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The role of the principal in implementing Information Technology (IT) as a learning tool in schools.

Case studies in five schools

Desmond Charles Wilsmore
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M.A.C.E.A., M.I.T.E.A.

A thesis submitted in partial fulfilment of the requirements for the degree of Doctor of Education at Charles Sturt University, Wagga Wagga, NSW.

February 2001
A VISION OF THE FUTURE

For I dipt into the future, far as human eye could see,
Saw the Vision of the world, and all the wonder that would be;
Saw the heavens fill with commerce, argosies of magic sails,
Pilots of the purple twilight, dropping down with costly bales;
Heard the heavens fill with shouting, and there rained a ghastly dew
From the nations' airy navies grappling in the central blue;
Far along the world-wide whisper of the south wind rushing warm,
With the standards of the people plunging through the thunderstorm;
Till the war-drum throbbed no longer, and the battle flags were furled
In the Parliament of man, the Federation of the world.

(...)

Knowledge comes, but wisdom lingers, and I linger on the shore,
And the individual withers, and the world is more and more.

Alfred, Lord Tennyson (1809-1892)

From Locksley Hall
DEDICATION

To Reta Jean and Richard Frank, who always showed faith and
the many students, parents, community members and educationalists
that have enriched my life, making it so enjoyable and rewarding.
ACKNOWLEDGEMENTS

This thesis would have not been possible without the good graces, help and assistance of many people. I would like to acknowledge their kind and unstinting help here. First to the many principals, staff and students of the thirty schools I visited and especially the case study schools. This study could not have occurred without you.

Second, my family who tolerated my many absences and missed their husband and father, even at home, for four years. I can never repay you. A special thanks to my father, who took the time to proofread all my work. Third, my friends in schools and universities, especially David, Patto and my friend and brother Gary. I learnt a lot. And Lisa, who in the early stages supported my efforts and gave of her time and knowledge so willingly. Many thanks to the lecturers and staff at Wollongong and Charles Sturt Universities who gave so unstintingly of their time.

Finally, to my supervisor, Mark McFadden who has guided his apprentice slowly and surely along the path of academic understanding. Your patience and meticulous eye for detail has been responsible for the completion of a more cohesive and academically intelligible thesis.
Key to transcripts

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Material edited out

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Transcription from different section of the interview or from different interview follows

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</tr>
</thead>
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<tr>
<td>ABS</td>
<td>Australian Bureau of Statistics</td>
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<td>APAPDC</td>
<td>Australian Principals’ Association Professional Development Committee</td>
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<tr>
<td>DEETYA</td>
<td>Department of Employment, Education, Training And Youth Affairs</td>
</tr>
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<td>EdNA</td>
<td>Education Network Australia</td>
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<td>IT</td>
<td>Information Technology</td>
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<td>K-6</td>
<td>Kindergarten to Year 6</td>
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<td>Kindergarten to Year 12</td>
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<td>7-12</td>
<td>Year 7 to Year 12</td>
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<td>NSWDET</td>
<td>NSW Department of Education and Training</td>
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<td>NSWDSE</td>
<td>NSW Department of School Education</td>
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<tr>
<td>PD/H/PE</td>
<td>Personal Development/Health/Physical Education</td>
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<td>RFF</td>
<td>Relief from Face to Face [teacher]</td>
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<td>TAFE</td>
<td>Technical And Further Education</td>
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<td>TILT</td>
<td>Technology In Learning and Teaching</td>
</tr>
</tbody>
</table>
ABSTRACT

The use of Information Technology (IT) in the wider society has exploded in the past five years in most parts of the world. In New South Wales (NSW), Australia, significant resources both physical and human have been allocated to most schools. This thesis examines the pivotal leadership role of the principal in the successful implementation of IT in schools as a teaching/learning tool. This also involves examining changing pedagogies and structures within case study schools.

A case study approach was used in the research to examine practices in five 'beacon' schools. These schools were selected first on the basis of their apparent success in introducing IT, second, to ascertain if there were certain discernible factors that principals in these schools displayed or paradigms they utilised to ensure the successful introduction and use of IT as a learning tool by students. A range of schools reflecting size, isolation and structures in rural NSW were selected for the study.

The literature suggests that any successful educational innovation in schools relies to a large extent on the leadership role of the principal, particularly in the areas of modelling, resourcing, professional development, planning, knowledge and collaboration. These among other key aspects were examined in the study.

The findings suggest that all of the above were prerequisites for the successful implementation of IT as a learning tool. The study showed that no single factor was an entity in itself. Some principals were gifted in their knowledge and understanding of IT but this in itself did not ensure success, nor did the availability of hardware or software. The keys to success were:

1. Availability of adequate and continuing professional development for staff;
2. The ability of the principal to establish and lead effective learning communities;
3. Changing of old structures and pedagogies; and
4. Principals overcoming their own technophobia and that of many of their teaching staff.

