questions**
Teachers' ICT Literacy		
Teachers' Culture and Attitudes of Teaching with ICT	2.2, 2.3, 2.4, 2.5 3.3, 3.5, 3.7, 4.1	1.1

Table 5 reveals that all of the teachers use computers each day as part of their work. The most common length of time of computer use, identified by 59% of teachers, was between one and five hours daily.

Table 5

Time spent by teachers using computers in their work each day

Statement	Not at all	< 1 hour	1 to 5 hours	> 5 hours
Each day, on average, I use ICT at school or home to prepare for teaching	0 (0%)	13 (36%)	23 (59%)	2 (5%)

Table 6 shows that all of the teachers had access to a computer at school and at home. Though access to computers amongst teachers is universal, 34% of teachers shared a computer with others at school and 32% shared a computer with others at home.

Table 6

Access of teachers to computers at school and at home

Statement	Share a computer with others	Have my own computer	Do not have access to a computer
At school I	13 (34%)	25 (66%)	0 (0%)
At home I	12 (32%)	26 (68%)	0 (0%)

All of the teachers have broadband access to the Internet at school. Table 7 shows that 83% of teachers have access to the Internet at home and that 15% do not have Internet access at home.

Table 7

Access of teachers to the Internet at home

Statement	Dial up modem	Broadband	No Internet access
At home my Internet access is	1 (3%)	31 (82%)	6 (15%)

Table 8 shows in descending order of frequency the ICT applications regularly used by teachers. Most teachers indicated that they regularly used Word processors, Internet browsers and Powerpoint. Despite the promotion of *Moodle* as the designated content management platform for the delivery of curriculum resources to students, only 42% of the teachers regularly used it in their teaching. A minority of teachers indicated that they regularly used computer applications other than the standard *Microsoft Office* programs and the Internet.

Table 8

ICT applications regularly used by teachers

ICT Application	Number of Responses	Percentage of Responses
Word Processor	37	97
Internet Browser	33	87
Powerpoint	22	58
Moodle	16	42
Spreadsheet	14	37
Educational Software	13	34
Image Creation/editing	6	16
Animation Software	2	5
Podcast Software	2	5
Other programs	1	3
Text to speech software	0	0

Table 9 reveals that electronic mail was used by 89% of teachers to communicate with their students. Other forms of communication with students using ICT are much less common amongst teachers. *Moodle* was used by 42% of teachers to communicate with their students. Despite the fact that all teachers used report software to produce semester reports, 39%

believed that this activity qualifies as communication with their students. Only 8% of teachers used Web 2.0 sites to communicate with their students.

Table 9

ICT applications used by teachers to communicate with their students

ICT Application	Number of Responses	Percentage of Responses
email	34	89
Moodle	16	42
report software	15	39
Web 2.0 sites	3	8

Teachers' use of the Internet with their teaching is presented in Table 10. Use of the Internet to access information was widespread amongst teachers, as evidenced by 92% of teachers who regularly used search engines, 82% who regularly used video sites and 61% who regularly used databases. The proportion of teachers who had incorporated the use of Web 2.0 sites involving the publishing of content as well its retrieval was noticeably lower, as shown by the 39% who used blogs, 32% who used knowledge sharing sites and 18% who used shared writing sites.

Table 10

Internet sites regularly used by teachers

Internet Site	Number of Responses	Percentage of Responses
Search Engines (e.g. Google, Yahoo, dogpile, AskJeeves)	35	92
Video Sites (e.g. YouTube, TeacherTube)	31	82
Databases (e.g. Google Earth, Internet Archive)	23	61
Community Building (e.g. Facebook, MySpace, ning, Bebo)	22	58
Image Sites (e.g. flickr, Photobucket, ImageShack)	16	42
Learning Management Systems (e.g. Moodle, WebCT, Blackboard)	16	42
Shared Concept Maps (e.g. Inspiration, C-Maps)	16	42
Blogs (e.g. OpenDiary, LiveJournal, blogger, Edublog)	15	39
Sharing Knowledge (e.g. Twitter, delicious)	12	32
Virtual Worlds (e.g. Dungeons and Dragons, Second Life)	10	26
Shared Writing (e.g. WebEx, Google docs)	7	18
Aggregators (e.g. iGoogle, pageflakes)	3	8

Table 11 presents a summary of teachers' responses regarding their attitudes towards teaching with ICT.

Table 11

Teachers' attitudes towards teaching with ICT

Statement	Agree	Disagree	Unsure
It is important for me to explore how ICT might enhance my teaching	36 (94%)	1 (3%)	1 (3%)
I feel comfortable with my level of technical expertise to teach with ICT	21 (53%)	15 (42%)	2 (5%)
I lack confidence in using ICT in my classes	10 (28%)	27 (69%)	1 (3%)
I feel anxious about teaching with ICT because my students usually know more about technology than I do	12 (31%)	24 (64%)	2 (5%)

There was almost universal endorsement from teachers of the importance of exploring how ICT might enhance teaching, given that 94% of teachers agreed with this statement.

Most teachers recognised that they lacked knowledge about Web 2.0 technologies but were looking for opportunities to learn more about its potential to enhance their students' learning. Penny's response is typical of the views that were expressed.

Show me how to do stuff. Show me possibilities that are out there that might have potential to engage my students in their learning. I'm so clueless that it's embarrassing. I can learn a lot of that stuff. I'm not afraid of it. It's more a matter of being able to make this happen. Why there's so much resistance to this is that there is not a lot of time to develop this expertise.

[Penny]

Many teachers were interested in their students becoming involved in on-line communication in forums social networking sites or nings. Mary's response is an example of this.

I would like to have another try at introducing the use of forums and nings with my Religion and Society classes. I'd like to look to see what's out there in the world of Web 2.0 and determine what might be of value.

[Mary]

A few teachers expressed interest in getting their students to become involved in Web 2.0 sites that were designed to enhance learning in their subject area. Celine represents this interest in her students' immersion in VOKI, an interactive site where avatars are created to communicate in French.

I am interested in having another go at nings, (collaborative learning sites). I am interested in exploring the list of Web 2.0 sites relevant to LOTE teaching that you have given me from the ACEC2010 conference and would like to explore what's there and try things. VOKI looks like it has potential to engage students to encourage them to communicate with one another as avatars.

[Celine]

Stephen was one of several teachers to express interest in his students creating and using podcasts to communicate with one another to develop their learning in on-line forums, as the following comments indicate.

In English Language in Year 11, I would like to try to get the students collaborating in the section of the course that looks at language acquisition of young children. I would like my students to go to an early learning centre or crèche and interview four year old children. They would create a podcast of their

language. We would put this on-line on Moodle. We would then listen to each others' recordings and comment on them in terms of what they tell us about language acquisition.

[Stephen]

Table 11 reveals that teachers' estimation of their level of technical expertise with ICT is mixed, given 53% rated themselves as comfortable with their expertise and a further 42% did not feel comfortable about their level of expertise with ICT. The following comment is typical of some teachers who rate their technical ability with ICT as fairly low.

Because of my lack of knowledge of ICT I would be concerned about what students are doing without my knowledge. I'd struggle to make sure they are engaged in the ICT stuff.

[Mary]

Teachers appeared to have more confidence in their ability to teach with technology than they had in their technical competence in using it. Table 11 shows that 69% teachers are confident in their ability to teach with ICT and 64% indicated that they did not feel anxious about teaching with ICT, even though their students might be more proficient with the technology than they are. I believe the experiences of Roberta help to explain this trend. As the following comment shows, she has rated her technical ability with ICT at a low level.

I find this whole area very difficult to deal with. I have missed out on the basics. When I try to do something, there is always something missing or a barrier that gets in the way.

[Roberta]

Despite this low rating of her technical ability in using technology, Roberta reveals a higher level of confidence in her ability to teach with technology in the following comment.

I don't have a problem with moving away from being the source of all information and knowledge for the students. I'm well aware that the kids are way ahead of me in their use of technology. If they can help each other, then that's cool by me.

[Roberta]

The majority of teachers who were interviewed had a similar perspective to Roberta and indicated that they were comfortable with allowing their students to act as mentors for each other and for them in their use of technology, as the following comment shows.

I have just started to learn Inspiration and am introducing the use of concept mapping into my teaching. I'm not sure how to use it properly yet. I get confused with some of the things and some of the kids know more about that than I do. I will be able to learn more about the program from some of the kids. I am comfortable with learning from the kids. It doesn't worry me at all to ask for this help.

[Annita]

5.2.3 Professional Development

The questionnaire and interview questions relating to this theme are presented in Table 12. Further discussion is provided from entries in the research journal that provide further insights into the issues raised in these responses.

Table 12

Professional development

Literature Review Theme	**Questionnaire items**	**Interview Questions**
Teachers' ICT Literacy		
Professional Development	2.6, 2.7, 3.10, 4.4	1.2, 1.3, 2.12

Table 13 shows that 55% of teachers believed that their needs for professional development in teaching with ICT are not being adequately met, while a further 37% were

unsure about this. Eight percent of teachers were satisfied with the adequacy of their professional development in teaching with ICT.

Table 13

Teachers' confidence in their professional development with ICT

Statement	Agree	Disagree	Unsure
I am confident that my needs for professional development in teaching with ICT are adequately met	3 (8%)	21 (55%)	14 (37%)

Table 14 illustrates that most of the professional development experiences of teachers in their practice with ICT are based on informal interactions with colleagues at work or with friends and family members at home rather than through externally provided courses or seminars. The proportion of teachers who received training or help from colleagues at work was 89%, while 39% received this type of assistance from friends or family. The proportion of teachers who accessed professional development in ICT from Internet sites was 42%, while 26% attended educational conferences or seminars on teaching with technology. No teacher participants had attained any formal qualifications in the field of ICT.

Table 14

Professional development activities in the use of ICT employed by teachers

Professional Development Activity	Number of Responses	Percentage of Responses
Instruction from colleague at work	34	89
Information from Internet Site	16	42
Instruction from friend or family member at home	15	39
Educational conference or seminar	10	26
Manuals or books	8	21
Short Course	4	11
Tertiary Qualification (e.g. Diploma in Computing)	0	0
Other (please describe)	0	0

The clear preference expressed by most teachers for asking questions and learning from people at school on a day to day basis rather than from external training or courses for their professional development with ICT shown in Table 14 is also represented in these interview responses.

> *The most effective training for me is when I have someone to ask questions of for help. I regularly do this with one of my colleagues when doing things on Moodle. It helps that his desk is quite close to mine.*
>
> [Celine]

> *I haven't had an external professional development day on ICT as such. I often get assistance from work mates to find out how to do things with computers like features of Powerpoint, creating hyperlinks and how to use Moodle. I find this sort of on the job training very useful with the ability to have questions answered as they arise.*
>
> [Mary]

Many teachers indicated that they failed to integrate ideas they experienced at professional development seminars into their practice in teaching with ICT, as revealed in the following experiences.

> *I have only been to one in service on teaching with ICT in LOTE. A lot of information was presented but once I returned to school I wasn't able to apply it to my teaching. Being able to learn on the job is more effective for me.*
>
> [Celine]

> *I have attempted to undergo professional development with Web 2.0 technologies but have had limited success. I have seen some stuff in action but haven't yet had the confidence to try things with my classes. External professional development sessions that I have been to are often good and thought provoking on the day but upon the return to school are often lost.*
>
> [Stephen]

Graeme's interview response brings to light experiences that several teachers expressed about the failure of professional development activities in teaching with ICT to improve classroom practice for teachers.

> *The emphasis has almost always been on the technology, not the practical educational detail of its application and use to facilitate learning, in a time economical way, in the classroom. A greater emphasis on good teaching strategies using ICT, ones that will actually enhance learning, relevant to my own subject areas is extremely important.*
>
> [Graeme]

Penny described her experiences from her teacher training where there was an over emphasis on learning about the technology itself, at the expense of an appropriate focus on the development of teaching practice to use technology effectively .

I did my Dip Ed in 2006. We had an ICT class there which was pretty dreadful. We were learning about skills in ICT rather than how to teach with it. We created a blog I think and created a power point and that was about it. I have had no professional development since I started teaching, apart from a training day last year on how to use Moodle which was not enough for me.

[Penny]

The description of an over emphasis on learning about technology at the expense of the development of pedagogy resonates with many of my experiences as Learning Technology Facilitator, one of which I have included here to illustrate this. In the Research Context chapter I endorsed the National Educational Technology Standards (NETS) as a valuable framework for teachers to use to develop their approach to teaching with technology. In the Literature Review I included a concept map that represents the major categories of Web 2.0 sites with hyperlinks to many of the most commonly used examples. In response to an invitation from the college leadership to provide input for an upcoming teachers' meeting on teaching with technology, I proposed to give a brief overview of the NETS framework and then to provide teachers with the opportunity to explore Web 2.0 sites. They would browse areas that they believed had most relevance to their teaching and consider how they might incorporate their use in a way that was consistent with the NETS framework. The following response to this proposal reveals a reluctance to consider the educational rationale behind teaching with technology and a preference to limit the focus to learning about the technology itself.

I think that an overview of the NET's standard is good, but you would need to be careful not to get too bogged down with details. Some practical examples would be great. Perhaps you could ask (names teacher) to speak and show examples of how he teaches about computer operating systems, CAD, robotics and systems engineering to promote these ideas

[email from a member of leadership to me, 12/11/2010]

Though there was a a great deal of evidence from both questionnaire and interview responses that teachers often gained skills in their use of technology through their communication with each other, there appeared to be a common failure to develop their teaching practice further with technology. The discussions amongst teachers typically did not appear to go beyond the acquisition of skills with ICT to encompass ideas such as the design of technology rich lessons or to focus on improved learning outcomes through the use of technology. This response highlights this limitation.

> *I think teachers need time to try things in teaching with technology, talk about successes and failures and then focus more on better learning for their students arising from this effort. At the moment we are supplied with the technology but don't talk to each other to develop our teaching with it nearly enough.*
>
> [Mary]

Several teachers expressed fear and anxiety about not being fluent learners with technology when they reflected on their experiences in attempting to further their practice with ICT. These responses highlight the difficulty that teachers have in moving from being dependent learners to becoming proactive and fluent in developing their teaching practice with ICT.

> *Probably the only professional development that I would find helpful is like this, one on one. I tend to go to water in a formal situation like workshops on Photoshop that I've been to where I feel like I'm one of the remedial kids at school. I've missed out on basic training and I get lost very easily in a group situation. Unless I have Peter or Ted sitting next to me I'm totally at sea. And that's really not fair on them because they are trying to help me but missing out on what they should be doing.*
>
> [Roberta]

I find it too difficult when I am in a group of people because there are people there who are more competent than me. I am reluctant to ask questions in this setting.

[Mary]

The provision of support and time for teachers to develop their practice in teaching with ICT was seen by some teachers as being vitally important but too often was lacking or not provided at all. The following comments highlight shortcomings that appeared to hinder teachers' professional development with ICT.

Having time to implement good ideas that I come across is very important to me. The everyday demands of school life preclude the chance to design new curriculum ideas and implement them into my teaching. If I were able to access this time to develop things it would make a big difference to me.

[Dorothy]

Having ongoing support back at school so that I have help in putting ideas into practice is essential.

[Elle]

Although many teachers called for increased support for their use of technology, from my experience, teachers often do not take up offers to help them in this area when they are provided. The invitation from a teacher-librarian to teachers, which is included here, received no response, even though the tutorials that were being offered were highly relevant to the teachers and covered information and skills that many of them appeared to lack.

Hi all,
The Library Staff are running mini tutorials on the following topics. The following tutorials have been designed around topics that staff have previously asked us for help. If you are interested in any of these tutorials just ring to make a time that suits you.
How to access Library Moodle services; VTV - how to access a 'free to air' programme we have recorded; How to connect your Lifebook to a data projector; How to connect a VHS/DVD player to a Data projector

[email sent from a teacher-librarian to all teachers, April 27, 2010]

According to the teacher-librarians, effective professional learning about teaching practice with ICT occurs when it is based on critical reflection with colleagues on an ongoing basis. The comment below was made by a teacher-librarian when she reflected about her experiences in an online learning course on the use of Web 2.0 in education in which she and her colleagues participated.

> *On the job training where we are working together to share ideas and develop our skills together is the way to go in the future. One of the best things that you could do is have a look at the blogs that we did when we went through the Web 2.0 course. This would give you a good idea of the progress we made, what we learnt together and some of the frustration that we experienced along the way when things weren't working so well.*
>
> [Teacher-librarian]

5.2.4 Collegial Collaboration

The questionnaire items relating to this theme are presented in Table 15. Further discussion is provided from entries in the research journal that provide further insights into the issues raised in these responses.

Table 15

Collegial collaboration

Literature Review Theme	**Questionnaire items**
Teachers' ICT Literacy	
Collegial Collaboration	2.8, 3.2, 3.4, 3.11

A large proportion of teachers do not appear to be engaged in collaborative processes to develop teaching practice with ICT.

Table 16 reveals that 50% of teachers often have discussions with their colleagues about the place of ICT in teaching and learning whilst a further 40% do not engage in this discourse. This contrast in approaches was also evident with 62% of teachers indicating that they do not have the time to talk with their colleagues about the place of ICT in teaching and learning whilst 32% believed that there was sufficient time for this communication. A minority of 37% of teachers regularly used ICT to communicate with teachers in other places to improve their teaching practice while a further 50% were not involved in this practice.

Table 16

Teachers' collaboration with colleagues about teaching with ICT

Statement	Agree	Disagree	Unsure
I often talk to my colleagues about the place of ICT in teaching and learning	19 (50%)	15 (40%)	4 (10%)
I usually do not have the time to talk with my colleagues about the place of ICT in teaching and learning	24 (62%)	12 (32%)	2 (6%)
I regularly use ICT to communicate with other teachers outside the college to improve my teaching practice	14 (37%)	19 (50%)	5 (13%)

In my experience, conversations between teachers about the place of ICT in teaching and learning often do not go beyond a focus on processes that involve the basic operation and availability of equipment. A typical example of this is shown in the following email, sent by a teacher to his colleagues raising concerns about teachers' access to classroom laptop computers.

> *Can teachers (not students sent on their behalf) please arrange with a teacher <u>before</u> a class has begun if they are able to borrow laptops from their room (or alternatively do a room swap with them prior)? This should also apply to teachers leaving extras as CRTs are being forced into the awkward position of asking for them, borrowing keys at the last minute from teachers etc. Recently it has been very disruptive to the original class in the room that the laptops are being borrowed from.*
>
> [email from a teacher, sent to all teachers 31/8/2010]

There was a difficulty in establishing a culture where teachers share ideas with one another about teaching and learning with technology so that they are able to learn from one another and develop their practice together. My recollection of events that followed the deployment of a tablet computer to all teachers to facilitate the improvement in their pedagogy with ICT confirms this. A message was sent from the college leadership to all teachers, at the time that they were issued with the tablet computers, encouraging them to embrace collaborative learning about teaching with the technology.

> *The technology you have received today is truly amazing.... pedagogically inert, it is only a tool. A tablet computer cannot teach children. To maximise the potential offered by the technology we need to understand how to make it work effectively for us. So I encourage you to play, experiment, share, discuss, compare, and at every chance, use the Lifebook in the classroom.*
>
> [email from school leadership to teachers, June 3rd, 2010]

At this time I was apprehensive because of the lack of awareness that I felt existed amongst teachers regarding an educational rationale underpinning the introduction of tablet computers. The prevailing climate at the college did not appear to encourage collaborative discussion amongst staff on many issues, including the use of technology. These concerns are evident in the research journal entry below. It was made after the session in which the tablet computers were distributed to teachers.

> *We were shown an excerpt from "Dead Poet's Society" where the students are asked to stand on the desk to gain a different perspective on the world. We were exhorted to adopt the same approach as teachers. "Look at things through different eyes with our new technology. Ask questions. Wonder. Discuss with others." Putting laptops into teachers' hands had to be supported with a coordinated process of professional development underpinned by approaches to teaching and learning that incorporated the use of technology. We were falling down in this regard.*
>
> [research journal entry, July 15th, 2010]

In the weeks that followed the deployment of the tablet computers I observed very few examples of collaboration amongst the teachers to explore effective practice with the technology together. The interactions that I observed amongst teachers often revealed an underlying resistance or uncertainty about using the tablet computer. This is evident in the notice that is included here, which was made in the first few weeks after the tablet computers were issued to teachers. The teacher who wrote the message appeared to intend to continue to use the desktop computer which had been in place for some time in his classroom in preference to the tablet computer which had recently been issued to him.

> *Could teachers please ensure that if a classroom desktop was unplugged from the projector, then it is plugged back in again at the end of the lesson.*
>
> [Bulletin notice from a teacher to all staff, July 27th, 2010]

In contrast to the collegial climate that was hoped for, the prevailing mood amongst many appeared to be apprehension and uncertainty about the introduction of this technology. The following email from a teacher to his colleagues highlighted this.

> *I have a concern with using the IT in the class room. Many staff still don't have the training to fully use their tablet computers to teach with. It would be like me being given a French class and a text book and saying go for it! Please think of the staff and the training that is necessary. Someone is setting up some staff to fail and feel embarrassed in front of the students.*
>
> [email from a teacher to all teachers, September 22nd, 2010]

The following interview response calls for a greater emphasis on shared leadership that involves teachers mentoring one another in the development of their teaching practice with ICT.

> *With the mentoring of teachers there are teachers here who aren't necessarily ICT teachers but who have amazing skills and they should be tapped on the shoulder and asked to be like a mentor for other teachers to sit down with a couple of people and guide them through stuff and get up at domain meetings and show them some of the great things that they have done to inspire others.*
>
> [Elle]

Some teachers felt powerless and frustrated when they reflected on the lack of a collaborative environment for their development of ICT use at the college. One teacher articulated this by using an analogy where the demands placed upon her to use technology in her teaching caused her to become immersed in an endless search for missing pieces of a puzzle.

> *The recent request for teachers to fill out an online questionnaire on their ICT competencies is a good example of how things don't work for me with technology a lot of the time. The program that is needed to do this questionnaire isn't available on my Macintosh computer. I have asked for it to be installed but it hasn't happened yet and it's weeks later. That frustrates me and doesn't allow me to accomplish what I want to do. The analogy of a jigsaw with pieces missing is a good one that describes my experiences in teaching with technology.*
>
> [Roberta]

There appeared to be an over emphasis from school leaders on teachers' acquisition of technical skills at the expense of collaborative learning to develop their pedagogy with ICT. The questionnaire referred to by Roberta to measure ICT competencies is included in Appendix M. It was an attempt by the school leadership group to identify each teacher's technical ability to operate a computer and use the main functions of a word processor, Internet browser, email, spreadsheets, presentation software, reporting package, content management system (Moodle), interactive whiteboard and data projector. The intention was to collate the results of the questionnaire, analyse these and from this set a focus for our professional development with teachers for the coming year.

Whilst I recognised the importance of technical skills amongst teachers, I contended in planning meetings that our focus for the professional development of teachers with ICT should include a focus on their pedagogy with ICT. With the aim of stimulating this work, I wanted to use the results of the questionnaire and interview questions that I administered for this research along with a questionnaire that was produced by the Catholic Education Office.

A copy of selected questions from this questionnaire is included in Appendix N. This questionnaire was very similar in content to the questionnaire used in this research. I believed that these results would provide us with insights into teachers' pedagogy with ICT and would be valuable for us in setting an agenda for their professional growth in this area. This suggestion was not taken up by the school leadership. It was my perception that the focus of professional development was restricted to competency with the technology instead of developing the craft of teaching with technology.

I observed a shift towards teachers mentoring one another in their practice with technology during the course of the 2011 school year. Wednesday afternoons were set aside during each week of term for professional development sessions on various aspects of teaching with technology. The sessions during first term focused on the operation of *Microsoft Outlook, Microsoft One Note, Adobe Acrobat* and their possible use in teaching. I led a session on the educational potential of Web 2.0 technologies. All of the sessions during term 2 were designed to allow teachers to become familiar with the operation of the *DyKnow* application. This allows a teacher to monitor the activity of computers of students in their class and to facilitate their learning through activities such as capturing and displaying their work, polling their understanding of concepts and collaborative information sharing in groups. The third term saw the introduction of sessions where teachers within subject domains met to share and discuss ideas about how they were teaching with technology. All of these sessions were run by teachers who volunteered to share their expertise. This shift from the delivery of ICT professional development by a small number of designated experts who were focused on technical competency to an open invitation to all teachers to make contributions based on their successes in teaching with technology was affirmed by a member of school leadership in the following email.

> *The focus of the professional learning that is to be offered across a wide range of areas in ICT this term is on teachers' successes in teaching with technology in the classroom to improve learning and engagement with their students. We thank the large number of teachers who have volunteered to lead these sessions and are confident that their insights will be valuable to us as we continue to develop or practice in this area.*

[email to teachers from school leadership, July 29th, 2011]

I responded to this open invitation from school leadership to contribute to the professional learning of teachers with ICT by leading several workshops during Term 4, 2011 on teachers' personal learning networks with Web 2.0. The email inviting teachers to participate reveals the aims of the workshops and the approach that was taken. Teachers showed a strong level of interest in this area as evidenced by participation levels of between eight and fourteen in these workshops.

> *The purpose of these sessions is to explore the learning potential of Web 2.0 through the development of your personal learning network. These allow you to connect with other teachers to engage in collaborative effort to enhance your professional learning, and, in turn the learning of your students. The learning challenge at Edublogs provides the outline of the broad approach that we are taking: http://teacherchallenge.edublogs.org/2011/08/08/pln-challenge-10-making-connections/*

[email invitation from me to teachers, October 17th, 2011]

5.3 Research Question 2

Which pedagogies with Web 2.0 effectively enhance learning?

5.3.1 Introduction

This research question was designed to explore pedagogical approaches taken by teachers with Web 2.0 that lead to enhanced learning outcomes.

The main themes emerging from this research question were:

- Teaching with technology
- Adopting Pedagogy to the Technological World of the Students
- Student-centred learning and ICT
- Pedagogy and information literacy

5.3.2 Teaching with Technology.

The questionnaire responses relating to this theme are presented in Table 17. Further discussion is provided from entries in the research journal that provide further insights into the issues raised in these responses.

Table 17

Teaching with technology

Literature Review Theme	**Questionnaire items**	**Interview Questions**
Pedagogy & ICT		
Teaching with technology	2.1, 3.1, 3.4, 3.8, 3.9, 3.23, 3.24, 3.28	2.1, 2.2, 2.3, 2.10, 2.11

Table 18 reveals that 59% of teachers employed the use of ICT in between one quarter and a half of their classes. A further 29% used ICT in over half of their classes. The percentage of teachers who did not use ICT in any of their classes was 11%.

Table 18

Proportion of classes where teachers use ICT

Statement	None of my classes	One quarter of my classes	Half of my classes	Three quarters of my classes	All of my classes
Each day, on average, I use ICT as part of my classroom teaching at school	4 (11%)	10 (27%)	13 (32%)	5 (14%)	6 (16%)

Table 19 presents a summary of teachers' opinions about their pedagogy with ICT and the influence that this has on enhancing the learning of their students.

Table 19

Teachers' beliefs about enhancing learning through teaching with ICT

Statement	Agree	Disagree	Unsure
I believe that the teaching methods that I employ with ICT often enhance the learning of my students	32 (84%)	3 (8%)	3 (8%)
I have a good understanding of the purpose of using ICT to enhance teaching and learning	29 (76%)	7 (19%)	2 (5%)
I am familiar with the VELS model of ICT as an interdisciplinary learning domain	15 (39%)	16 (44%)	7 (17%)
The VELS approach to ICT as an interdisciplinary learning domain is a good model that leads to enhanced teaching and learning	11 (29%)	7 (18%)	20 (53%)

Table 19 shows that 85% of teachers believe that the teaching methods that they employ with ICT often enhance the learning of their students. Only 8% of teachers believed that this was not the case. Complementing this positive self-appraisal was the revelation that 76% of teachers believed that they have a good understanding of the purpose of using ICT to enhance teaching and learning. Only 19% of teachers do not believe that they have this understanding.

A contrasting perspective to the apparent high level of understanding amongst teachers about the place of ICT to enhance learning is found in Table 19, where the comparatively low proportion of 39% of teachers indicated that they were familiar with the interdisciplinary model of ICT within the VELS. A further 61% were either unsure of, or not

familiar with, the VELS model of ICT. The views of teachers about the effectiveness of the VELS model of ICT in enhancing teaching and learning showed a similar pattern, where 29% of teachers endorsed the VELS model of ICT to enhance learning. A further 71% were either unsure or did not believe in the effectiveness of the VELS model to enhance learning.

The large proportion of teachers who were either not familiar with the VELS model of ICT, or did not believe that it enhances learning, suggests that the Victorian Government mandated implementation of this curriculum framework has not been effective at the college. Reasons for the perceived ineffectiveness of the implementation of VELS include negative attitudes towards, and a poor understanding of the model, as revealed in the following responses.

> *I am not familiar with VELS and do not use this framework when I am planning my teaching content. I was turned off VELS when it was introduced because it was introduced poorly at the time.*
>
> [Celine]

> *I'd be ticking that number 1 box, where 1 is the bottom of the scale. I know it can be used for things like creating art works but in terms of formally using the model, I don't have much knowledge at all. It's something I avoid like the plague I think.*
>
> [Roberta]

> *I am pretty unfamiliar with the VELS framework. Because I did my training in Sydney I didn't study VELS, I studied its equivalent in New South Wales. I have had no training or not accessed information about VELS since I have been teaching.*
>
> [Penny]

Some teachers have become familiar with the model of ICT in VELS but have not applied it effectively in their teaching. These responses represent this experience.

> *I read it very thoroughly and then forgot it.*
>
> [Graeme]

> *ICT in VELS is not really at the forefront of my thinking. I have some familiarity with the model but do not really use it in my teaching.*
>
> [Stephen]

A small number of teachers indicated that they are familiar with the VELS model of ICT and believed that they are able to use it effectively to enhance the learning of their students. This response highlights an awareness of the potential for enhanced learning within the VELS ICT framework.

> *I believe in using ICT as a learning tool in LOTE and so believe that the philosophy of ICT in VELS as a tool or medium to facilitate learning in the students across the curriculum is a good thing.*
>
> [Celine]

The teacher-librarians' response indicates that, although most teachers may not be using the VELS framework as a guide to their teaching, the methods that they employ may be consistent with the philosophy of this framework.

> *We have certainly found many examples of how teachers could use ICT across the curriculum to help their students learn so in that sense we have followed the VELS model.*
>
> [Teacher-librarians]

One teacher put forward the view that the VELS model of ICT is a theoretical model that is not able to be used in a secondary school setting.

> *My belief is that VELS reporting is really a primary school model where one teacher takes most of the subjects. It has large failings in secondary schools with cross-curriculum and interdisciplinary learning. If something is interdisciplinary then it needs to be made clear which domains do what and then each can assess and report on their own areas of responsibility.*
>
> [Graeme]

The low level of understanding amongst teachers about curriculum frameworks such as the VELS for teaching and learning with ICT prompted me to draw up a proposal to the Curriculum Team which called for the adoption of the ISTE standards for teachers and students. I was included in a working party which was given the task of revising the Teaching and Learning Policy of the college. I had a particular interest in incorporating into the policy a relevant framework for teachers that gave them a sound reference point for their pedagogy with ICT, something that was lacking in the existing policy. An excerpt of this proposal follows.

> *The ISTE standards involve teachers becoming fluent users of technology, engaged in ongoing professional development with technology, open to change and innovation if it improves learning outcomes, acting as role models to their students for its use, collaborating with one another to further their practice, promoting engagement, thinking skills, creativity and social integrity in their students*
>
> [excerpt from my proposal to Curriculum Team, July 15th, 2010]

Though the proposal appeared to be well received it has yet to be formally adopted. Meetings to review the Teaching and Learning Policy of the college did not continue as planned in late 2010 and this important task remains a work in progress.

Though the understanding and implementation of contemporary curriculum frameworks such as the ISTE and the VELS interdisciplinary learning model of ICT amongst teachers appeared to be low, there were several interview responses that reveal a wide variety of strategies which teachers employed to enhancing students' learning.

Graeme and Annita gave descriptions of their use of the content management system Moodle. The questionnaire data showed that 42% of teachers were using this learning resource.

> *I use Moodle in keeping students up to date with requirements and providing a central place for resources they need. On-line simulations and You Tube videos are good in Physics.*
>
> [Graeme]

> *I do all notes on Powerpoints and make these and all worksheets available on Moodle. I then do links to resources on the Internet that are relevant to what we are studying.*
>
> [Annita]

Teaching resources such as videos, animations and references that are accessed from Internet sites are used by many teachers to facilitate their students' learning.

> *I use animations in Biology a lot. I use a data projector every lesson and find it difficult to imagine teaching without one now. I use a couple of dissection simulation programs in Biology and often use videos from You Tube.*
>
> [Annita]

> *I get the students to use computers for Google searches.*
>
> [Mary]

> *I have used online games to practise language skills, online texts, forums in Moodle, podcasts of people speaking and videos from You Tube.*
>
> [Celine]

As shown in Table 10 from the *Teachers' Culture and Attitudes* section of this data chapter (p 97), the use of Web 2.0 sites which involve students both accessing and publishing content were being used by a relatively small number of teachers. The teacher-librarians appeared to have made the most progress in recognising the potential of this rapidly evolving medium. These responses show how they have attempted to develop their pedagogy through the use of this medium.

I came across an area of Web 2.0 called Glogster. This involves the students making a poster that is linked to websites, music and other media instead of producing the standard poster and pinning it up on the wall. The students can produce something on paper. This enhances the message that the student is trying to get across.

[Teacher-librarian]

With my book club, I have a lot of kids involved in using Shelfari to discuss the books that they are reading.

[Teacher-librarian]

Many teachers appeared to have had very little knowledge of the range of Web 2.0 sites that are available and as a consequence of this have not been able to form an opinion on their potential to enhance the learning of their students. This is apparent in the following responses.

I don't know anything. I haven't really got time to find out either unless the school administration gives me time.

[Graeme]

I don't feel as though I really know what Web 2.0 really is. I'm after further knowledge on what it is and what possibilities there are for me to consider with my teaching. I need to do this ground work to become better informed before I try things with my classes. Discussion boards could be worth a try.

[Elle]

On a scale of one to ten where one means I know very little, I'd give myself a one.

[Mary]

Some teachers appeared to have begun to use Web 2.0 technology in their teaching to enhance the learning of their students. The experience of one teacher, given in the response that follows, suggests that she is an early adopter of this technology at the school.

I created a series of podcasts of the entire course in Year 11 Environmental Science. I originally did this for a student who had missed many classes because of illness. When other students heard about this they asked for access to it as well. It surprised me how quickly it was taken up. They listen to me in the car or on their ipods. As far as I know I am one of only two teachers on staff who are doing this. This low level of take up surprises me. Students actively use this technology and it is natural for them to take it up when it is offered to them.

[Annita]

Some teachers openly expressed uncertainty about the use of Web 2.0 applications in the curriculum. Though they had become familiar with some of the emerging uses of Web 2.0 and recognised that it was a common part of their students' experiences outside of school hours, they were not enthusiastic about the prospect of teaching with this technology. This comment represents this ambivalence towards the technology:

I don't really use any of it much. I wouldn't mind using the social networking. After this recent VCAL presentation it occurred to me that my students are on the Internet and actively involved every single night and socialising in this realm of activity. The presenter jumped on to msn and threw out a Biology question. All of his students were there. They then started discussing Biology. But then I thought I'm not going to do that at night time because I have a life. If I was on there I could do that. I think that it could be valuable. I don't want to become a 24/7 social networker so I ask myself how can I tap into their lifestyle without compromising the way I want to approach my own life.

[Elle]

Some teachers rejected the place of Web 2.0 technology in teaching and learning. Roberta's response encapsulates this perspective.

The whole area of Web 2.0 doesn't interest me. It's just another way for me to have my time eaten into. I've got other things that are of a higher priority than facebook and all that. I haven't got time for it and it's not relevant to my teaching.

[Roberta]

The negative perspectives of teachers about the place of Web 2.0 in the curriculum were reinforced by a directive from school leadership that was made to teachers where they

were directed not to engage in any form of communication with their students on *Facebook, MySpace* and other similar social networking facilities.

> *A professional relationship will be violated if a teacher holds conversations of a personal nature or has contact with a student via written or electronic means including email, letters, telephone, text messages or chat lines, without a valid context.*
>
> [email from school leadership to all teachers, 12/8/2010]

Most teachers expressed reservations about the success of their efforts to improve learning outcomes through the use of ICT in their teaching and called for the provision of more support in their endeavours. This is evident in the following responses.

> *There is so much out there that it can be overwhelming at times. I don't have the time out of school to be engaged in this type of learning and find it difficult at school because teachers and students need me for various library functions and it is very hard to make the time to learn new things without being interrupted.*
>
> [Teacher-librarian]

> *I haven't done a lot of work in teaching with ICT. I think it takes me time to conjure up the confidence to do it.*
>
> [Dorothy]

The need that was expressed by several teachers for an effective process that enables them to attain a more effective focus on pedagogy and curriculum design with technology resonates with me, as shown in the following research journal entry.

> *We don't have a good track record on debate, dialogue and collegial collaboration when it comes to developing pedagogy and curriculum with the introduction of technology. We tend to focus on the technology then hope teachers will incorporate it well into their teaching. We don't really foster this process well. This goes back to the introduction of the Internet in classrooms in 1999 and later introductions such as computers in classrooms, data projectors, interactive whiteboards and Moodle... We make it available then we hope it will be used well rather than set up and nurture an environment that ensures that it is used well.*
>
> [research journal entry, 25/5/2010]

5.3.3 Adapting Pedagogy to the Technological World of the Students

The questionnaire and interview responses relating to this theme are presented in Table 20. Further discussion is provided from entries in the research journal that provide further insights into the issues raised in these responses.

Table 20

Adapting pedagogy to the technological world of the students

Literature Review Theme	**Questionnaire items**	**Interview Questions**
Pedagogy & ICT		
Adopting Pedagogy to the Technological World of the Students	3.6, 3.14, 3.17, 3.18, 3.19, 3.20, 3.27, 4.2,	2.4

Table 21 shows a very strong endorsement from teachers about the high level of proficiency that their students have with their use of technology with 85% of teachers holding this view. In addition to teachers' high regard for their students' proficiency with technology, 84% of teachers believed that teaching with ICT gives them a greater capacity to positively engage their students in their learning.

Table 21

Teachers' beliefs about the place of students' use of technology in their learning

Statement	Agree	Disagree	Unsure
My students are usually very proficient with their use of ICT	33 (85%)	5 (15%)	0 (0%)
Teaching with ICT assists me to more positively engage my students in their learning	32 (84%)	1 (3%)	5 (13%)
The students should be encouraged to use ipods or mp3 players in class to enhance their learning	12 (30%)	13 (35%)	13 (35%)
The use of mobile phones has the potential to enhance the learning of students	11 (29%)	18 (47%)	9 (24%)
The students that we teach should be encouraged to use laptop computers in class to enhance their learning	18 (47%)	8 (22%)	12 (31%)

Despite the apparently positive outlook from teachers about the potential of technology to enhance students' learning, Table 21 reveals many doubts and opposition in the minds of teachers about their use of this technology at school. Table 21 shows that 44% of teachers disagreed with the notion that students should use ipods or mp3 players to enhance their learning while a further 34% were unsure about the place of this technology. A similar perspective is held by teachers towards the use of mobile phones as only 29% of teachers

believed that mobile phone use has the potential to enhance their students' learning, while 47% did not believe that mobile phones have this potential and a further 24% were unsure. Further confirmation of teachers' high level of uncertainty about the place of technology in their students' learning is seen in Table 21. It shows that 47% of teachers believed that their students should be encouraged to use laptop computers to enhance their learning, while 22% were against students using laptops at school and a further 31% were unsure about this.

The doubts that many teachers had about whether their students should utilise technology in their classes revealed in Table 21 were raised in several interview responses. One teacher recognised the proficiency of her students with their use of technology and highlighted the crucial importance of good curriculum design for the use of technology to lead to better learning outcomes.

> *It does take time to develop the curriculum for this approach to be effective. Unless this is done well there will be kids who won't get organised and engaged in the task, no matter what is done to encourage them along this path. It doesn't matter whether it is a computer or a book. They are still going to be disengaged from their learning if the teacher doesn't have a sound approach.*
>
> [Dorothy]

Several teachers expressed concerns about the apparent inability or unwillingness of many teachers to become proactive and fluent users of technology. A consequence of this approach is increased disengagement of their students from their learning at school, as the following comment indicates.

> *What concerns me is that the kids are a lot more technologically savvy than their teachers are. They are right into things involving technology at home but their teachers often are not. At school, unless we incorporate this into the curriculum we run the risk of kids getting bored. They leave here and have their ipods and phones and Shelfari games at home. They are asked to live in two worlds*.
>
> [Teacher-librarian]

Even with these lifebooks, I heard a teacher say he didn't take his computer to class. He said "It's just another imposition on me as a teacher, another thing I have to learn." If the teachers don't embrace the technology then we can't expect the kids to benefit from it.

Not only do the students have technology at home, many of them have gone through schools that have technology in the classroom and they get to school and many of their classes do not have this. It is part of their lifestyle but this is not the case for teachers, especially those who are older, say over 45.

[Teacher-librarian]

Another teacher revealed a similar concern about the lack of proactive engagement or inertia that a lot of her colleagues appeared to have with the development of their use of technology. She believes that

There are quite a few teachers in this school that need to move with the times. I've shown some people some really basic things like accessing the Intranet and so on. I wonder why they haven't been able to pick up these skills when I have been able to pick this up and I've only been here a year. There are a lot of teachers who are a little bit too frightened of change. They are resisting change for the wrong reasons. Even go down to the photocopying room and see people struggling there with technology. We need to have lessons in that too. It will require a lot of training and changing the way that people think too.