Although schools were selected as 'beacon' schools, not all schools were seen to be highly effective at utilising IT as a learning tool. They were on a continuum from little effective use to exceptional use. Even though other key staff played important roles in the introduction and support of IT as a learning tool in the case study schools, the leadership role of the principal was crucial.
PUBLICATIONS AND PAPERS EMANATING
FROM Ed.D. RESEARCH


TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acknowledgements</td>
<td>v</td>
</tr>
<tr>
<td>Key to transcripts</td>
<td>vi</td>
</tr>
<tr>
<td>Acronyms</td>
<td>vii</td>
</tr>
<tr>
<td>Abstract</td>
<td>viii</td>
</tr>
<tr>
<td>Publications and papers emanating from Ed.D. research</td>
<td>ix</td>
</tr>
<tr>
<td>Table of Contents</td>
<td>x</td>
</tr>
<tr>
<td>List of Tables</td>
<td>xiii</td>
</tr>
<tr>
<td>List of Figures</td>
<td>xiv</td>
</tr>
<tr>
<td>List of Comparative Extracts</td>
<td>xiv</td>
</tr>
</tbody>
</table>

CHAPTER 1    INTRODUCTION

Outline                                                              | 1    |
Genesis of the research and biography of the researcher               | 1    |
Purpose of the study                                                  | 6    |
Significance of the study                                             | 7    |
Research questions                                                    | 8    |
Limitations of the study                                              | 8    |
Framework of the thesis                                               | 10   |
Conclusion                                                            | 10   |
Summary                                                               | 11   |

CHAPTER 2    CONTEXT OF THE STUDY

Outline                                                               | 12   |
Introduction                                                          | 13   |
Education and change                                                  | 15   |
Devolution in NSW schools                                             | 21   |
The development and use of IT in the wider community  26
Education policy and IT  28
Rural NSW and the case study schools  29
Conclusion  31
Summary  32

CHAPTER 3   REVIEW OF THE LITERATURE

Outline  33
Introduction  33
Leadership  37
Innovation and change-management  40
The use of IT as a learning tool in schools  42
The role of the principal in implementing IT as a learning tool  52
The barriers to the professional development of teachers  61
Learning communities  63
Teaching/learning and new pedagogies and structures in schools  65
Implications  76
Conclusion  78
Summary  79

CHAPTER 4   METHODOLOGICAL CONSIDERATIONS

Outline  80
Introduction  80
The study  81
Data collection  92
Data analysis  98
Conclusion  100
Summary  101
CHAPTER 5    THE CASE STUDY SCHOOLS

Outline 102
Introduction 102
Merino Central School 104
Explorer Public School 108
Vineyard Public School 112
River Valley Public School 116
Rural High School 120
Conclusion 123
Summary 124

CHAPTER 6    THEMES AND ISSUES

Outline 125
Introduction 125
Leadership 127
Learning communities 140
Teaching and Learning 153
School structures & NSWDET policies 163
Conclusion 167
Summary 168

CHAPTER 7    CONCLUSIONS AND RECOMMENDATIONS

Outline 169
Introduction 169
The Research Questions 171
Theoretical implications 175
Methodological implications 175
Further research issues 176
Recommendations 176
Conclusions 178
Summary 181

BIBLIOGRAPHY 182

APPENDICES

Appendix A  Staff survey  210
Appendix B  Student survey  214
Appendix C  Survey results  217
Appendix D  Interview questions  222
Appendix E  Principal interviews  223
Appendix F  Newspaper report on IT (K.Parsons)  240
Appendix G  IT in Education – presentation  241
Appendix H  School visitations  249
Appendix I  Student portfolio (River Valley Public)  250
Appendix J  Table of categories  251
Appendix K  Scope and sequence  252

LIST OF TABLES

Table 3.1  Educational leadership  39
Table 3.2  Change-management  41
Table 3.3  ACOT - Teaching and learning  47
Table 3.4  Key processes in team learning  67
Table 3.5  Using computers as a learning tool  73
Table 4.1  The Grounded Theorist  87
Table 4.2  The use of IT  88
Table 6.1  Knowledge, modeling, facilitating use of IT  116
Table 6.2  Leadership style  120
Table 6.3  Innovation – introduction and support  127

LIST OF FIGURES

Figure 4.1  Role of the principal in implementing IT  82
Figure 4.2  Triangulation and validation  100
Figure 6.1  Leadership  140
Figure 6.2  Teaching and learning  162
Figure 7.1  The principal and IT  180

List of Comparative Extracts

Comparative extract 6.1  Modeling  129
Comparative extract 6.2  Modeling  130
Comparative extract 6.3  Facilitating the use of IT  131
Comparative extract 6.4  Enabling others  145
CHAPTER 1

INTRODUCTION

Case studies are 'a step to action'. They begin in a world of action and contribute to it. Their insights may be directly interpreted and put to use; for staff or individual self-development; for within institutional feedback; for formative evaluation; and in educational policy making (Adelman 1980, cited in Cohen and Manion 1989, p.146).

Outline

This thesis focuses on the implementation of Information Technology (IT) as a learning tool in schools and the role of the principal in this implementation. It describes how five ‘beacon’ schools implemented IT and why they were successful to a greater or lesser extent. This chapter outlines the genesis of the research, the biography of the researcher, the purpose, significance and limitations of the study. It then states the research questions and gives the framework of the study.

Genesis of the research and biography of the researcher

When I started school fifty years ago, radio and newspapers were our contacts with the outside world. In my latter secondary years TVs were just making their presence felt in black and white with many breakdowns, rolling screens and fuzzy pictures. Technology was about listening to recordings of Shakespeare in schools or something that existed in the business or scientific world outside the classroom. Many schools were based on chalk/talk and memorisation.

In the late 1960s when Neil Armstrong stepped onto the moon it seemed as though he had truly taken one giant leap for mankind in the context of the new
technologies. The computer technology that allowed him to walk on the moon in the 1960s was first seen in the scientific world, then the business world of the 1980s and only very recently in schools. Schools, in a technological sense, in the early 1990s seemed to be little changed from the days of ‘John Brown’s Schooldays’

It was my early belief that there must be more to education than copying notes, reading and memorising facts. In fact I was fortunate to have been taught over the years by some innovative teachers who made our lessons live. These few teachers kept my love for learning burning through my formative years.