[Annita]

The uncertainty in the minds of teachers about the worth of a one to one computer program revealed in Table 21 is confirmed in Table 22. In a session that I led for a teachers' meeting on the subject of teaching with technology, I asked the teachers to reflect on their experiences in using sets of laptops for their classes and to identify positive and negative outcomes for the learning of their students through the use of this technology. A summary of teachers' responses is provided in Table 22. For every positive effect that was identified by one teacher there seemed to be a negative effect identified by another teacher.

Table 22

Positive and negative effects of one to one computers for students

Positive effect on student learning from one to one computing	Negative effect on student learning from one to one computing
communication, 'writing' is consistent & legible	*students need to write on their VCE exam and will lose this skill*
students have more avenues of communication with their teachers	*it might be difficult to communicate with and supervise them*
it can help to make students more responsible	*it can be more of a distraction (quick access to facebook) rather than a learning tool*
it provides a greater ability to do individual research	*it devalues research because so much of what is online is someone else's opinion*
it allows us to cater to different learning styles across all areas of the curriculum	*it favours some subjects ahead of others; Some subjects have no real advantage in having a laptop (e.g.. Chemistry., Maths, Physics)*

One teacher had no reservations about a one to one laptop program for students.

> *We definitely need a one to one program with our students. A lack of access to computers for my students to use is the biggest problem I currently have in teaching with technology. If we went one to one, this problem would disappear and I could try things that I know have value to consolidate the learning of my students.*
>
> [Celine]

All but two of the teachers who were interviewed saw the introduction of a student laptop program as having the potential to enhance students' learning, however, each of these teachers expressed reservations about such an introduction.

One of these teachers placed the onus on the student to use the computer productively otherwise improved learning outcomes would not occur.

A one to one laptop program is inevitable. At my past school some students did waste time on them but others used them to their advantage.

[Stephen]

Several teachers felt that the introduction of a laptop program must be accompanied by a close consideration of pedagogy if it is to be an effective vehicle for better learning outcomes, as the following comment indicates.

As long as teaching practices are changed to enable a new approach with technology that improves teaching and learning then it would be a good thing. When my kids went to secondary school they introduced a laptop program but disbanded it a couple of years later because the curriculum and approach of the teachers hadn't changed from what it was before the technology was introduced. They were little more than glorified typewriters and it just did not work.

[Teacher-librarian]

There was also opposition to the introduction of a laptop program. Graeme's response, which follows, is a call for a much greater focus on curriculum design and thinking about pedagogy if improved learning outcomes are to occur through the use of this technology.

I am yet to be convinced that the dollars spent on a one-to one laptop program couldn't be spent more effectively on other things. The computers by themselves are simply a tool. We need to be shown how to make use of their potential to improve learning in the classrooms.

The trouble is most ICT people are specialist in using ICT programs but often many are only just average and sometimes below average educators and teachers. I want a good educator and teacher to show me how to get the best out of my laptop to improve my classes.

[Graeme]

Some teachers were uncertain about the wisdom of implementing a student laptop program because of doubts about the provision of essential technical support.

I think that this is a good idea. It would definitely be helpful so long as we have the infrastructure to support it. There's not much point having all of these laptops if we can't connect properly to access information and run programs properly.

[Annita]

In accepting that ubiquitous access for students to computers at schools is inevitable, one teacher highlighted the importance of the personal relationship between students and their teachers if effective learning with technology is to occur.

> *My fear as a teacher is that you might have a room full of kids that are plugged in to a computer but not engaged. It doesn't mean that they are learning more because they have a computer. You still need a relationship with students. Good teachers are still needed to promote good learning. You can't just have a virtual classroom. Or you might as well pack up and go home.*
>
> [Penny]

A program to introduce a one to one laptop computer program for students had been discussed in various forums at the college for many years and culminated in the decision to implement a one to one program for students in Years 9 to 12 progressively between 2010 and 2012. The catalyst for this decision was the Australian Federal Government funding for this, which was provided to the college as part of its Digital Education Revolution (DER) program. An excerpt of the letter from school leadership states that

> *By the beginning of 2012 we need to be able to provide a 1:1 ratio for all students at Years 9 to 12. The DER money from the Federal Government will be used to supply a laptop to each student in Years 9 and 10 in 2011. Each student will have "ownership" of a machine. The machines will be introduced through a structured process as soon as practical after week one of the 2011 academic year...*
>
> *This decision is being announced to staff only at this point. The announcement will be made to parents and students in the coming weeks.*
>
> [email from school leadership to teachers, October14th, 2010]

Whilst many teachers endorsed the introduction of laptop computers to students in Years 7 to 9, they felt that students in Years 7 and 8 should also be included in the program. This concern was addressed by leadership in the following email to teachers.

> *Outside the DER, this obviously brings to the fore the discussion around 1:1 computers at Years 7 and 8. Over the next 8 months a process of consultation will take place with the College community to decide if a laptop program will be*

introduced at Years 7 and 8. If implemented, this will require parents to purchase the machines as the Federal money can only be used for students in Years 9 – 12. Whilst we shall have an obvious focus on the new technology at Year 9 and 10 it is, of course important to ensure that our teachers and students at Years 7 and 8 maintain a strong focus on this area next year.

[letter from school leadership to teachers, 19/10/2010]

This consultation within the college community about the introduction of a laptop computer program to students in Years 7 and 8, along with the decision about the implementation about technology at these year levels and an integrated approach to curriculum design with ICT across all year levels remains a work in progress.

5.3.4 Student-centred Learning and ICT

The questionnaire and interview responses relating to this theme are presented in Table 23. Further discussion is provided from entries in the research journal that provide further insights into the issues raised in these responses.

Table 23

Student-centred learning and ICT

Literature Review Theme	**Questionnaire items**	**Interview Questions**
Pedagogy & ICT		
Student-centred Learning and ICT	3.12, 3.13, 3.15, 3.16 3.26	2.5, 2.6, 2.7, 2.8

Table 24 shows that a majority of 57% of teachers either did not believe that their students could become more self-directed in their learning through the use of ICT or were unsure whether or not this was the case. There were 43% of teachers who believed that the use of ICT gave them a greater capacity to allow their students to pursue individualised learning programs in their classes.

The proportion of teachers who believed that their classes more often than not involved teacher-centred learning was 47 %, while 40% believed that their classroom teaching is mainly through student-centred learning practices, with a further 21% unsure.

Fifty three percent of teachers believed that the use of ICT allows their students to effectively collaborate with others in their learning, whilst 18% did not believe this. A further 29% were unsure whether or not their students collaborated more effectively through the use of ICT.

Table 24

Teachers' beliefs about the capacity of ICT to foster individualised learning with students

Statement	Agree	Disagree	Unsure
Teaching with ICT gives me a greater ability to adopt individualised learning programs with my students	16 (43%)	12 (31%)	10 (26%)
My usual teaching style more closely resembles me acting as a "sage on the stage" (using teacher-centred learning) than a "guide on the side" (using student-centred learning)	17 (43%)	14 (36%)	7 (21%)
The use of ICT allows my students to effectively collaborate with others	20 (53%)	7 (18%)	11 (29%)

Many teachers expressed a belief that it is important to provide an environment that promotes individualised learning, however, a much smaller number of teachers believed that they had successfully utilised ICT to foster this approach with their students. This response shows how one teacher was been able to involve her students in individualised learning through the use of ICT in her LOTE classes.

> *My high flying students are able to be given tasks and a licence to extend their skills through the use of ICT to learn LOTE. They may practise to master important skills and spend extra time on learning some of the more basic concepts. The middle ranking students can also benefit from choosing or being directed to resources that suit their learning needs and progress at the time.*
>
> [Celine]

One teacher showed in the following response how she was able to facilitate an individualised learning outcome for one of her students that involved the use of ICT which was underpinned by the theory, experiences and knowledge of Art.

> *One of the girls in Art is working with old books. She has created these lovely origami three dimensional sculptural relief type pieces. What we are thinking of doing is using several of these books to create one art piece. So rather than make twelve of these things straight off she photographed one and repeated the design in different configurations to find out which configuration looked best. We do that sort of thing but the kids choose to do that and use the skills they have on computer. I facilitate this and offer suggestions about the theory behind what they are doing in art.*
>
> [Roberta]

Though most teachers supported the concept of individualised learning for their students many believed that it was not possible to implement, with or without the use of ICT. Some believed the reason for this failure was a lack of time and support that is needed to set up an environment for learning of this type, as shown by the following comments.

> *I have used ICT to provide individualised programs to students with learning difficulties who had been mainstreamed into larger classes. The difficulty was that, without support these kids were not independent enough, nor did they have the concentration and the skills to access, read instructions and maintain their effort on the individualised tasks. The level of preparation and time required to develop individualised programs made the exercise untenable.*
>
> [Graeme]

> *When I was in the State system we worked with personalised learning plans in Years 7 to 9. The benefit of this was doubtful. It has to be done 100 per cent or it is not worth doing at all. It is very difficult for one person to coordinate one class of personalised learning plans. I felt like I was continually ticking the boxes for someone but not actually teaching well. It's almost impossible for one teacher to achieve this. You need a collective effort where we are all not expected to reinvent the wheel.*
>
> [Annita]

One teacher identified difficulties in classroom management that she believed arose from the adoption of a student-centred learning approach to learning with technology in this response.

> *I haven't been able to move far from teacher-centred learning. I'd love to be able to say to the students this is what you need to achieve and allow them to do this at their own pace and using their own learning style. My fear would be that some students might fall right behind but I suppose my role would be to move around the room and see where people are at.*
>
> [Mary]

Several teachers believed that an approach to individualised learning was not possible for them to adopt because the design and structure of the curriculum they were required to teach did not allow such an approach to be taken, as shown in the following responses.

> *With VCE courses I don't really do individualised learning with students. There is the time constraint of getting through a large volume of material that makes individualised learning much more difficult. Also the range of students in these classes isn't as large as it is in junior years because the non academic students tend to do VCAL. Because I am a psychology teacher I am aware of different learning styles but I find it difficult to put into practice.*
>
> [Elle]

> *There does appear to be potential here for individualised learning but it will only be possible with careful attention to curriculum design and the development of an alternative to the one size fits all approach that is typically adopted in teaching.*
>
> [Teacher-librarian]

One teacher strongly criticised the teacher-centred approach that continued to be taken with some classes involved with ICT, which she believed to be outdated and no longer appropriate. This approach involves the teacher leading their students in the acquisition of basic computer skills in lock step fashion, moving from one technology to the next, emphasising the different software applications.

This year my daughter has started in Year 7 and has gone back from having her own laptop at Primary School to the conventional environment of pen, paper and books for most of her classes. Her contact with ICT is quite negative. She has a domineering teacher who insists that the students carry out tasks in lock step fashion. She is being forced to cover skills that she has known for years already. This is a massive issue for students entering the school. I do not understand why something hasn't been done about this earlier. Unfortunately she has been turned off doing any IT stuff from here on. I don't understand how that can keep happening or who allows that to continue.

[Annita]

Many teachers recognised that their students' immersion in collaborative networking sites such as *Facebook* gave them the potential to foster increased engagement in their learning through the use of learning tasks within these media. Some teachers pointed out that this potential has not yet been realised. The following comments reflect this experience:

I am prepared to concede that social networking is an area which could be developed. It is a current phenomenon demonstrated by email, texting, Facebook and Twitter that social communication is important to young people of today. I have tried a forum on my Moodle site last year but the participation rate and the educational value of that was basically nil.

[Graeme]

I haven't been able to foster collaborative learning with ICT in my classes but I have heard of it happening through other people. I do believe that collaborative learning is valuable because I think that this style of learning allows the development of skills that are highly relevant today. People need to be able to work well together for a number of reasons. I would place a high priority on facilitating this style of learning with my students.

[Penny]

The large amount of time and effort that is needed to redesign the curriculum and approaches to teaching associated with the adoption of collaborative learning was identified by several teachers as a barrier to adopting this style of learning with their students. This viewpoint is represented by the following response.

It makes me think of when (names teacher) was here. He set up a blog with his class and had his students communicating with him in this forum. He was available 24/7 and most teachers won't buy into this type of commitment. As long as a way is found to make it feasible for the teacher to operate this way without getting burnt out with the associated workload then it could work well.

[Teacher-librarian]

Two teachers spoke enthusiastically about their success in facilitating students' collaboration with one another with the use of ICT as an important factor in the process. The first teacher who did this was with a collaborative learning task for his English Language students.

I was successful in getting the students collaborating in the section of the course that looks at language acquisition of young children. They went to an early learning centre and interviewed four year old children. They created a podcast of their language during this interview. We then posted these on Moodle. We then listened to each others' recordings and commented on them in terms of what they told us about the children's language acquisition.

[Stephen]

A second teacher reflected on her experiences in teaching digital photography.

Probably way back early when I was teaching photography when we first introduced this as a digital subject and moved away from film based photography. I was just keeping pace with it then. Sometimes I'd be able to help the kids with what little knowledge I did have. That was always a highlight of the day but also very rare. They generally picked up the skills they needed independently of me and more often than not learnt from each other. It was cooperative learning.

[Roberta]

A few teachers expressed doubts about the capacity of ICT to foster collaborative learning and suggested that there were a lot of unsubstantiated claims about its potential. These comments are representative of their views.

There are problems with collaborative learning not the least being assessment of the work of individuals within the collaborative group. Has ICT overcome this dilemma? Collaborative learning isn't new and there is a lot to learn, both good and bad from experiences without technology. Some of this seems to be forgotten in the hype about its use with ICT.

[Graeme]

A good teacher should mix up their approach and not rely on technology too much in their teaching or expect it to be a magic bullet that transforms the class room. They can do group work the old fashioned way and with their interpersonal skills talk to someone else in person.

[Elle]

Several teachers attributed difficulties they have encountered in their attempts to foster collaborative learning using Web 2.0 tools to the educational background and past experiences of their students. These comments demonstrate this.

My students usually don't like working with others in team situations. I'm not sure why but I have struggled to foster this way of learning. I'm not sure why this is the case. It is probably because they haven't been presented with this approach to learning much over their years at school.

[Celine]

I haven't involved my students in collaboration with people outside the school. I often get my students to do group work together. Typically this would involve them working together to source information on the Internet. I have had limited success using this approach. Unfortunately too many of them treat this as an opportunity to do as little work as possible and get others to carry the load if they can get away with it. We need to train our students to become better at this type of work and give them more opportunity to develop these skills.

[Annita]

5.3.5 Pedagogy and Information Literacy

The questionnaire and interview responses relating to this theme are presented in Table 25. Further discussion is provided from entries in the research journal that provide further insights into the issues raised in these responses.

Table 25

Pedagogy and information literacy

Literature Review Theme	Questionnaire items	Interview Questions
Pedagogy & ICT		
Pedagogy and Information Literacy	3.21, 3.22, 3.25,	2.9

Table 26 shows that 52% of teachers thought that the use of ICT has the potential to foster the development of higher order thinking in their students. Despite this majority, only 25% believed they were successful in realising this potential in their teaching. A further 34% were unsure about the potential of ICT to foster improved thinking skills in their students. Observations that teachers made about their students' information literacy skills when using the Internet were mixed, given 46% believed that their students displayed a high level of information literacy in using the Internet and a further 40% believed their students displayed a low level of information literacy. A further 13 % were unsure about their students' level of information literacy when using the Internet.

Table 26

Teachers' beliefs about students' information literacy with ICT

Statement	Agree	Disagree	Unsure
Teaching with ICT offers me a lot of potential to foster higher order thinking skills in my students	20 (52%)	6 (16%)	12 (32%)
I am able to successfully foster higher order thinking skills with students in my classes through their use of ICT	10 (25%)	15 (39%)	13 (36%)
My students display high information literacy skills when using the Internet	18 (46%)	15 (40%)	5 (14%)

Teachers commonly observed a lack of student awareness about the authenticity of information that they access on the Internet. A perspective that is typical of this response follows.

> *Students look at anything they see on the internet as Gospel. It's different to when a book is written where checks are made to ensure the information in the book is correct. This is not the case on the Internet and students often aren't aware of this.*
>
> [Teacher-librarian]

An English teacher suggests that

> *Critical literacy is very important. I actually worry that the more they use computers the less they are actually developing their critical literacy skills. Students believe unquestioningly everything that they see on a computer. It is a big issue that they are not able to discern information that is accurate.*
>
> [Penny]

During interviews, many teachers identified a variety of contributing factors that led to their students' low level of information literacy in their use of the Internet. One of these factors was an apparent low level of motivation amongst students to aspire to work with and improve their information literacy through a rigorous approach to research.

> *The minimalist approach from students is too common. They do the bare essentials and leave any striving for knowledge or information discernment alone. I'm not sure if it's because they haven't been trained to do this stuff. They don't appear to be consistently doing research. Half the class won't even do a bibliography and cite sources.*
>
> [Stephen]

One teacher attributed her students' poorly developed research skills to a lack of awareness and ability to cross reference material that they had found on the Internet.

> *Students are terrible at finding the right sites with the right type of information. They go to Wikipedia straight away or typically just copy and paste from the first site they visit. They don't read other sites and compare or combine different information sources. They don't know how to put information that they find into their own words. It certainly is not critical thinking.*
>
> [Elle]

Several teachers recognised that the promotion of information literacy was much more likely to be successful if the learning tasks that are set for their students do not have a set of prescribed answers. If tasks are scaffolded by the teacher to promote open ended problem solving that is both authentic to a real world situation and relevant to the experiences of the student they are more likely to be successful, as these comments illustrate.

Maybe another way forward is to not have such structured assignments that have a list of prescribed right answers. The process is more open ended where the student is formulating questions to work at researching then going away and chasing answers to them.

[Teacher-librarian]

We try pretty hard in Humanities to devise work where the students don't go to the first website and copy and paste information onto a document without thinking about what they are researching. We try to structure the task so that they don't simply regurgitate information. They have to think about it and often to transpose their thinking to a different environment and respond to it.

[Dorothy]

Many teachers highlighted the difficulties they are encountered when attempting to empower their students to become independent learners through the use of ICT. They believe that these difficulties are caused by the students' lack of understanding of the skills development required for independent learning. An example of this in the teaching of Religious Education follows.

With Religion and Society it is possible for the students to access the Catechism of the Catholic Church. They find it difficult to discern what they actually need. I need to help them to make links between sections of the Catechism website otherwise they will spend too long trying to do this themselves.

[Mary]

5.4 Research Question 3

What approaches from school leadership foster sustainable change in teachers' practice with Web 2.0 to enhance learning?

5.4.1 Introduction

This research question was designed to explore how leadership might be effective in promoting teaching practices with Web 2.0 which enhance learning outcomes. The main themes that emerged from the Literature Review from this research question were:

- The role of the principal in leading change with ICT
- Shared Leadership and ICT
- School development plans and ICT

A major focus of this theme was the involvement of teachers in the development of policy and planning for the use of ICT in the curriculum. This was used to gauge the extent to which shared leadership was prevalent at the case study college.

5.4.2 School Leadership with ICT.

The questionnaire and interview responses relating to this theme are presented in Table 27. Further discussion is provided from entries in the research journal that provide further insights into the issues raised in these responses.

Table 27

School leadership with ICT

Literature Review Theme	Questionnaire items	Interview Questions
School Leadership & ICT		
Shared Leadership and ICT	3.28, 3.29	3.1, 3.2, 3.5
School Development Plans and ICT	3.30, 3.31, 3.32	3.3, 3.4

Table 28 illustrates a low level of involvement of teachers in the process of planning and policy development for the use of ICT in teaching and learning. Only 31% of teachers are involved in planning for improved teaching and learning with ICT at subject domain meetings, while a further 64% were not involved. The strategic planning for the provision of ICT resources at the college does not appear to be entirely successful because there were only 23% of teachers who believed that the ICT resources in the classrooms that they used were adequate for their teaching needs.

Teachers were unfamiliar with both the IT Policy, with which only 19% of teachers were familiar, and the ICT strategic plan, with which 29% were familiar. Not surprisingly, given this low level of familiarity with ICT policy and planning, a very low proportion of 5% of teachers who responded to the questionnaire were actively involved in the development of the ICT strategic plan at the college.

Table 28

Teachers' involvement in leadership and planning for the development of ICT

Statement	Agree	Disagree	Unsure
I am actively involved in planning for improved teaching and learning with ICT at domain meetings	12 (31%)	26 (64%)	2 (5%)
The ICT resources in the classrooms in which I teach are adequate for my teaching needs	9 (23%)	28 (74%)	1 (3%)
I am familiar with the IT Policy that is in place at (case study college name)	7 (19%)	2 (65%)	7 (16%)
I am familiar with the ICT strategic plan at (case study college name)	11 (29%)	23 (60%)	4 (11%)
I play an active role in the development of the ICT strategic plan at (case study college name)	2 (5%)	31 (82%)	5 (13%)

Teachers' perceptions about the inadequacy of the ICT resources in classrooms, evident in Table 28, are highlighted in the following message from a teacher to the ICT support team at the college.

> *The science laptop computer vault is potentially a fantastic resource, however it continues to be more frustration than it is worth. My students regularly have issues logging on and students are wasting much valuable time in organising a computer that will even log them on. There are regularly several computers that will not allow anyone to log on, at the moment I am no longer content to send students over to IT when these computers are not working due to the amount of time this takes. Every time I use them there are issues*
>
> [email from a teacher to ICT support team, 27/8/2010]

I believe that an important underlying factor which caused many teachers to rate the college ICT resources poorly related to the very large demands that are inherent in

the management of an information system for a large school. These demands were often too difficult for the technical support team to meet. There was an ongoing problem where the diverse needs of the teachers and students who use the system were often not met in a timely fashion. This is evident in the following research journal entry which was made after a conversation with a member of the leadership team. It relates to the failure to complete important work over the summer break to prepare the information system for the new school year.

> *The summer break was a disaster for getting things done. The contents of (names colleague) laptop were lost after a routine upgrade failed. Months of work creating documents have been lost. Our carefully drawn up priority list of jobs was not followed. A couple of teachers have come in and moved equipment from one room to another without consultation and caused an angry storm amongst other teachers. The laptops designated for classrooms are still not ready to use, despite being delivered last October.*
>
> [research journal record of a conversation with a member of leadership, 27/1/2010]

Teachers expressed a range of opinions about the role of their leadership with ICT. Some believed that it should left to the designated leaders who had the necessary authority and expertise to make decisions. Others felt that they had a contribution to make but they were not able to do this effectively-, others felt that most teachers were not taking sufficient ownership of their professional duty to become proactive in the development of teaching practice with ICT.

Most teachers were not aware of what is in the ICT strategic plan at the college, let alone involved in its development. This is summed up in this interview response.

I had no role in the plan's development. I have heard that there is a plan but do not know what is in it.

[Annita]

Many of these teachers perceived that they are unqualified to have input into issues related to ICT leadership. They would prefer to leave it to those whom they consider are more qualified, or who have greater perceived expertise in the area. Dorothy's response shows that considerable cultural change was needed if there is to be an acceptance of shared or distributed leadership in the development of pedagogy with ICT at the school.

Most of the staff box ICT planning and say that's over there and I don't have to deal with it. I do feel that teachers have a role here but many teachers don't feel confident about having input in this area. I believe that this needs to change. We do seem to have more people on the ground here that can do stuff and show others how to do things. These experiences should be used more in the formulation of the future direction of the plan.

[Dorothy]

Some teachers have attempted to provide input into ICT planning at the college but found that their input was not appreciated or valued. There was a common feeling amongst these teachers that leadership in ICT is not shared across the teaching staff at the school as well as it could be. A consequence of this is that leadership amongst teachers is restricted, involving only a few people. The following interview response represents this point of view.

I have made many suggestions and proposals to school leadership on the ICT plan and on other issues but typically receive no response to these. I'm not a leader in their eyes apparently so have no influence. I now just do my own thing... mostly.

[Graeme]

The difficulty presented to leaders of ICT in schools in reaching a balance between a 'top down' management approach to the efficient and effective planning and deployment of resources with a 'bottom up' approach where the teaching and learning goals are the drivers

for development of the system capabilities is evident in the research journal entries that follow. With preparations underway regarding a decision about the implementation of a student laptop program imminent, I proposed these ideas to leadership on a way forward.

> *We should identify a core group of teachers and give them time to plan the curriculum and put the vision in place. They should visit other schools. We should get educational leaders in to talk to us. By October/November we would hope to have our plan in place with the curriculum design ready to go.*
>
> [email from me to School Leadership, May 4th, 2010]

The response that I received suggests a lack of awareness on the part of school leadership of the potential of shared leadership to achieve effective integration of ICT into the curriculum.

> *I wanted us to have discussions and then to develop a united plan to present to the Principal. In that context, I think that it may have been better to send your thoughts to the other Learning Technology Facilitator and myself rather than share them with Principal at this point.*
>
> [email to me from a member of leadership, May 10th, 2010]

The teacher-librarians endorsed a team approach to leadership with ICT and recognised the special role that they have to play in this.

> *We think librarians play a crucial role in ICT in education at schools and should be much more involved in the planning and future direction than we are now. We do fell isolated from these discussions and think we should be playing a much more active role than we are presently.*
>
> [Teacher-librarian]

Many teachers observed that they, and most of their colleagues, were not proactively engaged in the development of their practice with ICT. They often treated technology as an unwanted addition to their working life and reluctantly incorporated its use and were not interested in leading others in its use. Whilst recognising that support, encouragement and direction are required for teachers to develop their practice with ICT-, one teacher-librarian

asserted that leadership with ICT would improve at the college if all teachers became accountable for their professional responsibility to be proactive in this area.

> *Some way needs to be found to get teachers to take ownership of their professional responsibility to act as mentors to their students in their use of technology. This requires them to develop proficiency with the technology as well as change their teaching to get the benefits from it. To make this happen effectively, they will need to be given more resources such as time for training and curriculum design.*
>
> [Teacher-librarian]

5.5 Summary

In this chapter, the data collected through each of the data collection techniques of questionnaires, interviews and research journal were analysed. The data obtained was organised according the three Research Questions framing the thesis.

The first research question explored the factors that affect teachers' willingness and capacity to incorporate Web 2.0 technologies into their teaching practice. A profile of teachers' use of ICT was built up. This included a description of their use of the Internet and Web 2.0. It was found that the use of the Internet to access information was common amongst teachers. Their activity with Web 2.0 tools involving the publishing of content was much less established.

The exploration of teachers' experiences with professional development with Web 2.0 revealed the need for ongoing support for them to trial new approaches with this emerging technology. Their progress has been limited because of a lack of appropriate support, or a lack of awareness or understanding of how these technologies might be utilised. The importance of teachers being able to call upon this support and guidance at school was highlighted. Pitfalls were revealed in the externally provided

professional development with ICT because skills and knowledge presented in these sessions were often lost upon the teachers' return to school.

There appeared to be scope to promote and foster an environment for collaborative learning amongst teachers where they worked together to advance their practice and learnt from one another in this process. This includes interactions with teachers in other schools through online communication. The involvement of teachers in personal learning networks to advance their practice was found to be quite low.

The second research question involved an investigation of teachers' pedagogy to enhance learning in their students. The understanding amongst teachers of curriculum frameworks for the integrated use of ICT was found to be low. This affected their understanding of the possibilities for enhanced learning with ICT and the underlying philosophies for the use of ICT in learning.

A relatively large proportion of teachers were resistant to using ICT in their teaching and as a consequence they were not proactive in pursuing improved practice with the technology.

Teachers were largely sceptical about the value of students using technological devices that they typically possessed such as mobile phones and mp3 players. There was widespread doubt about the value of a one to one laptop program.

The teaching practice with Web 2.0 appeared to be at an early stage, with teachers unaware of many of the applications that are available and their possible impact on improved learning. Consequences of this were that the promotion of personalised learning in students through the use of Web 2.0 was not successful with many students, and there was scope for improvement in the development of information literacy with this medium.

The third research question explored the effectiveness of educational leadership approaches in the promotion of enhanced learning with Web 2.0. There was a strong feeling amongst teachers that the ICT resources that had been deployed for use by themselves and their students was often not conducive to the development of their craft with ICT. The school leadership had responded to this in recent years through increases in expenditure of equipment through a tablet computer program for both teachers and students.

Shared or distributed leadership in the development of policies towards the use of ICT and future practice did not appear to be widespread given the low number of teachers having any role in this area. There appears to be scope to involve a much wider cross section of the teaching staff, including teacher-librarians in this process.

In the final chapter, the findings regarding the three Research Questions are critiqued in the light of the literature. A number of conclusions are drawn and recommendations are made for professional learning leaders, curriculum leaders, school leaders and systemic authorities. Suggestions are also made for future research.

Chapter Six

Conclusions and Recommendations

6.1 Introduction

The permeation of Web 2.0 technologies into the lifestyles of most people in the community in recent times has not been seen in the teaching practices adopted in secondary schools to anywhere near the same extent. This research is timely because there appears to be a large degree of untapped potential to enhance the learning of secondary school students through the use of this technology.

This research was designed to explore the potential of Web 2.0 to enhance learning in students by:

- Examining the culture and attitudes of teachers towards Web 2.0
- Exploring approaches to pedagogy with Web 2.0 that enhance student learning
- Investigating leadership approaches that effectively incorporate the use of Web 2.0 to enhance student learning

In this final chapter the research data are discussed in the light of the literature and conclusions are drawn. Based on these conclusions, recommendations are made for professional learning leaders, curriculum leaders, and the school leadership team at the case study college.

Many of the conclusions that are made indicate that the experiences that are documented in this research, based on the case study college, may be typical experiences of teachers and leaders in Secondary Schools elsewhere, both in Australia and globally. Hence these recommendations are also presented for the consideration of teachers and leaders in other Secondary Schools. A series of recommendations are also made to systemic authorities.

Suggestions are offered for possible further research and the chapter concludes with some personal remarks.

6.2 Conclusions from Research Question One

How might teachers' willingness and capacity to effectively use Web 2.0 to enhance learning be cultivated?

6.2.1 Introduction

The first research question explored the factors that affect teachers' willingness and capacity to incorporate Web 2.0 technologies into their teaching practice. A profile of teachers' use of ICT was built up. This included a description of their use of the Internet and Web 2.0. It was found that the use of the Internet to access information was common amongst teachers. Their activity with Web 2.0 tools involving the publishing of content was much less established.

The exploration of teachers' experiences with professional development with Web 2.0 revealed the need for ongoing support for them to trial new approaches with this emerging technology. Their progress has been limited because of a lack of appropriate support, or a lack of awareness or understanding of these technologies and how they might be utilised. The importance of teachers being able to call upon this support and guidance at school was highlighted. Pitfalls were revealed in externally provided professional development with ICT because skills and knowledge presented in these sessions were often lost upon the teachers' return to school.

There appeared to be scope to promote and foster an environment for collaborative learning amongst teachers where they worked together to advance their practice and learnt from one another in this process. This includes interactions with teachers in other schools through online communication. The involvement of teachers in personal learning networks to advance their practice was found to be quite low.

6.2.2 Teachers' Use of ICT

Teachers had ready access to computers both at school and at home and used ICT on a daily basis. Their use was typical of teachers who are using ICT mainly for informational, organizational, evaluative, and lesson-planning activities instead of for communicative, activating, creative, and expressive purposes (Keijo, 2011). This is evident in this study when the most established practices involving ICT usage amongst teachers were related to word processors, Internet browsing, electronic mail, students' report writing and presentation software. The use of software for more creative endeavours was much less common.

6.2.3 Teachers' Use of Web 2.0

Whilst the Internet was accessed regularly by almost all teachers, it was predominantly used to access information or media. The use of Web 2.0 sites on the Internet such as blogs, social networking and wikis, which involve the collaborative publishing of content as well as its access, was much less common amongst teachers. This low take-up of Web 2.0 technologies is also typical of current practice amongst teachers in other schools globally and is an indicator that pedagogical thinking in educational institutes has not advanced in parallel with technological advances (Conole, 2010).

6.2.4 Teaching Practice with Web 2.0

The research data reveal that most teachers are competent in their use of ICT but they typically do not utilise Web 2.0 to develop their practice to enhance students' learning to the highest possible level. Several models of teachers' professional development with their use of ICT were presented in the Literature Review Chapter. One of these, the four stage continuum identified by King (2002), has been chosen to allow me to describe the progress that teachers typically made and to work within a framework to provide the description which follows of the approach that was most commonly adopted by teachers in their development of pedagogy with Web 2.0.

It is evident that while most teachers progressed through the first and second stages of this continuum, the proportion of teachers who successfully progressed to the third stage was noticeably smaller. Very few, if any, teachers demonstrated that they were able to reach the highest stage of this continuum in their practice with Web 2.0 on a consistent basis.

Many teachers involved their students in research tasks where they searched sites on the Internet to find answers to questions or information on designated topics. In reaching the first stage of King's (2002) continuum, these teachers overcame any fear and anxiety they may have had from utilising technology. Most teachers also progressed to the second stage of this continuum. They explored the role of students in research by facilitating their use of the Internet to find information instead of utilising the traditional method of looking up books in the library.

Many teachers appeared to have difficulty in reaching the third stage of King's professional development continuum. This stage involves them affirming the role of technology in students' research and consolidating their learning of and familiarity with using it. This difficulty in progress is evidenced by the large number of teachers who decried their students' low level of self-directedness, thinking skills and information literacy skills when they carried out research tasks of this nature. This supports the claim that technology integration in education is not so much a technical endeavour as it is a pedagogical one (Dutt-Doner, Allen & Corcoran, 2006).

In their teaching with Web 2.0, few if any, teachers demonstrated that they had progressed to the highest level of the professional development continuum, where new perspectives are achieved and integrated into their professional practice. Todd (2009) defines research in today's digital age as the access and creation of information through open choice, collaborative and participatory digital spaces. In their use of these spaces, teachers act as information guides for their students, rather than assuming the more traditional role of

gatekeepers of knowledge (Wells & Brooks, 2008). They provide the necessary scaffolding to support their students' learning to ensure that the technology employed supports informal conversation, reflexive dialogue and collaborative content generation, enabling access to a wide raft of ideas and representations (McLoughlin & Lee, 2010). The research data reveal very few teachers involved their students with Web 2.0 in research in this type of environment. A likely consequence of this was that the potential of this technology to cultivate students' genuine and increased autonomy in their learning (Connell, 2009) was not being realised. Associated with this, the research data highlighted that pedagogy with Web 2.0 was largely ineffective in fostering enhanced student learning through the development of higher order thinking, information literacy, student direction and connectedness (Crawford & Ratcliffe, 2010).

6.2.5 Promoting a culture of collaboration amongst teachers.

The research data endorse the claim made by Carey (2006) that support for teachers in the advancement of pedagogy with ICT is vital because it requires a critical enquiry which seems to be beyond the reach of most teachers, whose resources are stretched through the very busy and complex nature of their work. The culture of collegial collaboration that might provide an important component of this support appeared to be underdeveloped amongst teachers in terms of them working together to construct knowledge of how best to integrate educational technologies into their teaching practices (Koszalka & Tiffany, 2003). Over half of the teachers in this study appeared not to engage in this type of discourse at school. The most common purpose of the teachers who collaborated with others was to find out how to perform a task in using a program, or to remedy a technical problem. This mindset appeared to be reinforced by the focus of professional development with ICT often provided to teachers, where there was an emphasis on their acquisition of technical skills.

There appeared to be insufficient focus on teachers working together to improve their pedagogy with technology during the professional development sessions provided to them during 2010. A shift to a focus on teaching and learning with technology was evident in the professional development program offered in 2011. The need for this shift in focus was recognised by many teachers during the research interviews and is an endorsement of a system of mentoring amongst peers who are proactively developing their practice with technology (Glazer, Hannafin & Song, 2005).

An ongoing effort to establish a collaborative learning culture amongst teachers is likely to lead to many potential benefits, as identified by Stephens (2010). The research data revealed a wide scope for teachers to gain these benefits, which include personal learning networks, improvements in learning outcomes, use of technology for personal and professional enrichment, the ability to be selective with resources and technologies and a preparedness to take risks to allow improvement in practice to occur.

The driver for change for this effort is an understanding of the change process (Fullan, Cuttress & Kilcher, 2005). The energy, ideas and commitment of all teachers could be fostered in a collaborative and collegial environment. This could lead to ownership amongst teachers of a shared vision of teaching and learning with technology. This vision could include a proactive approach to the discernment of the potential of Web 2.0 technologies to enhance learning.

6.2.6 Pedagogy Before Technology

Many teachers' experiences affirmed that in their professional development with ICT it is educational purposes and pedagogy that must provide the lead, not learning about technology (Kirkwood & Price, 2005). Many teachers experienced frustration because they were not able to apply skills involving the use of technology in their classroom practice. A consequence of this was that the skills were either not learnt thoroughly in the first place, or

soon lost, or forgotten. Most teachers expressed a willingness to utilise the abilities of students as mentors to them because of their students' skills and proficiencies with technology (Chuang & Thompson, 2006). As a consequence of this teachers initially mitigated the effect of their own shortcomings with technology, but in time were able to improve their skills in collaboration with their students (Kimber & Wyatt-Smith, 2006). These experiences highlighted the importance of providing teachers with appropriate support networks as they grapple with their development of pedagogy for managing literacy, digital technology and learning in the classroom (Thompson & Van Eeden, 2005). Research suggests that the use of ICT for learning is still developing and will continue to be a focus for professional development (Keane, 2011).

6.2.7 Teachers and Personal Learning Networks

The current low level of teachers' engagement with colleagues in other institutions may be raised through the promotion of their interaction in online personal learning networks which provide encouragement for a culture of collaboration. This supports the observation made by Ward and Parr (2006) that teachers' involvement in on-line communities will not grow unless a culture of critical discourse and collective responsibility amongst teachers is fostered. Most teachers do not appear to be aware of the potential benefits of involvement in personal learning networks such as team teaching, access to learning resources and a sense of community beyond school and global boundaries (Mirtschin, 2009). This is consistent with the claim made by Dabinett (2006) that a critical mass of teachers has not yet been reached to work collaboratively in developing common understandings of electronic learning and its implications for teaching and learning.

This development of cultures for learning (Fullan, Cuttress & Kilcher, 2005) could be facilitated by collaboratively cultivating a set of strategies designed for teachers which are

focused on curriculum design and pedagogy to improve learning with technology. This could allow teachers to become collectively committed to improvement, to mentor and learn from one another and to develop their practice to enhance learning with technology.

6.2.8 Summary

Data received in response to the first research question generated a range of findings.

The use of the Internet was predominately for accessing information or media such as videos or images. The use of Web 2.0 sites which involve the collaborative publishing of content was much less common amongst teachers.

Teachers' progress in their professional development with Web 2.0 revealed that it is common for teachers to gain familiarity and competency with Web 2.0 technology but this is often not transferred to their pedagogy to enhance students' learning. This pedagogical competence is more likely to develop in teachers if greater attention were given to critical reflection about their pedagogy and a greater awareness and understanding of the educational principles that underpin the use of the technology.

The provision of ongoing support to promote collaborative learning amongst teachers to develop their pedagogy with Web 2.0 was greatest where they worked together to advance their practice and learned from one another in this process. There was a clear preference expressed for this professional learning to be available 'in house' rather than through externally provided courses on an occasional basis.

There is potential to promote and foster interactions with teachers in other schools through online communication. The involvement of teachers in personal learning networks to advance their practice was found to be quite low.

6.3 Conclusions from Research Question Two

Which pedagogies with Web 2.0 effectively enhance learning?

6.3.1 Introduction

The second research question involved an investigation of teachers' pedagogy to enhance learning in their students. There was a lack of understanding amongst teachers regarding established curriculum frameworks for the integrated use of ICT. This affected their understanding of the possibilities for enhanced learning with ICT and the underlying philosophies for the use of ICT in learning.

A relatively large proportion of teachers was resistant to using ICT in their teaching and as a consequence they were not proactive in pursuing improved practice with the technology.

Teachers were largely sceptical about the educational value of students using their personal technological devices such as mobile phones and mp3 players. Widespread doubt was evident about the educational value of a one to one laptop program.

The teaching practice with Web 2.0 appeared to be at an early stage on King's (2002) continuum, with teachers unaware of many of the applications that are available and their possible impact on improved learning. Consequences of this were that the promotion of personalised learning in students through the use of Web 2.0 was not successful with many students and there was scope for improvement in the development of information literacy and higher order thinking with this medium.

6.3.2 Improving Teachers' Understanding of ICT Curriculum Frameworks

Although most teachers regularly used ICT in their classroom teaching and there was a widespread belief that its use led to improved learning outcomes for their students, there was a low level of understanding about curriculum frameworks and guidelines for teaching with ICT. Two such frameworks, The Victorian Essential Learning Standards and the National Educational Technology Standards were described in the Research Context Chapter. This low level of understanding has been recognised earlier by Reynolds, Treharne, and Tripp, (2003). In schools the investment in equipment and infrastructure has not been combined with curriculum development and research into the use of ICT for specific subjects and as an integrated element within cross curricula provision. Establishing an improved understanding amongst teachers of the VELS and ISTE curriculum frameworks for teaching and learning with ICT might better engage teacher's moral purpose (Fullan, Cuttress & Kilcher, 2005) and provide the motivation for them to develop their practice with technology to enhance learning outcomes.

The consequences of this uneven level of ICT knowledge and expertise amongst teachers in curriculum design were seen in a variety of learning outcomes with ICT. Whilst some teachers appeared to be making progress in utilising ICT to improve learning, others resisted the idea of teaching with technology and regarded it as an unwanted imposition. The potential of teachers using ICT to foster rich learning outcomes, where the learner has genuine and increasing autonomy in his or her learning (Connell, 2009), did not appear to be realised as well as it could have been.

The uncertainty expressed by teachers about the place of ICT in the curriculum is continuing to be addressed by curriculum leaders at the case study college. The need to update and revise the Teaching and Learning Policy to include a clear set of aims and goals

for the use of ICT in the curriculum has been recognised. An important component of this revision is the articulation of an integrated pedagogic approach to ICT to enhance the capacity of the teacher to engage positively, collaboratively and critically with the growth of learning technologies (Unwin, 2007).