Moving from a country school as a student to a country teachers’ college I was one of the two year trained junior secondary teachers sent out in the early sixties to meet the enormous growth in student numbers in Australia. My first school was a large boys' high school on the North Shore in Sydney, NSW. Initially I taught Science, English and Mathematics to years 7-10, then, in the late sixties, Physical Education and Health to years 7-12. I became sportsmaster of this school and became actively involved in the life of the school for many years. I introduced many innovations into the sporting life of the school, local community and to the teaching of Physical Education and Health. During this time I held many executive positions in sporting organisations including National Secretary of the Australian Secondary Schools’ Water Polo Association and also coached the Australian Schoolboys’ team. I travelled widely both as a result of my involvement in sport and my interest in seeing new countries and their educational institutions. I visited most Australian states, New Zealand, England, Scotland, France, Belgium, Holland, Denmark and Sweden.

This period of teaching and travel was followed by executive appointments in various parts of the state teaching Personal Development/Health/Physical Education (PD/H/PE), then Science and Agricultural Science, chasing promotion

---

1 At ‘Rugby’ school in England in the C19.
and completing university degrees\textsuperscript{2}. I always believed that I had a broader vision of teaching than many of my colleagues and went to great pains to ensure that my students were motivated and that new methods and structures enhanced my students' learning.

My interest in the theories associated with teaching and learning increased as a head teacher in several schools and as a Leading Teacher [Deputy Principal] prior to becoming a principal. I was just as happy to learn new teaching strategies from a beginning teacher as a university professor. It is my belief that students deserve the best chances in education and improving teaching practice is the key to improved outcomes for the students. As a principal I was determined to leave no stone unturned in this pursuit.

On the home front my family and I established a merino sheep stud and enjoyed farm life as well as schooling, sport and study. A Commonwealth Schools' Commission Scholarship to South Australia and attendance at numerous seminars helped to broaden my outlook on schooling. Many of the innovations that came as a result of these opportunities I integrated into the schools at which I was working.

My wife became an expert typist, typing my many university assignments until I took over the task on a relatively primitive Apple 11E computer [followed by an IBM clone] in the late 1980s to complete my Master's Degree in Educational Administration through Deakin University. Professor Richard Bates, one of my lecturers, had a profound effect on my educational thinking at this time and challenged many of my previously held opinions on education. One of the key elements he challenged was that schooling was free from economic, cultural and political pressures and served to alleviate many of the social injustices of the past and present.

\textsuperscript{2} And several TAFE courses related to agriculture.
I learnt much from my travels, studies, colleagues and students. I tried to make my lessons interesting and stimulating and was always trying to build on my skills to improve the outcomes for my students. The tragedy was that as I became more skilled at teaching I taught less and less. By the time I became principal of a lovely central school in 1996 I was searching for better and different ways to improve my teachers' teaching practice to enhance student learning for all. My wide experience in many educational settings and my academic studies\(^3\) assisted in this. At the time I felt that the emerging educational technologies might offer new and perhaps better teaching and learning strategies for staff and students. I believed a rethink of pedagogical approaches and school structures might also be beneficial.

A good friend of mine became the technology adviser for my school district and we had many interesting discussions over coffee on the use of Information Technology [hereinafter IT] as a learning tool. At about the same time (1996) I attended a seminar\(^4\) in Sydney on the use of IT in schools where the keynote speaker was Gerry Smith, Principal of River Oaks (Ontario), a K-8 school in Canada. As I sat and listened to him speak and saw his brilliant 'PowerPoint' presentation to principals, academics and computer co-ordinators on the use of IT as a learning tool in schools it made me re-examine my role as a principal and what we were doing with IT in my school.

At this time I was principal of a K-12 Central School of approximately two hundred and fifty students in the eastern section of the Dubbo District of the NSW Department of School Education. The school had a very strong academic and sporting culture but I felt that much of the teaching, particularly in the secondary area, was not conducive to encouraging students to reach their full potential academically or prepare them for life outside school, particularly as we approached the twenty first century.

\(^3\) I had completed a Dip. Tch. in 1983, a B.Ed. in School Leadership in 1985 and a M.Ed. Admin. in 1990.

\(^4\) 'Curriculum for the Third Millennium'.
The school had established a computer laboratory\(^5\) in the secondary area, the library had access to the Internet, but the Internet was only used by the librarian. There were no computers in any staff room or my office. In the public/infants area there were old Apple 11E computers in each classroom with a four-year-old IBM compatible computer. A survey showed these were mainly used for games and word processing\(^6\). Most staff had very limited knowledge about how to utilise technology as a learning tool. The staff was, however, very dedicated and looking for new ways to improve teaching practice. At this time, the NSW government was introducing IT into schools through a 'rollout' of computers, limited training for some teachers and connection of all schools to the Internet.

Talking to my fellow principals at conferences and visiting a variety of schools I began to realise that there were vast differences in the ways that schools were introducing and utilising IT. Many principals appeared to be ill prepared for its sudden introduction. At this time I was beginning my doctoral studies and as part of this had conducted a pilot study in two rural high schools examining the role of the principal in the introduction and support of IT as a learning tool. With considerable help from my technology adviser friend and a heightened interest from the introduction of IT as a learning tool in my own school, the dye was cast.

It was my belief that IT could make a difference in many schools if only principals could successfully take it on board. The direction of my thesis was decided. I wanted to find out how principals were implementing IT as a learning tool in their schools and why some schools seemed to be using the technology more effectively than others. The focus would be on the role of the principal. A case study approach appeared to be the best way to answer these questions.