6.3.3 Giving Teachers a Mandate to Teach with ICT.

Although many teachers demonstrated a wide variety of approaches to their teaching with ICT which appeared to enhance the learning of their students, there were many who showed little interest in attempting to develop practice with ICT. Vanderlinde, van Braak and Hermans (2009) show a way forward in addressing this issue where they advocate that all teachers become involved in using ICT through the establishment of technology curricula which has a pedagogical rationale based on student competencies and their learning.

Enabling this focus on teaching pedagogy and curricula with ICT would mean that advances in teaching practice with technology would no longer be dependent on teachers' willingness and efforts to become involved. Rather, all teachers would be mandated to develop their practice within these curriculum guidelines. The provision of a climate of collegial and collaborative support to foster a culture where all teachers assumed responsibility for their professional learning (MacNeill, Cavanagh & Silcox, 2005) presents a difficult challenge for school leadership. This building of capacity (Fullan, Cuttress & Kilcher, 2005) could involve putting in place policies, strategies and resources to enable teachers to develop new knowledge, skills and competencies with ICT. The provision of resources such as tablet computers to students and teachers could be broadened to include students at Years 7 and 8. A new shared identity and motivation to integrate technology into curriculum, teaching, learning and assessing learning could be developed in an inclusive fashion and articulated to the college community.

6.3.4 Embracing Students' World of Technology

Although most teachers recognised the high level of expertise amongst students in their use of technology and its ubiquitous nature in their lifestyle, they had widespread reservations about the educational value of students' use of technology at school. The notion of students as well-educated consumers of technology, whose knowledge is invaluable for future educational planning (Hirsch, 2004), was not a part of teachers' mindset. Established practices involved the prohibition of the use of technological devices such as mobile phones, mp3 players and social media. There appeared to be a lack of recognition that these types of mobile technologies can provide a platform for active learning, collaboration and innovation in education (Fisher & Baird, 2007). This confirms the need to bridge the gap between how children live, and how they learn and this impacts significantly on the development and delivery of the curriculum (Freyvaud, 2008). Whilst negative consequences such as cyber-bullying and time wasting should not be ignored, a more proactive approach with educational applications of these technologies appears to be required. This then needs to be based on sound pedagogical principles and careful evaluation. This has the potential to result in meaningful learning experiences for all students (Huijser, 2008).

6.3.5 Exploring the Potential of Web 2.0 to Enhance Learning

The low take-up by teachers of Web 2.0 technologies in their teaching is common in schools which have been slow to respond to rapid emergence of this digital culture (Shuck & Aubusson, 2010). A consequence of this is that the potential benefits of Web 2.0 technology for enhanced learning are not being realised. These potential benefits include the promotion of higher-order thinking, substantive communication, meta-language, student direction and connectedness (Crawford & Ratcliffe, 2010), the transformation of pedagogy and facilitation

of student engagement in their learning (Cochrane & Bateman, 2010) and an enriched appreciation of other people's cultures in the world (McCullough, 2009).

Most students are already active users of interactive text, audio and image technologies and social networking through powerful Web 2.0 tools. Students see creating multi-modal content and posting it on the Internet to share with friends, or perhaps the world, as a normal part of their lives (O'Brien, 2008). The absence of these technologies from their school experiences confirms the need highlighted by Todd (2009) for the promotion of effective teaching approaches with Web 2.0 which would involve teachers re-thinking, re-imagining and recreating dynamic learning environments for their students.

6.3.6 Fostering Personal Learning Networks for Students

The low success rate that was reported by most teachers in utilising ICT to promote individualised student learning refutes the notion that in working with ICT, students can become self-directive and active exploratory learners in a very short period of time (Watts, 2004). This is revealed by some teachers who continued to teach about technology in lock step fashion. They failed to foster students becoming independent computer users with an ability to create innovative solutions to real world problems (Hirumi, 2002). Intellectual momentum is needed to ensure that ICT tools are integrated thoughtfully into students' learning. This would involve the incorporation of meaningful inquiry tasks and the development of the analytical, critical thinking and reflective scaffolds to construct meaning and understanding (Todd, 2009).

The low prevalence of individualised student learning with Web 2.0 confirms the need for teachers to examine how these new and emerging technologies could assist personalised learning (Zagami & Finger, 2010). This could enable the acquisition of 21st

century education skills of connection, communication and creativity for both teachers and students (Mirtschin, 2010).

6.3.7 Building Information Literacy in Students

Given the research findings that teachers have a poor level of understanding about curriculum frameworks for their teaching with ICT, an underdeveloped culture of collaborative and proactive engagement amongst each other to develop their pedagogy with ICT and an incoherent perspective of the technological world of the students, it is perhaps not surprising that teachers' perception was that students tended to display a low level of information literacy with their use of technology. If a vision for technology use in the college dealt with these factors effectively, it might allow the potential that personal computing offers to children to be realised; namely, to learn more efficiently, a greater chance to learn things which would have been impossible a few years ago and, most importantly, the capacity to learn to learn (Stager, 2006).

6.3.8 Summary

Data received in response to the second research question generated a range of findings.

Amongst teachers there was a low level of familiarity with and understanding of curriculum frameworks for the use of Web 2.0. In addressing this, a revision of the teaching and learning policy is required to include a clear articulation of the place of ICT and Web 2.0 in the curriculum. This would include ongoing education for teachers about the integration of policy and practice at the case study college.

Teachers' use of ICT to improve learning outcomes is largely an 'opt in' system. Some teachers are proactive in developing their practice and others are not. This

highlighted the need for teachers to be mandated to incorporate the technology into their practice within a supportive culture of professional learning.

Students' use of their own technology was usually prohibited at school rather than it being evaluated as a potential learning tool.

The fostering of personalised learning amongst students through their use of Web 2.0 was found to be at an early stage of development.

There appears to be significant room for improvement by teachers in their development of information literacy and higher order thinking skills amongst students through the use of Web 2.0.

6.4 Conclusions from Research Question Three

What approaches from school leadership foster sustainable change in teachers' practice with Web 2.0 to enhance learning?

6.4.1 Introduction

The third research question explored the effectiveness of approaches to leadership in the promotion of enhanced learning with Web 2.0. There was a strong feeling amongst teachers that the ICT resources that had been deployed for use at the case study college were often not conducive to the development of their craft with ICT. To address this shortcoming, an increase in expenditure for ICT equipment through a tablet computer program for both teachers and students has occurred at the case study college in recent years.

Shared or distributed leadership in the development of policies relating to the use of ICT and future practice did not appear to be widespread with a low number of teachers having any role in this area. There appears to be scope for teachers to take on more responsibility for enhancing their own development in this area. This could result in a much wider cross section of the teaching staff, including teacher-librarians, in leading the development of pedagogy with Web 2.0 in future.

6.4.2 Consolidating ICT Resources for Teachers and Students

The belief amongst teachers that the ICT resources available for their use at school are inadequate for their teaching needs is a reflection of the struggle in which the case study college's ICT leaders were constantly immersed-, namely to identify, discuss and resolve important issues related to the use of technology. As leaders, we had to stretch a limited budget in an attempt to meet an increasing number of options for its deployment. This experience was typical for school leaders over this time (Di Bello, 2005). The presence of a large proportion of teachers who appeared to be disenchanted about the place of technology at our college is also common in schools more generally (Beastall, 2006). School leadership

responded to this challenge during the period of this research by committing resources into an upgrade of the infrastructure of the college network and a tablet computer program for teachers and students in Years 9 to 12.

6.4.3 Strategically Linking ICT Resources to Improved Pedagogy

The recent introduction of tablet computers to teachers and students in Years 9 to 12 is likely to address many of the shortcomings in ICT resources reported by teachers. A clear strategy is needed to ensure that this infusion of equipment and extra expenditure has a positive impact on student learning outcomes. The factors that Jamieson-Proctor and Finger (2008) identified as being necessary to effectively devise such a strategy were evident in the findings of this study. These include improving the lack of confidence that teachers have in their expertise with ICT, providing a greater focus for teachers' beliefs about the potential for ICT to make a difference to student learning and the continued provision of school technological infrastructure and support.

Effective leadership is required to ensure that improvement in teachers' pedagogy with ICT is made and strategically implemented, otherwise the expenditure in resources will not be used to its full potential (Reading & Daly, 2009). The low level of awareness amongst teachers of contemporary frameworks for the integrated use of ICT highlights the need to provide renewed emphasis to foster curriculum focused integration of technology. This requires encouragement and ongoing support towards curriculum leaders and teachers to allow them to achieve clearly defined goals (Divaharan & Ping, 2010).

6.4.4 The Mission of Schools in the Digital Age

The presence of a large number of teachers who do not appear to be engaged in developing their pedagogy with ICT and who appear to be resistant to change their practice to incorporate the use of technology represents a major challenge for school leadership to overcome. Promoting the involvement of all of the teaching staff in the establishment of a technology policy plan (Vanderlinde, van Braak & Hermans, 2009) is a high priority for leadership to address.

The case study college is typical of many schools which appear not to have fully appreciated that schooling is moving from its traditional paper operational mode to one that is digital and networked. The implications of that shift are profound (Lee, 2010). The recent decision to implement a one to one computer program to students in Years 9 to 12 but to continue with traditional paper based instruction for students in Years 7 and 8 was driven by the funding and mandate from the Federal Government Digital Education Revolution program. School leadership faces an ongoing challenge to clearly articulate a vision of the place of technology in education and how its use might lead to improvements in learning. This highlights the difficulty of meeting the major challenge involved in leading schools in the digital age. It involves thinking differently about how schools are organised and how the networked school community is best placed to meet the educational as well as the social demands and opportunities brought about by the transition from the industrial to the post-industrial age (Gaffney, 2009).

6.4.5 Engaging Teachers in Strategic Planning with ICT

The low number of teachers involved in the formulation and development of the strategic plan for ICT in the college presents yet another challenge for leadership. The introduction of technology has meant that leaders need to place a greater emphasis on

dispersed leadership (Gurr, 2004) where they communicate with team members and establish an appropriate social climate and convey exemplary interpersonal skills through the associated technology. Leaders must consider shared vision, shared meanings and principles, shared involvement and responsibility and shared understandings in terms of the impacts of digital technologies (Gaffney, 2009)**.** For this to happen, school leadership could promote a climate for professional learning with ICT where all teachers are supported to be proactive and engaged with the development of improved practice.

The balance that is needed in ICT leadership between a promotion of the expertise of technology leaders and a respect and valuing of the more traditional skills and knowledge of educators in schools (McPherson, Wizer & Pierrel, 2006) has been difficult to achieve. Some teachers felt that their efforts to lead change with ICT were often not encouraged or valued and many other teachers were not engaged at all in playing a role in developing practice with ICT. The effective promotion of a climate for collaboration and experimentation, which are fundamental to the integration of technology into pedagogical innovations (Wong, Choi & Lee, 2008) remains a major challenge for the college.

A shift was evident at the case study college during the latter stages of this research in the leadership approach taken in developing teaching practice with ICT. In the early stages of this research the focus of leadership was largely a top-down approach, where leadership originated from one individual or small group. Over the course of this research, leadership with ICT teaching practice at the case study college developed a greater resemblance to the approach advocated by Cowie and Harlow (2011), where leadership is distributed over people at all levels of the system and across policies, practices and material resources. Associated with this shift, the research data support the observation made by Lai and Pratt (2004) that technology coordinators are most effective in their leadership role when they

collaborated with teachers, acting as curriculum managers and change agents, rather than assuming the role of an expert with technology and spending most of their time offering technical advice and support to teachers.

6.4.6 Harnessing the Expertise of Teacher-Librarians

The research data highlighted the importance of a collaborative relationship between the principal and teacher-librarians in contemporary developments in teaching and learning with technology (Hay, 2009). This shared approach to leadership in schools' technology planning is likely to lead to teacher-librarians and others with curriculum knowledge and skills being able to maximise the intellectual resources of the school community and ensure ownership of the schools' educational programmes (McInerney, 2003). Leadership that involves sharing and collaboration amongst all school leaders requires the energy, commitment and contributions of all who work there (Duignan & Bezzina, 2006).

6.4.7 Promoting a Vision for Web 2.0 in Schools

The emergence of Web 2.0 technologies involving on-line communication in an environment of social networking has created a cultural gap (Williams, 2008) which poses a major challenge for school leadership. On the one hand there is a twentieth-century ethos of institutional provision and, on the other, there is the twenty-first century expectations including digital lifestyles of school students. The formulation and articulation of a vision for a networked mode of schooling (Lee & Mitchell, 2009) is required at the case study college to bridge effectively this widening cultural gap.

Adolescents' new ways of interacting with Web 2.0 spaces and producing information could possibly render current configurations of schooling obsolete and hence require new conceptualisations of schooling (Shuck & Aubusson, 2010). The research data show that an

evaluation of the educational potential of Web 2.0 technologies arising from teachers and students accessing information globally and interacting with each other collaboratively in the creation of knowledge (White, 2008) is required for school leadership to face this challenge effectively.

The promotion of a vision for Web 2.0 would foster coherence-making (Fullan, Cuttress & Kilcher, 2005) amongst teachers. The investments made in building capacity and cultures for learning would be reflected upon on a regular basis to allow coherence to be gained amongst teachers about how improved learning results from teaching with technology. This would involve a thorough review of the initial deployment of tablet computers to students and teachers in the past two years at the case study college and yearly reviews of progress made in subsequent years.

6.4.8 Summary

Data received in response to the third research question generated a range of findings for leadership in the development of teaching practice with Web 2.0 at the case study college.

The continued building and consolidation of ICT resources for teachers is required to enable effective learning programs to be implemented with this technology

The link between expenditure for ICT equipment and improved learning outcomes could be made much clearer and more direct through the strategic development of curriculum with ICT and teachers' professional development in their practice with the technology.

A shift in emphasis on curriculum focused integration of technology rather than on teachers' competency with the technology is required. This would best occur within

a climate of shared leadership where all teachers are encouraged to play a proactive role in the development of practice.

The emergence of Web 2.0 requires the revision of the mission of the college in the digital age through a careful evaluation of the role of this technology in contemporary learning.

Though a move to shared leadership away from the reliance on a few designated experts in technology could most effectively lead to improvements in teaching practice with Web 2.0, the importance of having key input from strategic players such as the Principal, curriculum leaders, ICT co-ordinators and teacher-librarians was recognised.

6.5 The Key Conclusions of this Research

After reviewing the conclusions of the three research questions, it is important to review the findings of this research in relation to the research problem.

The research highlighted the importance of the establishment of a culture of collaborative learning amongst teachers to develop their practice with ICT where there is a commitment to critical dialogue and review of practice to improve learning outcomes on a regular basis.

The development of pedagogy with Web 2.0 to foster improved learning outcomes such as higher order thinking, information literacy and personalised learning in students depends largely on the renewal of a vision for teaching and learning with Web 2.0 and the commitment of teachers to use this vision to underpin their efforts to work proactively together to improve their practice.

The establishment of a shared approach to leadership which strategically develops the use of Web 2.0 in schools through communities of learning involving all teachers was highlighted as an important factor in effective leadership to enhance learning with Web 2.0.

6.6 Recommendations and Areas for Further Investigation

6.6.1 Recommendations for Professional Learning Leaders

It is recommended that:

1. Professional learning leaders ensure that an appropriate form of mentoring regarding the integration of Web 2.0 in teaching and learning is established and maintained for teaching staff.
2. The awareness is heightened amongst teachers of the potential of Web 2.0 resources to foster an environment of collaborative, creative and student-centred learning. This would occur through an ongoing program of professional learning to explore the wide array of possibilities for enhanced learning with this technology.
3. A professional learning focus is given to the development of pedagogy that underpins the use of Web 2.0 to promote information literacy, collaborative learning and higher order thinking. This would facilitate teachers in their advancement to the highest level of sophistication in their practice with Web 2.0 to enhance learning.

6.6.2 Recommendations for Curriculum Leaders

It is recommended that:

4. The relationship between teachers and students characterised by a creative dynamic as co-learners with their use of Web 2.0 through such strategies as collaborative research activities and participation in on-line learning communities is fostered. This would lead to the adoption of innovative teaching and learning approaches with the potential to enhance learning.
5. An increased understanding of the ISTE NETS standards be cultivated in curriculum design and associated teaching practice with Web 2.0. This would provide subject domain leaders and teachers with a sound framework with which to develop approaches to enhance learning outcomes for students through the use of Web 2.0.

6.6.3 Recommendations for School Leadership

It is recommended that:

6. An ongoing evaluation of the teaching and learning policy is carried out to include a renewed vision of contemporary pedagogy with Web 2.0. Teachers would be provided with appropriate support and encouragement to contribute to this evaluation and to develop their practice with Web 2.0 in a manner that is consistent with this vision.
7. The ICT resources and associated infrastructure of the school information system is consolidated on an ongoing basis in a cost effective manner to ensure that teachers have the capacity to meet the goals of the teaching and learning policy to enhance the learning of their students with Web 2.0.
8. A shared approach to leadership is adopted to foster enhanced learning outcomes with Web 2.0. While the continued support for leadership roles such as curriculum leaders, teacher-librarians, ICT Coordinators and Network Managers to act as drivers of sustainable change is required, the engagement of all teachers to exercise leadership in the development of enhanced learning outcomes with Web 2.0 would be actively fostered.

6.6.4 Recommendations for Systemic Authorities

It is recommended that:

9. The capacity of personal learning networks to enable the facilitation of discussion, reflection and evaluation amongst teachers about their practice is harnessed. These networks provide institutions such as education offices, subject associations and curriculum and assessment authorities with greatly increased potential to achieve their goals.

10. School leadership teams are encouraged to consult with teachers and students to formulate a vision for the use of Web 2.0. Such consultation would give due recognition to the shift that has occurred from the 'pen and paper' era of information transfer to the 'digital age' of Web 2.0 and lead to a redefinition of the mission of the school.
11. Teachers and members of school leadership teams are given opportunities on an ongoing basis to explore issues of importance to education with Web 2.0. Diocesan, Victorian and Australian Education systems would provide these opportunities to allow the participants to immerse themselves in examples of best practice, emerging issues and policies to enhance students' learning with Web 2.0.

6.7 Suggestions for Further Research

It is suggested that further research be undertaken to examine:

1. The potential for students' and teachers' social networks within their use of Web 2.0 to become transformed into personal learning networks to enhance the process of teaching and learning (Zagami & Finger, 2010).
2. The implications for education of future developments in Web 2.0 to incorporate semantic aware applications. This research would focus on the capacity of these applications to foster personalised learning and information literacy by assisting students to access information of relevance to them from the huge volume of on-line material by methods such as saving, tagging and categorising information (Collins, 2010).
3. The possible impacts on future scenarios of schooling of adolescents' engagement with Web 2.0 spaces (Shuck & Aubusson, 2010). This would involve an examination of how schools in future will be best placed to meet the educational as well as the

social demands and opportunities brought about by the transition from the industrial to the post-industrial age (Gaffney, 2009).

4. Drivers for sustainable change (Fullan, Cuttress & Kilcher, 2005) which enable technological change forces to be sustainable in their enhancement of student learning. This would involve a proactive attitude to the school and student use of on-line opportunities in Web 2.0 environments (Lee & Mitchell, 2009).

6.8 A Personal Note

When this doctoral research began in 2007, I had several goals in mind: to re-energise my involvement in professional learning, to build upon my knowledge and understanding of the potential of Web 2.0 to enhance the learning process, to explore effective approaches taken to effectively lead change in this area, to enact these in my working life and model this for others. I believe that these goals have been mostly achieved. Yet as this research work concludes, it is the rich and personal learning beyond these goals that will sustain my work in the future. The wealth of literature in the area reveals the depth and complexity of the issue and the dedication of so many people who are working to advance education with Web 2.0 in these changing times.

The interview participants in this research were the most memorable part of the research process for me because of the perspectives that I gained from such a group of dedicated teachers. Their insights and reflections on this journey made a deep impression on me. The strongest message I gained from this was teachers' need to formulate and articulate a vision for the use of ICT in their work and then to be given support to design curriculum and modify their pedagogy accordingly. I am confident that, in time, they, and teachers like them, will be able to meet the challenges that this involves through the superimposition of practice with ICT towards what was already a very complex role.

I have always been more fascinated with the light that ICT is able to throw on learning than with the technology itself. Though the latter perspective has an important place, this research has given me several insights that indicate that learning about technology continues to dominate teachers' thinking at the expense of learning with technology. In leading change with ICT this research has given me renewed energy to promote an exploration amongst my colleagues of its potential to enable enhanced thinking, creativity and connectedness for our students. The literature review and the reflections in my research journal have provided me with a rich source of professional learning in this effort.

This research highlighted to me that when it comes to ICT and education, building a culture of shared leadership with technology is a vitally important issue for schools. This style of leadership does not come naturally to many teachers and school leaders. They typically look to the 'technical experts' for the answers, bemoan their own shortcomings or lack of knowledge and shy away from exercising leadership in this area. This research highlighted the largely untapped potential that the use of Web 2.0 technologies has to enable and foster this building of culture.

In my vocation as a teacher and in my various leadership roles in education, it has been a privilege to have witnessed such remarkable change caused by the introduction of ICT. It is clear from this research that recent developments in Web 2.0 offer great potential to enhance the learning of our students. I look forward to doing my best to develop my teaching practice further and to working with my teaching colleagues to meet the challenges that lie ahead of us to enhance learning with this technology.

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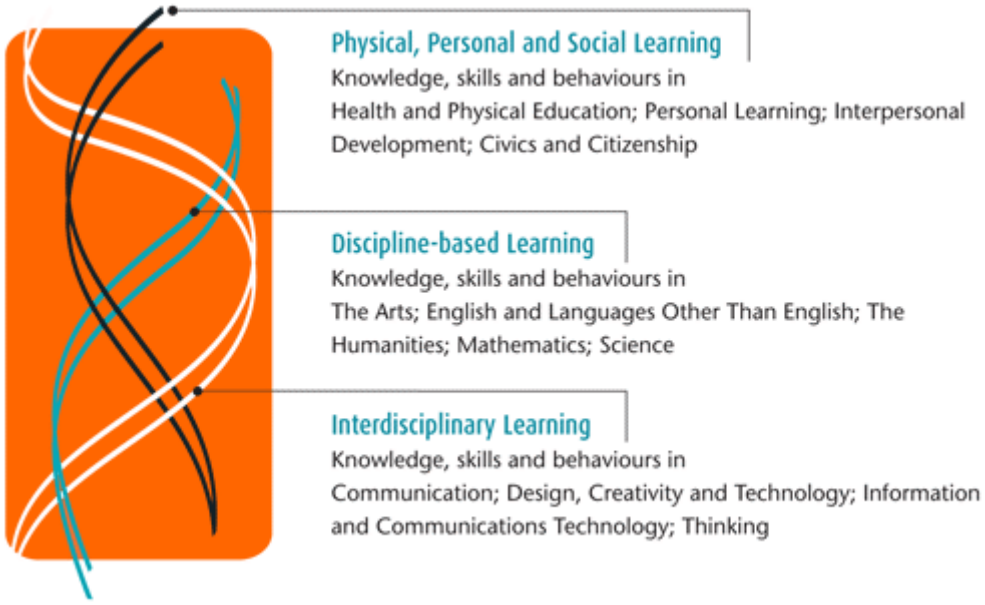
Appendices

Appendix A: Structure of the VELS

The VELS are organised in three important, inter-related areas called ‘strands’. The content and skills covered in each of the strands are important to the development of well-rounded and confident young people. The VELS emphasise the value of each area and their relevance by providing standards for teaching and assessing each learning area.

The specific learning areas in each strand are outlined in the diagram below.



Learning that occurs within each strand includes:

Physical, Personal and Social Learning
Students learn about themselves and their place in society. They learn how to stay healthy and active, develop skills in building social relationships and working with others, take responsibility for their learning, and learn about their rights and responsibilities as citizens.

Discipline-based Learning
Students cover the traditional subjects that help them make sense of their world. To assist their learning, students draw on the knowledge and skills covered in the other two strands. This helps students see connections between subjects and how they can use their skills in different ways.

Interdisciplinary Learning
Students develop knowledge and skills which they use across learning areas. They explore different ways of thinking and solving problems; learn to use a range of technology such as computer software to plan, organise, analyse and present their work; learn different ways of communicating their knowledge; and learn about creativity, design principles and processes.

Appendix A (cont): Structure of the VELS

School programs

Teaching activities may draw on elements from each of the three strands so that learning becomes more meaningful for students. This integrated focus on knowledge, skills and behaviours in the process of physical, personal and social growth, in the disciplines and across the curriculum helps to develop deep understanding which students can transfer to new and different circumstances.

Schools are not required to offer exactly the same programs as each other and not all learning areas will appear as separate subjects on the school's timetable. The VELS provide a guide for schools to design tailor-made programs that consider their students' backgrounds and needs. Please contact individual school's for inquiries on how their curriculum programs meet the requirements of the standards.

Appendix B: Teachers' Questionnaire

ACU National

Australian Catholic University Limited

ABN 15 050 192 660

Melbourne Campus (St Patrick's)

115 Victoria Parade Fitzroy VIC 3065

Questionnaire to staff: Enhancing teaching and learning with Web 2.0.

For each question in parts one to four of the questionnaire, please mark the appropriate box. If you believe there is more than one answer to a question please mark the appropriate boxes.

Part 1. Background information

1.1 Gender

- ☐ Female
- ☐ Male

1.2 Age:

- ☐ 20-29
- ☐ 30-39
- ☐ 40-49
- ☐ 50-59
- ☐ 60 or older

1.3 The units that I teach are in the Learning Domains of (please tick):

Domain		**Domain**	
Arts		Mathematics	
English		Religious Education	
Health & Physical Education		Science	
Humanities		Technology	
LOTE		Other:	

Other:_(please specify)_____

1.4 I have been in teaching for:

☐ less than a year

☐ 1 - 5 years

☐ 6 – 10 years

☐ 11 – 15 years

☐ 16 - 25 years

☐ more than 25 years.

Part 2. General Experience with ICT.

2.1 Each day, on average, I use ICT as part of my classroom teaching at school:

☐ not at all

☐ in approximately one quarter of my classes

☐ in approximately half of my classes

☐ in approximately three quarters of my classes

☐ in all of my classes

2.2 Each day, on average, I use ICT at school or home to prepare for teaching:

☐ not at all

☐ 0 to 1 hours

☐ 1 to 5 hours

☐ more than 5 hours

2.3 At school I:

☐ share a computer with others

☐ have my own computer

☐ do not have access to a computer

2.4 At home I:

☐ share a computer with others

☐ have my own computer

☐ do not have access to a computer

2.5 At home my Internet access is:

☐ Dial up modem

☐ Broadband

☐ I do not have internet access

2.6 I regularly use the following programs in my teaching:

☐ Word Processor

☐ Spreadsheet

☐ Powerpoint

☐ Image Creation/editing

☐ Animation Software

☐ Text to speech software

☐ Podcast Software

☐ Moodle

☐ Internet Browser

☐ Educational Software

☐ Other programs (please list)……

2.7 I use the following computer applications when communicating with my students (either during or outside class time)

☐ Moodle

☐ email

☐ report software

☐ Web 2.0 sites

☐ other (please describe) _____

2.8 In the last three years, I have received the following forms of training or professional development in the use of ICT:

☐ Tertiary Qualification (e.g. Diploma in Computing)

☐ Short Course (e.g. one hour per week for a term to learn Photoshop)

☐ Educational conference or seminar

☐ Instruction or help from colleague at work

☐ Instruction or help from friend or family member at home

☐ Information from Internet Site

☐ Manuals or books

☐ Other (please describe) _____

Part 3. Teachers perceptions about teaching with ICT.

For each of the statements in the table below, please tick the column that most closely represents your opinion about the statement.

SA **Strongly Agree**

A **Agree**

D **Disagree**

SD **Strongly Disagree**

U **Unsure/ Don't know**

.	**RATING**				
STATEMENT	**SA**	**A**	**D**	**SD**	**U**
3.1. I have a good understanding of the purpose of using ICT to enhance teaching and learning.					
3.2. I often talk to my colleagues about the place of ICT in teaching and learning.					
3.3. I lack confidence in using ICT in my classes.					
3.4. I usually do not have the time to talk with my colleagues about the place of ICT in teaching and learning.					
3.5. It is important for me to explore how ICT might enhance my teaching.					
3.6. I feel anxious about teaching with ICT because my students usually know more about technology					

than I do.					
3.7. I feel comfortable with my level of technical expertise to teach with ICT.					
3.8. I believe that the teaching methods that I employ with ICT often enhance the learning of my students.					
3.9. My teaching skills are more important than my skills in using technology if I am to teach with ICT effectively.					
3.10 I am confident that my needs for professional development in teaching with ICT are adequately met.					
3.11. I regularly use ICT to communicate with other educators elsewhere to improve my teaching practice.					
3.12. Teaching with ICT gives me a greater ability to adopt individualised learning programs with my students.					
3.13. My usual teaching style more closely resembles me acting as a “sage on the stage” (using teacher-centred learning) than a “guide on the side” (using student-centred learning).					
	RATING				
STATEMENT	**SA**	**A**	**D**	**SD**	**U**
3.14. The ICT resources in the classrooms in which I teach are adequate for my teaching needs.					
3.15.					

I regularly use a computer with a data projector in my classes.					
3.16. I am a much more effective teacher when I can use a computer with a data projector in my classes.					
3.17. The students should be encouraged to use laptop computers in class to enhance their learning.					
3.18. The students should be encouraged to use ipods or mp3 players in class to enhance their learning.					
3.19. The use of mobile phones has the potential to enhance the learning of students.					
3.20. My students are usually very proficient with their use of ICT.					
3.21. My students display high information literacy skills when using the Internet.					
3.22. I am able to successfully foster higher order thinking skills with students in my classes through their use of ICT.					
3.23. I am familiar with the V.E.L.S model of ICT as an interdisciplinary learning domain.					
3.24. The VELS approach to ICT as an interdisciplinary learning domain is a good model that leads to enhanced teaching and learning.					
3.25. Teaching with ICT offers me a lot of potential to foster higher order thinking skills in my students.					

3.26. The use of ICT allows my students to effectively collaborate with others.					
3.27. Teaching with ICT assists me to more positively engage my students in their learning.					
3.28. I am actively involved in planning for improved teaching and learning with ICT at domain meetings.					
3.29. I am actively involved in making decisions about how ICT resources are deployed at the college.					
	RATING				
STATEMENT	**SA**	**A**	**D**	**SD**	**U**
3.30. I am familiar with the IT Policy that is in place at the college.					
3.31. I am familiar with the ICT strategic plan at the college.					
3.32. I play an active role in the development of the ICT strategic plan at the college.					

Part 4. Web 2.0 Experiences

4.1 I am familiar with but do not necessarily use the following Web 2.0 technologies:

☐ Search Engines (e.g. Google, Yahoo, dogpile, AskJeeves)

☐ Learning Management Systems (e.g. Moodle, WebCT, Blackboard)

☐ Image Sites (e.g. flickr, Photobucket, ImageShack)

☐ Databases (e.g. Google Earth, Internet Archive)

☐ Video Sites (e.g. YouTube, TeacherTube)

☐ Blogs (e.g. OpenDiary, LiveJournal, blogger, Edublog)

☐ Aggregators (e.g. iGoogle, pageflakes)

☐ Community Builiding (e.g. Facebook, MySpace, ning, Bebo, Cyworld)

☐ Sharing Knowledge (e.g. Twitter, delicious)

☐ Virtual Worlds (e.g. Dungeons and Dragons, Active Worlds, Kaneva, Second Life)

☐ Shared Concept Maps (e.g. Inspiration, C-Maps)

☐ Shared Writing (e.g. WebEx, Google docs)

☐ Other (please describe) _____

4.2 I use the following Web 2.0 technologies in my teaching:

☐ Search Engines (e.g. Google, Yahoo, dogpile, AskJeeves)

☐ Learning Management Systems (e.g. Moodle, WebCT, Blackboard)

☐ Image Sites (e.g. flickr, Photobucket, ImageShack)

☐ Databases (e.g. Google Earth, Internet Archive)

☐ Video Sites (e.g. YouTube, TeacherTube)

☐ Blogs (e.g. OpenDiary, LiveJournal, blogger, Edublog)

☐ Aggregators (e.g. iGoogle, pageflakes)

☐ Community Builiding (e.g. Facebook, MySpace, ning, Bebo, Cyworld)

☐ Sharing Knowledge (e.g. Twitter, delicious)

☐ Virtual Worlds (e.g. Dungeons and Dragons, Active Worlds, Kaneva, Second Life)

☐ Shared Concept Maps (e.g. Inspiration, C-Maps)

☐ Shared Writing (e.g. WebEx, Google docs)

☐ Other (please describe) _____

4.3 I use the following Web 2.0 technologies in activities that are not associated with my teaching.

☐ Search Engines (e.g. Google, Yahoo, dogpile, AskJeeves)

☐ Learning Management Systems (e.g. Moodle, WebCT, Blackboard)

☐ Image Sites (e.g. flickr, Photobucket, ImageShack)

☐ Databases (e.g. Google Earth, Internet Archive)

☐ Video Sites (e.g. YouTube, TeacherTube)

☐ Blogs (e.g. OpenDiary, LiveJournal, blogger, Edublog)

☐ Aggregators (e.g. iGoogle, pageflakes)

☐ Community Building (e.g. Facebook, MySpace, ning, Bebo, Cyworld)

☐ Sharing Knowledge (e.g. Twitter, delicious)

☐ Virtual Worlds (e.g. Dungeons and Dragons, Active Worlds, Kaneva, Second Life)

☐ Shared Concept Maps (e.g. Inspiration, C-Maps)

☐ Shared Writing (e.g. WebEx, Google docs)

☐ Other (please describe) _____

4.5. I am interested in learning more about the following Web 2.0 technologies to explore the potential that they might have to enhance my teaching.

☐ Search Engines (e.g. Google, Yahoo, dogpile, AskJeeves)

☐ Learning Management Systems (e.g. Moodle, WebCT, Blackboard)

☐ Image Sites (e.g. flickr, Photobucket, ImageShack)

☐ College Intranet

☐ Databases (e.g. Google Earth, Internet Archive)

☐ Video Sites (e.g. YouTube, TeacherTube)

☐ Blogs (e.g. OpenDiary, LiveJournal, blogger, Edublog)

☐ Aggregators (e.g. iGoogle, pageflakes)

☐ Community Building (e.g. Facebook, MySpace, ning, Bebo, Cyworld)

☐ Sharing Knowledge (e.g. Twitter, delicious)

☐ Virtual Worlds (e.g. Dungeons and Dragons, Active Worlds, Kaneva, Second Life)

☐ Shared Concept Maps (e.g. Inspiration, C-Maps)

☐ Shared Writing (e.g. WebEx, Google docs)

☐ Other (please describe) _____

Thank you for the time that you have taken to complete this questionnaire.

Please refer to the attached covering sheet regarding your submission of this questionnaire and your possible participation in workshops and interviews on the use of Web 2.0 to enhance teaching and learning.

I would welcome the opportunity to work with you to develop your teaching practice with Web 2.0 in the future.

Kevin Sharkey

Appendix C: Teachers' Interview Questions

Name of interviewee:
Date:

1. What factors influence teachers' capacity to incorporate Web 2.0 into their teaching practice?

1.1 Most teachers have indicated that they have ready access to a computer, both at school and at home. What access to computers do you have at school? What access to computers do you have at home?

1.2 It is clear that most teachers believe that ICT has the potential to enhance learning yet many teachers feel that their training and professional development in the use of ICT at school is lacking. What forms of professional development in teaching with ICT have you found helpful? What made them helpful?

1.3 What sort of approaches would benefit your ongoing professional development in teaching with ICT?

2. How can an approach to learning with Web 2.0 enhance the development of pedagogy?

2.1 It is clear that many teachers are struggling to keep up with what is available to use in the world of ICT as well as curriculum design for its use in schools. Most teachers don't seem to be aware of the interdisciplinary learning framework of ICT within the VELS framework. How familiar with the VELS framework with ICT are you?

2.2 What do you consider to be the strengths of the VELS ICT model? What do you consider to be the weaknesses of the VELS ICT model?

2.3 Can you describe successes that you have had in your own subject area in teaching with ICT to enhance students' learning?

2.4 There doesn't seem to be consensus amongst teachers at (COLLEGE NAME) about the potential of ICT to facilitate students' learning through a one to one laptop program. Some are in favour of this model, others against or doubtful of its value. What are your thoughts about the need for a one to one student to computer program to enhance their learning?

2.5 Many believe that teaching with ICT offers great potential to facilitate individualised learning programs with students. What does your experience suggest about this?

2.6 On a scale of 1 to 5, with 1 being very low and 5 being very high, what priority would you place on providing a personalised learning plan for each of your students through the use of ICT? Why do you have this opinion?

2.7 Many teachers believe that ICT engages their students in their learning through collaboration with other people. Can you describe experiences where this has happened in your classes?

2.8 On a scale of 1 to 5, with 1 being very low and 5 being very high, how would you rate the importance of students being involved in collaborative learning projects using ICT? Why do you have this opinion?

2.9 The promotion of critical literacy in searching for and analysing information and higher order thinking skills are two areas that have been highlighted by teachers as lacking in many students. How have you tried to foster your students' information literacy through the use of ICT? How have you tried to foster your students' thinking skills through the use of ICT?

2.10 Most teachers appear to be aware of and use some of the more established activities of Web 2.0 such as social networking, video sites and databases such as Google Earth but are less familiar with emerging areas of Web 2.0 such as nings, blogs, aggregators and virtual worlds. How would you describe your familiarity with web 2 technologies? Which Web 2.0 sites do you use? How do you use Web 2.0 sites in your teaching?

2.11 Do you consider that there is good potential for the use of Web 2.0 to enhance student learning? Which areas of Web 2.0 do you consider have the most potential to enhance the learning of the students that you teach?

2.12 In developing your teaching practice with Web 2.0, which area(s) of Web 2.0 would you like to start working with in your classes? How can I best assist you over the weeks ahead in preparing for these classes? What support could would you like me to provide you with at the time that you are giving the classes? How would you like to review how effective this effort was in enhancing the learning of your students?

3. How can the school leadership team effectively facilitate the enhancement of teaching and learning with ICT?

3.1 It appears that the majority of teachers believe that insufficient emphasis is given by the school leadership team to foster the development of curriculum and pedagogy with ICT. How do you think that this change might be effectively fostered by the school leadership team?

3.2 What can curriculum leaders do to effectively facilitate and promote the development of teachers' pedagogy with ICT?

3.3 There appears to be widespread disengagement amongst staff in the development of the strategic plan for ICT at (COLLEGE NAME). What role, if any, did you have in developing the (COLLEGE NAME) strategic plan for ICT?

3.4 How do you think the strategic plan for ICT at (COLLEGE NAME) might enhance the learning of students? Do you have any suggestions to change the plan for the better?

3.5 What role do you think that teachers should have in future strategic planning for ICT at (COLLEGE NAME)?

Appendix D: Interview transcript for Graeme

Name of interviewee: (Graeme)
Date: April 17th 2010.

1. What factors affect teachers' willingness and capacity to incorporate Web 2.0 into their teaching practice?

1.3 Most teachers have indicated that they have ready access to a computer, both at school and at home. What access to computers do you have access to at school and home?
Laptop at school, Desktop, scanner/printer at home

1.4 It is clear that most teachers believe that ICT has the potential to enhance learning yet many teachers feel that their training and professional development in the use of ICT at school is lacking. How would you describe your professional development in teaching with ICT?
I can use most stuff and many programs (sometimes needing a little help) but teaching with it is a different skill. In most ICT PD I think this is forgotten. I have been to very few GOOD teaching example/strategy sessions of ICT PD and its potential for improving student outcomes. The emphasis has almost always been on the technology, not the practical educational detail of its application and use to facilitate learning, in a time economical way, in the classroom.

1.5 What sort of approaches do you consider would benefit your professional development in teaching with ICT?
A greater emphasis on GOOD teaching strategies using ICT (ones that will actually enhance learning) relevant to my own subject areas is EXTREMEL important. The strategies must be time-effective to use in the class-room and they must improve student understanding and the speed with which they learn. They also need to be time effective in how much teacher effort is necessary to set-up, use and maintain them. A flashy program does not necessarily satisfy these requirements (Moodle is a good example).

2. How can an approach to learning with Web 2.0 enhance the development of pedagogy?

2.1 It is clear that many teachers are struggling to keep up with what is available to use in the world of ICT as well as curriculum design for its use in schools. Most teachers don't seem to be aware of the interdisciplinary learning framework of ICT within the VELS framework. How familiar with the VELS framework with ICT are you?
I read it (very thoroughly) and then forgot it. It is clear what is required but when the assessment of interdisciplinary learning isn't clear in the VEL's document and when most schools break ICT up and say, "I will use this program which is ICT and another says " so will I but you can report on it", then it isn't really integrated nor interdisciplinary is it? All the interdisciplinary areas within VELS have this problem. Things happening in many different areas have no way of being reported on collectively.

2.2 What do you think of the model of learning across the curriculum with ICT, and in particular, your subject area(s)?
It can work but how to assess effectively and how to collectively report needs to be worked out!! My belief is that VELS reporting is really a primary school model where one teacher takes most of the subjects. It has large failings in secondary schools with cross-curriculum and interdisciplinary learning. If something is interdisciplinary then it needs to be made clear which Domains do what and then each can assess and report on their own areas of responsibility.

Appendix D (cont): Interview transcript for Graeme

2.3 Can you describe successes that you have had in teaching with ICT in your own subject areas to enhance students' learning?
Only a little! Use of Moodle in keeping students up to date with requirements and providing a central place for resources they need, works ((see the Physics 3 Moodle). Moodle as an advertising medium for a subject (see "Physics is Mental") works but is too labour intensive. On-line Simulations and you-tube videos are good in Physics. Forums I set up weren't popular except for social discourse. They did little to promote learning enquiry and had little if any effect on learning outcomes.