\(^5\) Used only for Computing Studies and Design and Technology.
\(^6\) But not on a regular basis.
Purpose of the study

When I started this research there were few books on using computers in schools and fewer magazines on the use of computers. There was virtually nothing on how principals should go about introducing or supporting the greatest innovation available to schools in the last decade (and perhaps even this century). A search of the ‘Eric database’\textsuperscript{7} in mid 1997 located only six relevant journal articles. As the Internet took off and computers were placed in ever-increasing numbers into schools the information regarding the use of computers and related technologies also exploded. But there was still little useful information to assist principals with the difficult task of implementing technology to aid learning in schools. Some principals threw up their hands and handed over the task to other school members, some ignored it, some led the way, and still others wanted to do it in the best possible way but lacked direction. There had, however, been a great deal written in educational books and journals on the theoretical aspects of leadership and change, on teaching and learning and a multitude of other educational issues. Except for the work of Schiller (1997) and the Australian Principals Association Professional Development Committee (APAPDC) there was little that principals could use to guide them with the introduction and support of IT in their schools.

This research is an attempt to help provide the kind of advice that principals need to implement IT as an effective learning tool. It describes how principals in some ‘beacon’ schools ensured the effective implementation of IT as a learning tool in their schools. This study examines the practices of principals, staff and students working in five very different schools in country NSW. Its focus is on the role of the principal in implementing IT and why these schools were considered successful in the use of IT in the classroom. It attempts to gauge the influence that the various principals had on the successful implementation of IT. As principals do not exist in schools in a vacuum related questions as to the positive

\footnote{An educational database set up by Syracuse University via the Internet.}
factors that assisted and the barriers to the successful implementation of IT and other relevant themes were also examined.

Significance of the study

This research has the principal as its prime focus while necessarily looking at the use of IT as a learning tool in schools, and as a consequence its use in the classroom by individual teachers. It poses the question, how significant is the principal in the implementation of IT? It also asks how and why is the leadership role of the principal in the introduction and support of this innovation more or less significant than in other innovations.

The research is significant for a number of reasons. First, very little has been written about this issue and as such, this research is very timely. As a consequence the study has the chance to influence positively the future introduction and support of IT by principals and to give them some key indicators of what is essential practice to gain the maximum benefits for their students and the school community. Second, this is a qualitative series of in-depth case studies that try to unlock the minds, processes, structures and beliefs of school communities to see why they appear to be successful in the introduction and support of IT as a learning tool. While it is, of course, sometimes difficult and problematic to generalise from case study research, it is hoped that significant factors will emerge that will speak to the experience of other school communities as they struggle to implement IT in their schools.

Finally, significant resources\(^8\) have been poured into NSW schools over the past three years in the area of IT. The community and students should receive value for these resources. It is also my belief that IT's successful use as a learning tool has the potential to enhance current teaching practice and therefore impact

\(^8\) 77,000 computers; training for 15,000 teachers; connection of all schools to the Internet; curriculum documents for all KLA's and a variety of other initiatives.
positively on life opportunities for many students. As Maddux, LaMont Johnson and Willis (1997, p.1) so neatly put it:

...many past innovations in education have failed partly because advocates have ignored what is known about change and how it is facilitated or hampered by events from inside and outside the education subculture.

It would be a shame if innovation in IT failed because we did not fully realise the significant implications its successful implementation has for leadership, change management, how students learn and the context in which the use of IT in schools is taking place.

Research questions

The main research question that this study seeks to answer is:

What is the role of the principal in implementing Information Technology (IT) as a learning tool in schools?

When examining this question the following sub-questions are also of significance.

- What factors positively influence the implementation of IT as a learning tool in schools?
- What are the barriers to the implementation of IT as a learning tool in schools?
- How is IT currently used as a learning tool in schools?

Limitations of the study

Case studies are of greatest relevance to the particular sites under consideration but because of their nature, cannot always be used to forecast what might be
appropriate on a more general basis. It has been suggested by Sturman (1997, p.63), that 'certain multisite case studies, properly conducted, can be used for prediction in similar sites'. This view is supported by Parsons (1976, p.133) who further suggests that, 'If one understands, one can attempt prediction and hopefully plan better for the future'. Whilst not wishing to argue the case in relation to the predictability or otherwise of the findings here it is hoped that this research might lead to a better understanding in other schools of similar questions. By only utilising five schools the study suffers to some extent from a lack of breadth. This in no small way has been made up by the depth of the study at each of the sites. In fact it will be seen that schools that were initially seen as 'beacon' schools by the Technology Adviser and myself, on closer examination, were found to be on a continuum from extensive use of IT as a learning tool by all staff to isolated use by some staff within the school. These staff were using IT extensively in their teaching. While generalisations cannot be made from this type of research, as most are case specific, certain key factors will emerge that may have applicability to other school contexts.

Another limiting factor has been the decision to study only schools in rural NSW. The researcher has, however, visited several sites in the Sydney metropolitan area and the choice of the five schools was made after a pilot study where two large rural secondary schools were also visited. Preliminary visits to another twenty schools (of varying sizes and locations) were also undertaken to ensure the broadest possible picture and access to the best available examples of IT implementation. A broader perspective has also been possible through attendance at a variety of international, national and state conferences to speak with principals from a range of backgrounds and at a variety of stages of implementation of IT in their schools.

9 The selection of the five case study schools was aided by a technology adviser who had visited all 59 schools in the District while assisting with the implementation of IT.

10 Including a fascinating discussion with a principal from Uganda who said that 90% of their schools had no computers but that they were trying to work on teacher training to ensure that when they did become available they would be used in the best possible way.
Finally, the research is limited in that its design focuses mainly on the use of interviews, observations and the study of a variety of relevant documents. Surveys have played an important part in the research methodology but there has been no attempt to survey large numbers of teachers or students and to interpret those findings either qualitatively or quantitatively in any great detail. Where surveys were conducted, a descriptive analysis of the survey results has been integrated into the results and conclusions. Further research using a more quantitative approach is thus needed in the future. Additionally, no attempt has been made to closely examine what is effective use of IT as a learning tool. The focus has remained on the principal and the principal's role in effective implementation of IT.

Framework of the thesis

This chapter introduces the issues and details the research questions the thesis seeks to answer. The following chapter examines the context of the study while chapter 3 reviews the literature. The methodological considerations are detailed in chapter 4 and the case study schools and the background of principals involved in the study are described in chapter 5.

Chapter 6 details the results of the study and describes and discusses in detail the themes and issues arising from the research. Chapter 7 discusses the implications of the results of the research for theory and practice, giving some recommendations for the future including possible areas for further research and drawing some tentative conclusions in relation to the research questions posed.

Conclusion

This study hopes to provide a basis for better understanding the skills principals need and the approaches that are most beneficial in implementing IT as a
learning tool in schools. It is also hoped that this study may bring about a re-
examination of the way that modern technologies are currently utilised in schools
and therefore the ways that teachers actually teach in the classroom. Hopefully,
we may see the teacher more as a facilitator of student learning than a fountain of
knowledge that is dispensed to the students.

The obvious conclusion for principals might be that using IT as a learning tool
could assist them and their school communities in the educative process if they
approach its introduction and support it in a meaningful way.

As Maddux, Johnson and Willis (1997, p.2) suggest:

... computers have the potential to revolutionise teaching and
learning... but ... the computer is a tool, and, like any tool, it can be
poorly used or misused.

The challenge is to use IT and other relevant technologies wisely, appropriately
and effectively.

Summary

This chapter outlined the thesis, gave the genesis of the research, biography of
the researcher and examined the purpose and significance of the study, stated the
research questions and the limitations of the study. The chapter finished by
describing the framework of the thesis.

The following chapter examines the context in which IT is being used in
Australia, especially as it relates to schools and the implications of that context
for the research described in this thesis.
CHAPTER 2

CONTEXT OF THE STUDY

... it is impossible to understand teaching unless one appreciates the historical, social and cultural influences that shape it and the social and cultural context in which it is located. (Hatton 1998, p.425)

Outline

The previous chapter outlined the thesis, gave the genesis of the research and the biography of the researcher, dealt with the significance, limitations and purpose of the research and stated the framework of the research and the research questions. This chapter will concentrate on the context of the research. It will examine education policy in the broader sense in Australia (and to a lesser extent in New Zealand and other countries) over the past decade with a focus on the NSW government system where the case study schools are situated. In particular, the chapter will examine the recent devolution of authority to school communities in the areas of management, finance, curriculum and other relevant areas. The chapter will then examine the growth of computer related technologies in the wider Australian community and overseas leading to a survey of education policy in relation to Information Technology (IT). This broad policy analysis will be followed by an examination of IT policy in the NSW Department of Education and Training (NSWDET). Finally the chapter will clarify the institutional and educational context of IT in schools in rural NSW and describe briefly the schools involved in the case studies.
Introduction

Education has always been important to Australians and public education has had a prominent role in the education debate for over a century. Changes in education do not occur in isolation from other shifts in society, they are part of rapid technological and other changes taking place in most walks of life. The extent of these changes in IT in the past ten years is reflected in an excerpt from a feature article by Benson in the ‘Daily Telegraph’ (Saturday, July 17, 1999, p.11).

Professor Clark and his team at the Semi-Conductor Nano-fabrication Unit have made a major breakthrough in the development of a quantum computer that in fact will be able to store data on a single phosphorous atom. It will be the tiniest computer around and it will be 100 million times faster than even the world’s fastest supercomputers.

Educational change has been a continuing process over the past few decades. The historical, economic and political contexts are seen to be important, as it will be argued that these impinge on change in education. In particular, they are significant in relation to the introduction of IT in schools and the leadership role of the principal.

If, as the NSW Minister for Education, John Aquilina (1999, p.3) suggests, ‘teaching and learning has changed forever’ as a result of the new technologies adopted in schools and the wider community then the role of the principal would appear crucial to their implementation. If this is coupled with a statement made by the Director General of Education in NSW (Boston 1995)\(^1\) where he suggested that: ‘The rhetoric about self-managing schools is dead and buried. It is now a reality’, then aspects of school leadership in the context of devolution takes on an even stronger perspective.

\(^1\) In a paper delivered to new NSW DSE District Superintendents of schools in Sydney, Nov., 1995.)
If Boston is correct, then principals are responsible for the organisation and management of their schools and consequently, it is their responsibility to ensure the successful introduction and support of IT in their schools. Aquilina (1998) shared this view. To what extent the self-management associated with Boston’s pronouncement has occurred is therefore very important to this study.

The argument advanced here is that while the implementation of IT in schools has been going on, schools have been dealing with shifts and changes in management, staffing, professional development and curriculum. Of significance is devolution in the area of curriculum. A democratic curriculum would involve student access to the best uses of IT as a learning tool and consequent advantage in more equal opportunities for learning and less chance of the curriculum being seen as a tool for social reproduction. This general view is supported by Hackbarth (1997) who suggests that curriculum must change to support the new technologies. Smith (1999a) also contends that without the ability to radically change curriculum structures at 'River Oaks' that very little real use could have been made of the emerging technologies. A closed curriculum may mean a continuation of an academic curriculum targeting a select range of students. These views on social reproduction and equal opportunity in regard to curriculum offerings are shared by Porter (1991) and Laird, Grundy, Maxwell and Warhurst (1998).