2.4 There doesn't seem to be consensus amongst teachers at (COLLEGE NAME) about the potential of ICT to facilitate students' learning through a one to one laptop program. Some are in favour of this model, others against or doubtful of its value. What are your thoughts about the need for a one to one student to computer program to enhance their learning?
It is all about dollar value, time value and learning effectiveness. I would have to ask "Will spending this amount of money, save time (teacher preparation and student learning time) and increase knowledge take-up, better than spending the same amount of money in some other way. I am yet to be convinced that the dollars spent on a one-to one laptop program couldn't be spent more effectively on other things.
Show me all the good learning strategies that will be improved by the laptop program and maybe then I can make an informed decision. The computers by themselves are simply a tool. We need to be shown how to make use of their POTENTIAL to improve learning in the classrooms.
The trouble is most ICT people are specialist in USING ICT programs but often many are only just average and sometimes below average educators and teachers. I want a good EDUCATOR and TEACHER to show me how to get the best out of my laptop to improve my classes.

2.5 Many believe that teaching with ICT offers great potential to facilitate individualised learning programs with students. How does your experience fit with this?
I have used ICT to provide individualised programs to students with learning difficulties who had been mainstreamed into larger classes. The difficulty was that, without support these kids were not independent enough, nor did they have the concentration and the skills to access, read instructions and maintain their effort on the individualised tasks.
Individualised programming does not mean students do not need teacher help, nor does it mean they can operate independently.
The level of preparation and time required to develop individualised programs made the exercise untenable.

2.6 How high a priority would you place on providing a personalised learning plan for each of your students through the use of ICT?
Teachers already do this in their classes but mostly it is done verbally, one to one with the student, without the use of ICT. I would be VERY wary of FORMALISING this process because at this stage I don't believe the workload justifies changes to the current way of doing this. It is like many of the current initiatives, it may make the school LOOK good and foster the view that it is innovative, but it is just an added task requiring MUCH more effort for little added benefit.
The effect or outcome MUST justify the effort and the cost if it is going to be popular with teachers.

2.7 Many teachers believe that ICT allows their students to become more engaged in their learning through collaboration with other people. Can you describe experiences where this has happened in your classes?
I am prepared to concede that this is an area which could be developed. It is a current phenomenon demonstrated by email, texting, Facebook and Twitter that social communication is important to

young people of today. SHOW me how I can incorporate that effectively in my Physics classes (with such incredibly tight timelines) and SHOW me how it actually improves OUTCOMES and then maybe I will use it.
I have tried a forum on my Physics is Mental Moodle site last year but the participation rate and the educational value of that was basically NIL.

2.8 How important do you think it is for students to engage in collaborative learning projects using ICT?
I get back to the basics Kev and I will reverse the question. Without ICT, how important are collaborative learning projects? The issue shouldn't be about ICT but should be about the LEARNING strategy. The theory is that ICT enhances this strategy. Show me, with ICT, how the strategy can improve my subject and maybe it would be worthwhile trying.
We should also learn from past experience. There are problems with collaborative learning not the least being assessment of the work of individuals within the collaborative group. Has ICT overcome this dilemma? Collaborative Learning isn't new and there is a lot to learn (good and bad) from experiences without technology. Some of this seems to be forgotten in the hype about its use with ICT.

2.9 The promotion of critical literacy in searching for and analysing information and higher order thinking skills are two areas that have been highlighted by teachers as lacking in many students. How would you describe your experiences in fostering your students' information literacy through the use of ICT?
All my classes use the internet as a source of information and have been shown simple tips in refining searches to find what you are looking for. They are required to reference all their sources and make critical comment on the expertise and bias of the source. We have talked about this at length.
Apart from this I don't do anything much.

2.10 Most teachers appear to be aware of and use some of the more established activities of Web 2.0 such as social networking, video sites and databases such as Google Earth but are less familiar with emerging areas of Web 2.0 such as nings, blogs, aggregators and virtual worlds. How would you describe your familiarity with web 2 technologies and which of these sites do you tend to use?
Don't know NUTHIN'.

2.11 What are your thoughts regarding the potential of Web 2.0 to enhance student learning?
Don't know NUTHIN'. Haven't really got time to find out (unless admin GIVE me time)!!!!

2.12 In developing your teaching practice with Web 2.0, what approach would you like to take and which area(s) would you like to start working with?
I would prefer to talk about good teaching practice FIRST and how ICT can enhance it SECOND. You don't buy a chain saw unless you have a task (a tree to chop down) for it. Let's determine what we want to improve in our teaching skills and THEN we will go and look for a tool to do it. The current push seems to imply let's buy the tool and then look for a situation where it can be used.
This is the wrong way round.

3. What school leadership approaches are effective in enhancing teaching and learning with ICT?

3.1 The majority of teachers believe that insufficient time is spent at domain meetings to develop curriculum and pedagogy with ICT. Do you believe that there should be more emphasis given here?

I know this is the case but the demands on time mean that "deep" learning is not possible in theis limited time. Domains need access to examples of use, descriptions of goods and bads in delivery and assessment of effectiveness in improving outcomes.
Sharing good teaching practice is important, regardless of whether it is conventional approaches or ICT approaches. The former doesn't occur much either so a system (like mentioned previously) needs to be set up to record and share successful teaching practice.

3.2 How do you think that curriculum leaders might work to effectively facilitate and promote the development of teachers' pedagogy with ICT?
Do what I have suggested earlier..... and...

Also make use of the "disciple" approach to promulgate new and innovative practice. The first disciples need to be given time, however, to develop new examples and then to share their experiences with others. Their disciples can then need to be given time to pass on their next lot of experiences to the next group. This is an exponential system so it becomes self-perpetuating in a relatively short time. This system was very successful at Portland Secondary College and was funded.

3.3 There appears to be widespread disengagement amongst staff in the development of the strategic plan for ICT at (COLLEGE NAME). How would you describe your role in developing the strategic plan?
Haven't got a role. I'm not a leader (apparently) so have no influence. I just do my own thing..... mostly.

3.4 What are your thoughts on the strategic ICT plan for the school and the direction that we are headed in teaching and learning with ICT?
I think there is too much emphasis on the ICT tools without enough thought about the educational practices they can enhance. There MUST be measurable benefit to student Learning Outcomes. Who has developed the tools to measure these benefits.

3.5 Do you think that teachers should have an active role in strategic planning for ICT or do you think that this should be left to designated ICT leaders?
If ALL the ICT leaders were EXCELLENT CURRICULUM DEVELOPERS then possibly they could take on the role of initiating action in ALL Domains but they aren't. It needs and interdisciplinary ICT development group (perhaps the first ICT disciples could take on this role.... if given time!)

Appendix E: Interview transcript for Mary

Name of interviewee: (Mary)
Date: Tuesday April 13th 2010

1. What factors influence teachers' capacity to incorporate Web 2.0 into their teaching practice?

1.6 Most teachers have indicated that they have ready access to a computer, both at school and at home. What access to computers do you have at school? What access to computers do you have at home?

I have an old laptop at home that is not usable. I have access to a desktop computer at school that I usually don't have to share with anyone else.

1.7 It is clear that most teachers believe that ICT has the potential to enhance learning yet many teachers feel that their training and professional development in the use of ICT at school is lacking. What forms of professional development in teaching with ICT have you found helpful? What made them helpful?

I haven't had an external pd days on ICT as such. I often get assistance from colleagues to find out how to do things with computers like features of Powerpoint, creating hyperlinks and how to use Moodle. I find this sort of on the job training very useful with the ability to have questions answered as they arise. I find it too difficult when I am in a group of people because there are people there who are more competent than me. I am reluctant to ask questions in this setting.

1.3 What sort of approaches would benefit your ongoing professional development in teaching with ICT?

On the job training and having the ability to get help when I need it during the working day. I also think I need to go off and get a one or two day training in programs such as Powerpoint where I can learn some of the terminology around IT.

2. How can an approach to learning with Web 2.0 enhance the development of pedagogy?

2.1 It is clear that many teachers are struggling to keep up with what is available to use in the world of ICT as well as curriculum design for its use in schools. Most teachers don't seem to be aware of the interdisciplinary learning framework of ICT within the VELS framework. How familiar with the VELS framework with ICT are you?

Not up to date with it all. Is that bad?

2.2 What do you consider to be the strengths of the VELS ICT model? What do you consider to be the weaknesses of the VELS ICT model?

Not aware of strengths of the model because I'm not familiar with it.

2.3 Can you describe successes that you have had in your own subject area in teaching with ICT to enhance students' learning?

I get the students to use computers for Google searches and I have just started to learn Inspiration and am introducing the use of concept mapping into my teaching. I'm not sure how to use it properly yet. I confused with some of the things and some of the kids know more about that than I do. I will be able to learn more about the program from some of the kids. I am comfortable with learning from the kids. It doesn't worry me at all to ask for this help.
The only other thing I have done is that forum on Moodle that you showed me how to do but I have forgotten how to do that. I would like my students in unit ¾ Religion and Society to go in to the forum and they could ask me questions and I could get back to them. Other kids could access it too and they could learn from each their questions and answers.

2.4 There doesn't seem to be consensus amongst teachers at (COLLEGE NAME) about the potential of ICT to facilitate students' learning through a one to one laptop program. Some are in favour of this model, others against or doubtful of its value. What are your thoughts about the need for a one to one student to computer program to enhance their learning?

I'd like to know more about it and I'd like to know who pays for it. Do all students have the access? Obviously there are students that are less well off than others and that issue needs to be addressed. Looking after them properly is also an issue but if we give kids that responsibility they would probably take it on board.
Because of my lack of knowledge of ICT I would be concerned about what students are doing without my knowledge. I'd struggle to make sure they are engaged in the ICT stuff. With Religion and Society the only resource they have is me in front of them but I suppose they can access other things more readily. They are more available. In some ways it would be good and in some ways it would be a challenge to start with anyway.

2.5 Many believe that teaching with ICT offers great potential to facilitate individualised learning programs with students. What does your experience suggest about this?

I think it does give potential to facilitate individual learning but I haven't been able to reach this stage. I haven't been able to move far from teacher-centred learning. My use of Powerpoint is a god example of this. I'd love to be able to say to the students this is what you need to achieve and allow them to do this at t heir own pace and using their own learning style. My fear would be that some students might fall right behind but I suppose my role would be to move around the room and see where people are at

2.6 On a scale of 1 to 5, with 1 being very low and 5 being very high, what priority would you place on providing a personalised learning plan for each of your students through the use of ICT? Why do you have this opinion?

Up around 5 I think. I'd like to provide an environment where students take responsibility for their own learning. For a lot of kids they might be more engaged if we went this way. I don't know if t hat is so much an ICT issue as a self-directed learning issue.

2.7 Many teachers believe that ICT engages their students in their learning through collaboration with other people. Can you describe experiences where this has happened in your classes?

I haven't done a lot of that. In fact, probably none. When my students use Inspiration, they did help each other out a bit. There's got to be other stuff that they can collaborate with on things.

Appendix E (cont): Interview transcript for Mary

2.8 On a scale of 1 to 5, with 1 being very low and 5 being very high, how would you rate the importance of students being involved in collaborative learning projects using ICT? Why do you have this opinion?

It could work well but you'd need to be careful about the combinations of students that you asked to get to work with each other. Students' experiences in that type of learning are pretty shallow as well so we would be up against this as well. Some of them do work well together but it depends on who the kids are in lots of cases.

2.9 The promotion of critical literacy in searching for and analysing information and higher order thinking skills are two areas that have been highlighted by teachers as lacking in many students. How have you tried to foster your students' information literacy through the use of ICT? How have you tried to foster your students' thinking skills through the use of ICT?

With Religion and Society it is possible for the students to access the catechism of the Catholic Church. There is loads of stuff there they don't need and I find it necessary to do this filtering of information so that they access only the relevant information. They find it difficult to discern what they actually need. Part of the problem here is the tight structure of VCE and limited time. There isn't enough time and I need to help them to make links between sections of the Catechism website otherwise they will spend too long trying to do this themselves.

I try to get them to look at the source of the information when they do an Internet search. Trying to keep tabs on every student in the class and what they are accessing.

I have started using Inspiration to try to foster their ability to make concept maps and organise relevant information within them.

2.10 Most teachers appear to be aware of and use some of the more established activities of Web 2.0 such as social networking, video sites and databases such as Google Earth but are less familiar with emerging areas of Web 2.0 such as nings, blogs, aggregators and virtual worlds. How would you describe your familiarity with web 2 technologies? Which Web 2.0 sites do you use? How do you use Web 2.0 sites in your teaching?

On a scale of 1 to 10 where 1 means I know very little I'd give myself a one. I have used Google earth once or twice on a friend's computer. I have used You Tube once or twice in my teaching but I'm not sure how to actually search You Tube to find something. I've only shown something when someone else has shown me where the resource is by sending me the link on email. Someone is told me about blogs before but I really don't know what one is and never seen one. Same for wikis.

2.11 Do you consider that there is good potential for the use of Web 2.0 to enhance student learning? Which areas of Web 2.0 do you consider have the most potential to enhance the learning of the students that you teach?

I think it probably does but feel I don't know enough about it to make that call.

2.12 In developing your teaching practice with Web 2.0, which area(s) of Web 2.0 would you like to start working with in your classes? How can I best assist you over the weeks ahead in preparing for these classes? What support could would you like me to provide you with at the time that you are giving the classes? How would you like to review how effective this effort was in enhancing the learning of your students?

I would like to have another try at introducing the use of forums with my religion and society classes.

Nings. I'd like to look to see what's out there in the world of web 2 and determine what might be of value. Having said that I think teachers need time to do this and inform themselves properly. There's no point in just supplying the technology and not having the training.

3. How can the school leadership team effectively facilitate the enhancement of teaching and learning with ICT?

3.1 It appears that the majority of teachers believe that insufficient emphasis is given by the school leadership team to foster the development of curriculum and pedagogy with ICT. How do you think that this change might be effectively fostered by the school leadership team?

Maybe a rolling thing of a few people like yourself who are knowledgeable in IT and other staff take their lesson to free them up to work with people like me to learn new stuff all the time. There's got to be time when the school leadership need to give some time to make it work.

3.2 What can curriculum leaders do to effectively facilitate and promote the development of teachers' pedagogy with ICT?

In curriculum meetings, physical examples are used and people have the chance to take this in and learn from it. The relevance of the activity needs to be shown and people discuss how they might use it in their class. This is not just for Year 10 but also for VCE subjects.

3.3 There appears to be widespread disengagement amongst staff in the development of the strategic plan for ICT at (COLLEGE NAME). What role, if any, did you have in developing the (COLLEGE NAME) strategic plan for ICT?

I don't know when it was even. It might have been the year when I was away. I've never seen it.

3.4 How do you think the strategic plan for ICT at (COLLEGE NAME) might enhance the learning of students? Do you have any suggestions to change the plan for the better?

Because I don't know what's in the plan I can't make that call but unless the who, what and how is in the strategic plan it will not work. Any plan I have been involved in sets tasks for people for ths upcoming period as everyone knows what who is going to do next. There's a timeline that spells out clearly what each person is going to do and how they are going to do it.

3.5 What role do you think that teachers should have in future strategic planning for ICT at (COLLEGE NAME)?

Yes teachers should be involved but the people who are more aux fait with ICT should have more say in it than people like myself who don't know much. I would be able to say something like we should be more creative with ICT but I don't know how to do it. I need hands on examples of things that have worked well in classrooms. I have done this sort of thing at RE pd where we did two on twos as a communication and learning exercise. Because it was clearly presented it has stayed with me and I have used this teaching method lots of times since to good effect. I need that sort of thing in ICT and then have the time to go away and practice it and the support to ask for help when needed.

Appendix F: Interview Transcript for Roberta

Name of interviewee: Roberta
Date: Monday May 7th, 2010

1. What factors influence teachers' capacity to incorporate Web 2.0 into their teaching practice?

1.8 Most teachers have indicated that they have ready access to a computer, both at school and at home. What access to computers do you have at school? What access to computers do you have at home?

I have a mac notebook computer that I can access at both school and at home.

1.9 It is clear that most teachers believe that ICT has the potential to enhance learning yet many teachers feel that their training and professional development in the use of ICT at school is lacking. What forms of professional development in teaching with ICT have you found helpful? What made them helpful?

Probably the only professional development that I would find helpful is like this, one on one. I tend to go to water in a formal situation like workshops on Photoshop that I've been to where I feel like I'm one of the remedial kids at school. I've missed out on basic training and I get lost very easily in a group situation. Unless I have Peter or Ted sitting next to me I'm totally at sea. And that's really not fair on them because they are trying to help me but missing out on what they should be doing.

1.3 What sort of approaches would benefit your ongoing professional development in teaching with ICT?

If I can get one to one mentoring I am much more comfortable and likely to experience success.

2. How can an approach to learning with Web 2.0 enhance the development of pedagogy?

2.1 It is clear that many teachers are struggling to keep up with what is available to use in the world of ICT as well as curriculum design for its use in schools. Most teachers don't seem to be aware of the interdisciplinary learning framework of ICT within the VELS framework. How familiar with the VELS framework with ICT are you?

I'd be ticking that number 1 box, where 1 is the bottom of the scale. I know it can be used for things like creating art works but in terms of formally suing the model, I don't have much knowledge at all. It's something I avoid like the plague I think.

2.2 What do you consider to be the strengths of the VELS ICT model? What do you consider to be the weaknesses of the VELS ICT model?

I have no idea what the model of ICT in VELS here. I would mainly get the students to use the computers for research. They don't use it for design or creating product.

2.3 Can you describe successes that you have had in your own subject area in teaching with ICT to enhance students' learning?

Appendix F (cont): Interview Transcript for Roberta

Probably way back early when i was teaching photography when we first introduced this as a digital subject and moved away from film based photography. I was just keeping pace with it then. Sometimes I'd be able to help the kids with what little knowledge I did have. That was always a highlight of the day but also very rare. They generally picked up the skills they needed independently of me and more often than not learnt from each other. It was cooperative learning. I don't have a problem with moving away from being the source of all information and knowledge for the students. I'm well aware that the kids are way ahead of me in their use of technology. If they can help each other then that's cool by me. It puts me in a bad light but you just have to be practical. I don't think it's fair to the kids that I teach a subject like digital photography when I don't have the skills so I have chosen not to teach it any more.

2.4 There doesn't seem to be consensus amongst teachers at (COLLEGE NAME) about the potential of ICT to facilitate students' learning through a one to one laptop program. Some are in favour of this model, others against or doubtful of its value. What are your thoughts about the need for a one to one student to computer program to enhance their learning?

Because I work in a really practical environment in a room where the kids have access to things like paint and water and those sorts of materials I would have reservations about kids having access to computers in that sort of environment. Because it is such a visual subject there is less of a place there for computers. When I need to use computers like research assignments on artists I seek them out in areas like the library and take the kids off to there. If there was a subject like computer art that was geared toward computer aided design there would be a place for that.

2.5 Many believe that teaching with ICT offers great potential to facilitate individualised learning programs with students. What does your experience suggest about this?

I'll give you an example where it could be used. One of the girls in Art is working with old books. She has created these lovely origami three dimensional sculptural relief type pieces. What we are thinking of doing is using several of these books to create one art piece. So rather than make twelve of these things straight off she photographed one and repeated the design in different configurations to find out which configuration looked best. We do that sort of thing but the kids choose to do that and use the skills they have on computer. I facilitate this and offer suggestions about the theory behind what they are doing in art.

With Caitlin who is doing a project on nature photographs, I asked her had she considered using the "liquefy" tool in photoshop. This is one feature that I remember using from my photography teaching days. The image melts and so it's another form of abstraction. I use it as a tool in this way.

2.6 On a scale of 1 to 5, with 1 being very low and 5 being very high, what priority would you place on providing a personalised learning plan for each of your students through the use of ICT? Why do you have this opinion?

I encourage students to use computers when it will help them to produce art work when appropriate. It's important for kids to have the freedom to make this choice.

2.7 Many teachers believe that ICT engages their students in their learning through collaboration with other people. Can you describe experiences where this has happened in your classes?

They focus on individual learning, especially at Year 11 and 12. They mainly use the computer for researching sacs to support t heir theory and also as described above. Not much group work goes on in my classes.

2.8 On a scale of 1 to 5, with 1 being very low and 5 being very high, how would you rate the importance of students being involved in collaborative learning projects using ICT? Why do you have this opinion?

2.9 The promotion of critical literacy in searching for and analysing information and higher order thinking skills are two areas that have been highlighted by teachers as lacking in many students. How have you tried to foster your students' information literacy through the use of ICT? How have you tried to foster your students' thinking skills through the use of ICT?

Usually they are fairly competent and directed in what and who they are researching. This might eliminate some of the extraneous stuff they might come across. They are fairly competent. Some more competent than others and this relates to t heir language and English skills more than anything else.