The development and use of IT in the wider community has also arguably had a significant influence on the timing and importance of the implementation of IT in schools. This development and use, coupled with changes in education policy surrounding the introduction of IT have all influenced principals and the case study schools in a variety of ways that will be further examined.

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2 River Oaks is the school in Canada where Smith was principal.
3 One that is negotiated only at State level and viewed by some as not subject to aspects of equity and social justice.
Education and change

The Australian and New Zealand Education systems are influenced by a worldwide trend of change in education and education policies. France, England, Canada and the USA are also feeling the winds of change. This view is supported by Beare and Lowe Boyd (1993, p.137) who contend that 'school restructuring is an international trend'. The argument posited here is that the implementation of IT is occurring at a time of changing economic, political and educational contexts. These are reflected in a move to give increased autonomy to schools and school leaders in some areas while tightening central control in others, particularly that of accountability and curriculum.


In 1988 the Picot Taskforce ("TOMORROWS SCHOOLS") recommended the radical devolution of power, resources, and responsibilities to education institutions and local communities.

The end result of the associated reforms saw the following occur:

1) The number of staff at the 'centre', that is, head office, fell dramatically\(^4\). [This idea of the 'centre' is similar to the old NSW system where a head office (centre) in the capital city had control over most educational decision-making.] This meant that, theoretically, there were fewer staff involved in decision-making processes at the centre and thus more decisions were made at the school level.

\(^4\) This is similar to NSW where a drop of 57% has occurred in the past four years. (ABS 1999)
2) Ten Education Boards were scrapped.
3) Other educational agencies were scaled down.
4) Principals were put on contract.
5) School Boards were set up to oversee policy and resource management in individual schools.

Caldwell (1990), at this time, also suggested that more than 90 per cent of the costs of running schools would be devolved to schools and staff would be selected and employed by the school board. He further argued that school boards were to be biased in favour of community representatives as opposed to teachers. There was still, however, a national curriculum framework in New Zealand and, as in NSW, there were some staff still employed at the systems level to monitor school operations, both budgetary and educational (Caldwell 1990). There was also limited support for special programs. New Zealand schools always had some degree of autonomy that in most cases was greater than Australian Public Schools.

Wylie (1994), asserted that increased autonomy was attractive to many principals and trustees because of quicker decision-making and better ability to target areas of need, for example, the purchase of computers, but this has come at a price. The price is in increased workloads and stress and the feeling by many principals that their extra efforts have had little effect on teaching and learning (Bennett 1994). Bennett further argues that the resource gap between schools serving various socio-economic groups also appears to have widened. The degree of success of these New Zealand educational experiments is yet to be fully assessed even a decade later. What we can say is that principals appear to have become more accountable through performance contracts, curriculum has been retained at the centre and school communities, not just principals, had increased autonomy.
The Australian education system has also undergone radical changes in the past ten years. This has led to the decentralisation/centralisation conundrum. Burrow (1995, cited in Marginson 1997, p.5) contends that:

*Devolution; in this context (i.e. transition to market-based schooling) is not drawn from the democratic tradition. Rather it is constructed such that political responsibility for funding, staffing and therefore system-wide equity can be abandoned.*

Rizvi (1994) further suggests that the idea of devolution has been widely accepted in education in Australia. He also contends that it is less clear whether these changes, that is, increased devolution to schools, will lead to educational reform but that it may have sociological implications on the grounds of equity. This idea of equity is not central to our argument but recent studies suggest that rural schools in Australia have issues of equity that need to be addressed. Sidoti (2000, p.3) suggested that, on the available evidence, ‘rural and remote children are generally disadvantaged in comparison with their urban counterparts’. He went on to argue that this was often reflected in poorer performance by many students. Many suffer the dual problems of ineffective teaching/learning and isolation from real life learning experiences. The question of equity may be seen to be significant if it is discovered that the use of appropriate technologies and strategies to assist student learning in fact do assist the learning chances of these rural children. An examination of educational change in Australia over the past ten years may clarify some of these arguments in regard to autonomy, equity and rural disadvantage. Let us begin in the early 1990s with the state of Victoria and the issue of devolved decision-making.

Educational change in Victoria accelerated in the early 1990s. The ‘Schools of the Future’ document followed Kennett’s removal of 4,500 teacher jobs in 1992. Kronemann (1994) suggests that the stated object of the document was to improve the quality of education by increasing school level decision-making.
Outside the rhetoric it appeared to be an attempt to move the focus of decision making on hard budgetary considerations down to the school level and out of the political arena and to save money in a period of economic restraint for Victoria. He further argued that Victorian schools were also ironically facing increasing levels of centralised control. An example of this is the Education Bill of 1994 that allowed the minister to issue guidelines to School Councils on the performance of their duties by empowering the Director of Schools to undertake effectiveness and efficiency audits. This change relates to the area of increased accountability that we previously noted in New Zealand reforms under Picot.

Other states at this time paint a similar picture. In South Australia, the 1991 Education Department submission to the Government Agencies Review Group clearly showed it wanted to cut key administrative functions and support services and devolve a greater part of the planning, administration and management to schools (Martin, McCollow, McFarlane, McMburdo, Graham & Hull 1994). Tasmania had its ‘CRESAP Review’ and Western Australia its 1991 ‘Memorandum of Agreement’. These were similarly aimed at increased autonomy for school communities whilst increasing accountability and centralising control of areas such as curriculum. What is significant from the point of view of this study is that all of these changes tended to add to the responsibilities of principals at a time when the implementation of IT was about to commence.

The Commonwealth government has also had a part to play in the changes in education as we have seen funding increasingly tied to performance in the areas of literacy and numeracy, and cutbacks to government school funding as the drift to private education gains momentum. These changes have been widely reported in the press for the last several years and are part of a continuing political and educational agenda of recent national governments. As we can now see there is
little apparent evidence to support attempts at greater equity or overcoming rural disadvantage in education (Sidoti 2000).

Whitty, Power and Halpin (1998, p.1) also contend that:

...at the same time as appearing to devolve power to individual schools and parents, governments have actually been increasing their own capacity to 'steer' the system at a distance.

At this stage no attempt will be made to analyse fully the conundrum of the decentralisation/centralisation issues or the economic and political reasons behind the devolution agenda. These will be covered in more detail when describing the NSW policy context below. Suffice it to say that it is a widely held view that economic rationalism is the dominant ideology that influences the present political process in a fashion previously not recognised in educational circles (Marginson 1997). Bates (1985), Chapman (1990) and Whitty, Power and Halpin (1998) concur with this view. The effects of this dominant ideology will now be dealt with by briefly examining the NSW experience.

There have been a number of attempts to develop autonomous schools in NSW. Some of this motivation came from people such as Caldwell and Spinks' (1988, p.vii) concept of the self-managing school. They defined it as one for which:

...there has been significant and consistent delegation to the school level of authority to make decisions related to the allocation of resources (knowledge, technology, power, material, people, time and finance) ...the school remains accountable to a central authority for the manner in which resources are allocated.

Fairservice (1994) argued that in 1989 NSW government schools (following the Scott Report of 1988) were given a large amount of responsibility for financial management of recurrent expenditure and savings were to be passed on to the
individual schools. In practice, the savings (after the first year) were returned to the central authority. A large amount of funds as well as human resources in the form of advisers and bureaucrats were also retained at the Regional level. He contended that merit selection of school staff allowed local school communities a say in the selection of some staff. Principals received minimal training in their new responsibilities but were now accountable for a huge array of areas, many of little educational importance. This belied the role that was suggested by Caldwell and Spinks (1988, p.54) wherein they stated: ‘...the Head Teacher (principal) can exercise his or her role as an educational leader in the school’.

It would seem that the devolution that started in the late 1980s was about moving power to local communities in the belief that it would make education more effective and efficient (Meyenn & Parker 1993). It appeared to some that we were back to the early 1900s in the United States (Callahan 1962) where principals were concerned with the plumbing, electricity and cleaning of schools and where the wholesale adoption of the values and techniques of the business world became the norm.

At the same time there was a huge push for School Councils in all schools. Currently over 70% of government schools have School Councils with the principal theoretically accountable to these for policy matters and budgeting. Once again questions of equity and rural disadvantage appear not to have been addressed (Sidoti 2000).

The previous discussion begs the question about what is actually happening now in NSW government schools. We are particularly concerned in the following section with devolution as it is contended that this impinges on the ability of principals to successfully implement IT as an effective learning tool.

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5 There were 10 Regional Areas but after restructuring there are now 40 Districts.
Devolution in NSW schools

According to Cavenagh (1995, p.8)

*Devolution is a term used to describe a form of decentralisation typified by the restructuring of education in Australia and New Zealand in the 1980s and 1990s. Decentralisation in its purest form requires transference of authority from a centralised political or administrative group to other groups lower in the organisational hierarchy. In an educational system, authority is transferred to Districts or individual schools. The shift is made by moving resources and decision-making responsibility away from the centre. In reality this process is rarely absolute.*

While agreeing in broad terms with the definition it could be argued that very little real control in the important areas of curriculum and staffing has been devolved to the schools. Instead, limited financial control and accountability have been foisted on schools (Sturman 1989) without real thought for educational value. It has been suggested (Collins 1999) that the devolution has more to do with economic rationalism and political accountability than educational benefit.

According to Harold (1989) the idea of devolution grew out of the economic problems of the seventies where ‘program budgeting’ had its origin. The idea was to rationalise the top-heavy structure of businesses and bureaucracies and utilise best business practice to improve efficiency and accountability. It is contended here that much of what has occurred in NSW, as Boston (1995) admits has an economic and political base. It is about cutting costs (economic) and removing accountability to the base level (the school) and away from the Centre.
Harrison (1996) also contends that principals have little autonomy in government schools over the selection of staff and claims that autonomy in these areas is vital for good teaching and effective education.

It could be further argued (Chubb & Moe 1992, p.9) that:

...all the crucial decisions about organisation and governance must be placed in the hands of schools. They must be truly autonomous. For this to happen, and for it to be real and enduring, the authority to control schools from above must be eliminated as far as possible. Any authority that remains will inevitably become a magnet for political pressure, and it will eventually be used to reassert control when the schools exercise their autonomy in ways that powerful political interests do not like.

This supposed devolution has been influenced by many factors. Politics and economics are but two of these.

As Cavenagh (1994, p.45) states:

Central policy construction is as powerful as ever. The schools, which always had much more capacity to be independent than they ever cared to admit, have more legislated room to move. But the price in workload is high, and this will take its toll. The other local processes are weakening rather than strengthening, and until the system rids itself of its major barrier to genuine devolution - the regions - devolution might continue to be a fizzer in New South Wales.

This devolution is now theoretically complete with the political decision that saw the demise of the regions and the establishment of forty education districts in late 1996. A careful analysis might suggest that this devolution is only complete in the areas of accountability and fiscal responsibility for global budgets (Caldwell 1997). Certainly recent statistics released by the Council on the Cost of Government (NSW) suggest that the number of senior officers in the NSW Department of Education and Training (DET) has dropped by 57%.