2.10 Most teachers appear to be aware of and use some of the more established activities of Web 2.0 such as social networking, video sites and databases such as Google Earth but are less familiar with emerging areas of Web 2.0 such as nings, blogs, aggregators and virtual worlds. How would you describe your familiarity with web 2 technologies? Which Web 2.0 sites do you use? How do you use Web 2.0 sites in your teaching?

Number 1 again. I'd have to ask you what's web 2. You've just explained it. I don't use it myself. One of the things I need to learn how to do is to create a Powerpoint. The whole area of web 2 doesn't interest me. It's just another way for me to have my time eaten into. I've got other things that are of a higher priority than face book and all that. I haven't got time for all of that sort of stuff.

2.11 Do you consider that there is good potential for the use of Web 2.0 to enhance student learning? Which areas of Web 2.0 do you consider have the most potential to enhance the learning of the students that you teach?

It's not relevant to me in my teaching area.

2.12 In developing your teaching practice with Web 2.0, which area(s) of Web 2.0 would you like to start working with in your classes? How can I best assist you over the weeks ahead in preparing for these classes? What support could would you like me to provide you with at the time that you are giving the classes? How would you like to review how effective this effort was in enhancing the learning of your students?

3. How can the school leadership team effectively facilitate the enhancement of teaching and learning with ICT?

3.1 It appears that the majority of teachers believe that insufficient emphasis is given by the school leadership team to foster the development of curriculum and pedagogy with ICT. How do you think that this change might be effectively fostered by the school leadership team?

3.2 What can curriculum leaders do to effectively facilitate and promote the development of teachers' pedagogy with ICT?

For me it happens more informally. Peter and Jason and Ted will help me. I feel really self conscious about asking people for help because it takes their precious time. Unfortunately that's the only way where any sort of learning is going to happen.

3.3 There appears to be widespread disengagement amongst staff in the development of the strategic plan for ICT at (COLLEGE NAME). What role, if any, did you have in developing the (COLLEGE NAME) strategic plan for ICT?

God no. I would have no idea. I leave that to people who know. The only thing that I would like the powers that be is that there are people like me who still exist. I find this whole area very difficult to deal with. I have missed out on the basics. When I try to do something, there is always something missing or a barrier that gets in the way. The recent request for teachers to fill out an online questionnaire on their ICT competencies is a good example of this. The program that is needed to do this isn't available on my macintosh computer. I have asked for it to be installed but it hasn't happened yet and it's weeks later. That frustrates me and doesn't allow me to accomplish what I want to do. The analogy of a jigsaw with a piece missing is a good one that describes my experiences in teaching with technology.

3.4 How do you think the strategic plan for ICT at (COLLEGE NAME) might enhance the learning of students? Do you have any suggestions to change the plan for the better?

3.5 What role do you think that teachers should have in future strategic planning for ICT at (COLLEGE NAME)?

Appendix G: Tentative themes within Pedagogy and Web 2.0.

Tentative Theme	**Pedagogy and Web 2.0**
Interactive whiteboards Classroom design Integrating ICT across the curriculum e-teaching constructivism/ instructivism/ connectivism	**Teaching with technology**
Learning outcomes with ICT Student engagement with ICT self-directed learning social networking and learning global classrooms collaborate learning	**Student-centred Learning and Web 2.0**
ICT skills acquisition Virtual worlds Mobile technologies and schools Multimedia and learning	**Adopting Pedagogy to the Technological World of the Students**
Cybersafety Libraries role in 21st century Copyright and plagiarism Higher order thinking Global citizenship 21st century learning digital literacy	**Pedagogy and Information Literacy**

Appendix H: Thematic Coding scheme

Theme Code	Literature Review Theme
TL	**Teachers' ICT Literacy**
TLCA	Teachers' Culture and Attitudes of Teaching with ICT
TLPD	Professional Development
TLCC	Collegial Collaboration
PY	**Pedagogy & ICT**
PYTT	Focusing on teaching, not on the technology
PYSL	Student Centred Learning and ICT
PYCD	Classroom design and Pedagogy with ICT
PYSW	Adopting Pedagogy to the Technological World of the Students
PYIL	Pedagogy and Information Literacy
SL	**School Leadership & ICT**
SLRP	The role of the Principal in leading change with ICT
SLSL	Shared Leadership and ICT
SLMI	Managing School Information Systems
SLDP	School Development Plans and ICT

Appendix I: Copy of Ethics Approval

Australian Catholic University
Brisbane Sydney Canberra Ballarat Melbourne

ACU National

Human Research Ethics Committee

Committee Approval Form

Principal Investigator/Supervisor: Dr Annette Schneider Melbourne Campus
Co-Investigators: Melbourne Campus
Student Researcher: Kevin Sharkey Melbourne Campus

Ethics approval has been granted for the following project:
An exploration of the use of ICT to enhance teaching and learning: An action research project in a Victorian Cathloic Secondary School.

for the period: 15.06.2009 to 31.12.2011
Human Research Ethics Committee (HREC) Register Number: V2009 24

The following standard conditions as stipulated in the *National Statement on Ethical Conduct in Research Involving Humans* (2007) apply:

(i) that Principal Investigators / Supervisors provide, on the form supplied by the Human Research Ethics Committee, annual reports on matters such as:
- security of records
- compliance with approved consent procedures and documentation
- compliance with special conditions, and

(ii) that researchers report to the HREC immediately any matter that might affect the ethical acceptability of the protocol, such as:
- proposed changes to the protocol
- unforeseen circumstances or events
- adverse effects on participants

The HREC will conduct an audit each year of all projects deemed to be of more than low risk. There will also be random audits of a sample of projects considered to be of negligible risk and low risk on all campuses each year.

Within one month of the conclusion of the project, researchers are required to complete a *Final Report Form* and submit it to the local Research Services Officer.

If the project continues for more than one year, researchers are required to complete an *Annual Progress Report Form* and submit it to the local Research Services Officer within one month of the anniversary date of the ethics approval.

Signed: ..... Date: .....
(Research Services Officer, Melbourne Campus)

Appendix J: Copy of Letter of Consent for Research from Principal

9 June 2009

Mr Kevin Sharkey
82 Kennedy Street
CASTLEMAINE 3450

Dear Kevin,

Re: Research for Doctorate in Education - ACU

Thank you for your letter dated 1 June 2009 requesting approval to undertake research at [redacted]

Your proposed research project is very exciting and I can certainly see the benefits for our College in the long term. I understand this research will involve teachers and Students at Years 10-12 level and the heart of the research is based on ICT practices, pedagogy and the enhancement of teaching and learning. The period of this research is noted as October 2009 until December 2011.

I wish you all the best in your endeavours and look forward to you sharing your findings.

Yours sincerely,

[redacted]

Principal

Appendix K: Copy of Letter of Consent for Research from Director of Catholic Education Office

Catholic Education Office
Sandhurst

BENDIGO OFFICE
120 Hargreaves Street (PO Box 477)
BENDIGO CENTRAL VIC 3552
T 03 5443 2377 F 03 5441 5168

WANGARATTA OFFICE
71 Ryley Street (PO Box 1181)
WANGARATTA VIC 3677
T 03 5723 0000 F 03 5723 0033

SHEPPARTON OFFICE
c/- St Brendan's Presbytery
121 Knight Street
SHEPPARTON VIC 3630
T 03 5831 3611 F 03 5821 3077

26 October 2009

Mr Kevin Sharkey
Learning Technology Facilitator
[redacted]

Dear Kevin

Re: How can Secondary School teachers effectively use web 2.0 to enhance teaching and learning?

I am pleased to advise that, in relation to schools in the Diocese of Sandhurst, your research proposal is approved subject to the following standard conditions.

1. The decision as to whether or not research can proceed in a school rests with the Principal of that school. You will therefore need to obtain approval directly from the Principal of each school that you wish to involve.
2. You should provide each Principal with an outline of your research proposal and indicate what will be asked of the school. A copy of this letter of approval and a copy of the notification of approval from the relevant Ethics Committee should also be included.
3. No student is to participate in research study unless s/he is willing to do so and informed consent is given by a parent/guardian.
4. You should provide a list of schools which have agreed to participate in the research project to the Professional Development section of this Office.
5. Any substantive modifications to the research proposal, or additional research using the data collected, will require a further research proposal approval submission to this Office.
6. Data relating to individuals or schools is to remain confidential.
7. Since participating schools have an interest in the research findings, you should discuss with each Principal ways in which the results of the study could be made available for the benefit of the school community.
8. At the conclusion of the study a copy of the research findings should be forwarded to

   Catholic Education Office, Sandhurst

   Attn: Senior Education Officer, Human Resources

I wish you well with your research study. If you have any queries concerning this matter, please contact Rosemary Rasmussen (Tel: 5445 9902) of this Office.

Yours sincerely,

Kevin Lawlor
Senior Education Officer, Human Resources

Email: director@ceo.sand.catholic.edu.au Website: www.ceo.sand.catholic.edu.au

ABN: 94 493 967 364

Appendix L: Copy of Consent Form for Teachers Participating in Research:

Australian Catholic University Limited

ABN 15 050 192 660

Melbourne Campus (St Patrick's)

115 Victoria Parade Fitzroy VIC 3065

ACU National

CONSENT FORM: **PLEASE RETAIN THIS COPY FOR YOUR OWN RECORDS**

TITLE OF PROJECT: An exploration of the use of ICT to enhance teaching and learning.

PRINCIPAL SUPERVISOR: Dr Annette SCHNEIDER.
PRINCIPAL INVESTIGATOR: Kevin SHARKEY

I ..... *(the participant)* have read (*or, where appropriate, have had read to me)* and understood the information provided in the **INFORMATION LETTER TO PARTICIPANTS – Interview**

Any questions I have asked have been answered to my satisfaction. I agree to participate in this interview which I understand will take approximately 30-40 minutes of my time. I understand that the interview proceedings may be audio-taped or digitally recorded. I realise that I can withdraw my consent to participate at any time without comment and that such action will not affect my situation at ACU or my relationship with the researchers. I agree that research data collected for the study may be published or may be provided to other researchers in a form that does not identify me in any way.

NAME OF PARTICIPANT: .....

SIGNATURE .....

DATE .....

SIGNATURE OF PRINCIPAL INVESTIGATOR: .....

DATE:……..

Appendix L (cont): Copy of consent form for teachers' participating in research:

CONSENT FORM: **PLEASE RETURN THIS COPY TO THE PRINCIPAL INVESTIGATOR**

TITLE OF PROJECT: An exploration of the use of ICT to enhance teaching and learning.

PRINCIPAL SUPERVISOR: Dr Annette SCHNEIDER.
PRINCIPAL INVESTIGATOR: Kevin SHARKEY

I ..... *(the participant)* have read (*or, where appropriate, have had read to me)* and understood the information provided in the **INFORMATION LETTER TO PARTICIPANTS – Interview**

Any questions I have asked have been answered to my satisfaction. I agree to participate in this interview which I understand will take approximately 30-40 minutes of my time. I understand that the interview proceedings may be audio-taped or digitally recorded. I realise that I can withdraw my consent to participate at any time without comment and that such action will not affect my situation at ACU or my relationship with the researchers. I agree that research data collected for the study may be published or may be provided to other researchers in a form that does not identify me in any way.

NAME OF PARTICIPANT: .....

SIGNATURE .....

DATE .....

SIGNATURE OF PRINCIPAL INVESTIGATOR: .....

DATE:……..

Appendix M: Copy of Staff Technical Competency Survey

ICT SKILLS AUDIT

Name: Kevin Sharkey **Date:** May 17 2010

This audit is designed to determine basic skill levels of staff in relation to ICT. It will assist us in designing appropriate PD to enhance the teaching and learning at [redacted]

Alistair Shaw / Kevin Sharkey

Use this guide for your 1– 4 ratings: 1 = no experience, need training 2 = very basic skills, need training 3 = OK but some gaps, might need training or self paced study 4 = competent	Please complete the below Audit. When finished, click on the 'Submit by Email' button located on the last page.

Operate a computer	My skill level now			
	1	2	3	4
• Turn a computer on	○	○	○	◉
• Log on and off a computer, change password	○	○	○	◉
• Use the start menu to locate and open a program	○	○	○	◉
• Close all open applications. Shut down computer correctly	○	○	○	◉
• Use mouse to click, double click, select, scroll, drag and drop.	○	○	○	◉
• Use keyboard to add text and numbers.	○	○	○	◉
• Use arrow keys and special function keys: Alt, Control, Del, Esc, Shift, Tab, Print Screen, Insert, Page up, Page Down.	○	○	○	◉
• Create folders and sub-directories, rename, move folders	○	○	○	◉
• Open, rename files. Copy, cut and paste files across directories/folders. Locate files, copy to USB, delete, retrieve deleted files.	○	○	○	◉
• Print information, view progress of print job, install printer, change default printer	○	○	○	◉
• Install / Uninstall programs. Download and install program updates.	○	○	◉	○
• Insert USB and open files	○	○	○	◉

Operate a word processing application	My skill level now			
	1	2	3	4
• Open document, add, move, copy, delete text and paragraphs. Use: help function, spell check, templates, mail merge. Save document to correct folder.	○	○	◉	○
• Change font, align text and line spacing, adjust margins, modify toolbar.	○	○	◉	○
• Format document using italics, bold, underline, use document styles. Use page breaks, tabs, indents, headers & footers. Save in another format.	○	○	◉	○
• Insert tables, customise cells, insert and delete columns, rows, use borders.	○	○	○	◉
• Insert images/graphics in a word document, import, format position and resize objects,	○	○	○	◉
• Preview document, select print options and print document or part of document.	○	○	○	◉

Appendix M: Copy of Staff Technical Competency Survey (cont)

Use the internet to access and share information	My skill level now			
	1	2	3	4
• Open browser, access a particular site and retrieve data. Open a URL, obtain data, browse links. Add a website to favourites.	○	○	○	◉
• Use search engines with key words, save search results, create bookmarks, print web page and information, shut down and exit browser.	○	○	○	◉
• Create address book, add, delete, update addresses. Create address list, send mail to list. Create folders for categories of addresses.	○	○	○	◉
• Use Web 2.0 tools including forums, blogs, wikis, RSS feeds and podcasts.	○	○	◉	○

Use Outlook to communicate and as a personal management tool	My skill level now			
	1	2	3	4
• Open inbox, create new message, add/copy/delete text, add auto signature, attach files, spell check, send message. Reply to and forward messages. Open and save attachments to folders. Search/ sort/ delete/file messages.	○	○	◉	○
• Use internal email groups, email particular groups of students.	○	○	○	◉
• Create email folders. Use rules to redirect emails to specific email folders.	○	○	◉	○
• Use Calendar functions to set and share appointments and reminders, create tasks, share and overlay calendars	○	○	◉	○

Operate a spreadsheet application	My skill level now			
	1	2	3	4
• Enter text, numbers, formulas into cells. Use: sum, average, help function, search and replace, check spelling. Add, copy, delete, move columns and rows.	○	○	○	◉
• Adjust page size, modify toolbar, adjust font and alignment, adjust column width and margins, view multiple workbooks/spreadsheets.	○	○	○	◉
• Format and align text, use page breaks, tabs, indents, borders, insert headers & footers, save to another format.	○	○	◉	○
• Import objects, use and modify charts	○	○	◉	○
• Preview for printing, select options, print spreadsheet or part of spreadsheet	○	○	○	◉
• Use a spreadsheet to organise class results	○	○	○	◉

Operate a presentation package (eg. Power Point)	My skill level now			
	1	2	3	4
• Design a presentation, Add text and symbols. select, move, copy text. Use: templates, help function, formatting tools, spell check.	○	○	◉	○
• Import and modify images, tables, lists. Format text, colours. Modify slide layout, reorder, add/delete slides.	○	○	○	◉
• Add videos, sound and animation effects, slide transition effects, use onscreen navigation to start/stop and move between slides	○	○	◉	○
• Print presentation notes, add notes, format and print slides	○	○	○	◉

Appendix M: Copy of Staff Technical Competency Survey (cont)

• Design a presentation, Add text and symbols. select, move, copy text. Use: templates, help function, formatting tools, spell check.	○	○	◉	○
• Import and modify images, tables, lists. Format text, colours. Modify slide layout, reorder, add/delete slides.	○	○	○	◉

Operate Markbook	My skill level now			
	1	2	3	4
• Copy report template from the college's network, update reports to central.	○	○	○	◉
• Create, edit and use a comment bank.	○	○	○	◉
• Use keyboard shortcuts including fill down and starting new lines.	○	○	○	◉
• Use spell check and search and replace functions.	○	○	○	◉
• Back up reports on to a USB.	○	○	○	◉
• Roll reports over to a new semester	○	○	○	◉

Moodle	My skill level now			
	1	2	3	4
• Modify a course including inserting text, image and website links.	○	○	○	◉
• Set up a forum, wiki, quiz and survey.	○	○	◉	○
• Allocate tasks to a group of students within a course.	○	○	◉	○

Teaching and Learning using ICT	My skill level now			
	1	2	3	4
• Use an interactive whiteboard to select and move objects on the screen, use the pen to add annotations, save and recall sessions.	○	○	◉	○
• Operate a data projector, change laptop display settings, change input mode on data projector.	○	○	○	◉
• Adjust the sound levels, mute sound, problem solve if sound is not working correctly.	○	○	○	◉

Student Computer use Awareness	My skill level now			
	1	2	3	4
• Have processes in place in the classroom to ensure that students take care of computer hardware.	○	○	○	◉
• Established a specific set of rules are in place when my class is in a computer lab, or using laptops.	○	○	○	◉
• Check what background tasks students having running.	○	○	◉	○
• Understand what games, music, videos and internet sites students are allowed to access.	○	○	◉	○

Appendix M: Copy of Staff Technical Competency Survey (cont)

Computer First Aid	My skill level now			
	1	2	3	4
I have an understanding of what to do if:				
• The laptop or desktop computer will not turn on	○	○	◉	○
• The keyboard or mouse on a desktop computer does not work	○	○	◉	○
• I plug in a USB stick, but it does not appear in My Computer	○	○	◉	○
• A student is unable to login to a Computer on the school Network	○	○	◉	○
• A program crashes	○	○	◉	○
• I need to recover a deleted file	○	○	◉	○

Submit by Email Print Form

Appendix N: Copy of some Questions from Catholic Education Office Administered Survey

Use a variety of digital communication tools

***28.** Use email to communicate with colleagues, parents and/or students.

- Never
- Occasionally
- Regularly
- Frequently

***29.** Receive and send messages as a member of an email list, online discussion group or professional network.

- Never
- Occasionally
- Regularly
- Frequently

***30.** Participate in Internet-based calls (Skype, VoIP, videoconferencing, etc.) or Web-based conferences, presentations or "Webinars".

- Never
- Occasionally
- Regularly
- Frequently

***31.** Follow posts, messages or updates from a range of Web 2.0 sources (Facebook/Ning, Twitter, Diigo/Delicious).

- Never
- Occasionally
- Regularly
- Frequently

Appendix N: Copy of some questions from Catholic Education Office administered survey (cont)

Participate in online environments

***32.** Use an online environment as a regular part of teaching (SharePoint, myClasses, Moodle, Intranet, blog, wiki, etc.)

- Never
- Occasionally
- Regularly
- Frequently

***33.** Use social networks for communication, sharing resources, personal learning (Facebook, blogs, Twitter, Moodle, etc.).

- Never
- Occasionally
- Regularly
- Frequently

Professional Experience

The following items focus on how you might use contemporary ICT tools to support your own professional learning.

Source and use digital media

***34.** Use an online bookmarking tool like Delicious, Diigo, Evernote, etc.

- Never
- Occasionally
- Regularly
- Frequently

Appendix N: Copy of some questions from Catholic Education Office administered survey (cont)

Engage in online professional learning

***39.** Look beyond local resources like textbooks and library media to provide students with activities or materials found online.

- Never
- Occasionally
- Regularly
- Frequently

***40.** Participate in online sharing of electronic, digital or web-based resources with people outside your school.

- Never
- Occasionally
- Regularly
- Frequently

***41.** Create and post original content online for other educators to use.

- Never
- Occasionally
- Regularly
- Frequently

***42.** Participate in online courses, chats, conferences or workshops for professional learning.

- Never
- Occasionally
- Regularly
- Frequently

Appendix N: Copy of some questions from Catholic Education Office administered survey (cont)

Educational Strategies

The last set of items focus on strategies you might use to support student-use of contemporary learning tools and environments.

Facilitate students' participation in online learning

***48.** Classroom activities prompt my students to communicate with students in other parts of the world.

- Never
- Occasionally
- Regularly
- Frequently

***49.** My students participate in online collaborative projects.

- Never
- Occasionally
- Regularly
- Frequently

***50.** Students post comments to our online environment that contribute to our classroom life or learning.

- Never
- Occasionally
- Regularly
- Frequently

Develop strategies to support personalised student learning

***51.** Use critical thinking prompts to engage students in open-ended inquiries.

- Never
- Occasionally
- Regularly
- Frequently

***52.** Use mind-mapping software through a projector or interactive whiteboard.

- Never
- Occasionally
- Regularly
- Frequently

***53.** Students use an online space where they post to their own blog, add to a wiki, or participate in a group.

- Never
- Occasionally
- Regularly
- Frequently