7 Quoted in ‘School Education - Service Efforts and Accomplishments. 1997’.
In more recent times it has been widely reported that NSW government schools have had more centralised accountability imposed on them in the form of Annual School Reports and a plethora of centre based initiatives, for example, Child Protection, Fair Discipline Codes, Technology in Schools policies. These suggest that the devolution of some areas of education policy have often been balanced by central control over other issues.

It is opportune to examine the areas of finance, staffing and curriculum in a little more detail.

Finance

Schools do control large amounts of their annual budgets but have little control over the major resource budget in the area of staffing (Whitty, Power & Halpin 1998). This may change. According to Parker (1999), when reporting on the NSW Secondary Principals' Conference, principals will be given the freedom to use their allocation of staff and their budget more flexibly. There is room for schools to manoeuvre to improve areas of need specific to them. As Meyenn and Parker (1993) contend, principals are increasingly seen as branch managers and their efficiency and effectiveness judged largely on their ability to manage a devolved budget. Another area of interest for this study is staffing.

Staffing

Following the Scott Report, merit selection has seen schools able to select many of their own executive and to a lesser extent their classroom practitioners (Fairservice 1994). It is still difficult to staff remote or disadvantaged schools. Following a merit selection advertisement statewide for an Assistant Principal of a Central school in rural NSW (1998) it was widely reported both inside the
Department and in the press that only one application was received. Devolution has its problems. On the positive side, through merit selection, it has enabled some young and very talented teachers and administrators to break the deadlock of the old seniority system and advance in the service.

**Curriculum**

Boston (1995), the Director General of the NSWDESE [now NSWDET] insisted in his inaugural meeting with school superintendents that Districts would not develop curriculum materials. Prior to this, schools were able to develop some courses that were relevant to the needs of their students. This statement meant that there would be even fewer school-based programs in the curriculum area. An additional problem in the area of curriculum and equity of offering for some schools is the categorisation of subjects in the senior curriculum. The NSW Board of Studies\(^\text{8}\) with its categorisation of subjects into Category A and Category B subjects had also ensured that what counts as real knowledge in the curriculum maintained an academic ideology. Category A subjects were considered more academically challenging than Category B subjects. Not only were principals not able to develop their own programs but students who wished to pursue tertiary studies often could not choose Category B subjects (often more relevant to their needs and abilities) as these could adversely affect University entrance. This has implications for the successful implementation of IT in schools as control of its use as a learning tool in the curriculum may be centralised as well. Recent curriculum documents from the Board of Studies have confirmed this view. All new syllabus documents contain recommendations for the integration of IT into their KLA. This issue of the implementation of IT in schools will be dealt with more fully later in the chapter.

The Quality of Education Review Committee (1985) suggested that more
curriculum control was desirable (Sturman 1989, p.67) using the following reasoning:

*Some parents fear that their children will be disadvantaged by divergence from standard curriculum provisions and that, in deciding what is appropriate for the students at a particular school, teachers may provide offerings which limit their students' subsequent options.*

Harrison (1996) states that the move towards more centralised control through industrial regulation, the national curriculum and the Key Competency model is further weakening decentralisation.

It is clear the provision of education in the 1990s was a melting pot of ideological, sociological, economic, political, historical and other factors as indicated in this chapter. As Barcan (1993, p.366) points out:

*The educational reforms of the late 1980s and early 1990s were introduced in the context of the economic crisis of the welfare state and of the structural changes in society...*

Meyenn and Parker (1993, p.20) clearly state the case against these trends with particular regard to devolution and the drift to private education:

*Public Schooling cannot afford the luxury of allowing its most able and most powerful to marginalise the majority. ... a binary system (i.e. second class comprehensive and first class specialist schools) is inevitably hierarchical and in the end hierarchy is neither socially just nor equitable.*

We have seen that NSW is little different from other states of Australia or New Zealand in regard to educational change, and in particular, devolution of decision making. Principals have increased accountability for a variety of issues but in the key areas of curriculum and staffing the control is still very much centralised.

* The statutory body responsible for all curriculum development in NSW government schools.
These changes in education were occurring at the same time as rapid technological change continued to accelerate. This was particularly noticeable in the area of Information Technology. The impact of IT in the context of the wider community and then a narrower view of its influence on education policy is essential to an understanding of this study. Principals, already dealing with a great deal of educational change, were about to be faced with further change as a result of the IT revolution.

First, let us examine the development and use of IT in the wider community as this preceded, in most cases, its development and use in schools.

The development and use of IT in the wider community

According to Jones (1996) technology on the one hand might ensure better economic equity, freedom of choice and an active democracy. On the other hand, he contends that it might increase the prospect of widening the gap between the rich and poor, the institution of a technocracy and the chance of democratic goals becoming irrelevant. An Australian Bureau of Statistics media release [No. 152/99, December 20 1999] on 'Internet and Internet Purchases Continues to Grow' showed that 48% of all Australian households had a home computer in August 1999 and nearly 23% of all households had home Internet access. In the previous twelve months 5.6 million adults accessed the Internet. Adult Internet access was nearly evenly divided between work and home with slightly more access at work then at home. Finally the greatest users were the 18-24 year age group.

Certainly, there is little question that technology has changed many of the ways we live our lives. The media report that automatic tellers are fast replacing the face to face banking system and Internet banking, although in its infancy, seems set to gather an increasing market. Computerised robotic arms and machines
have replaced thousands of workers in the motor industry. Even our motorcars are now filled with complicated electronic wizardry to automatically open and lock doors, open windows and almost tell the car how to operate. We have been ‘seduced by the force’ of technology. Education, however, appears to have lagged behind. A visit to many classrooms would show they are little different from the sixties, with computer technologies often restricted to computer laboratories and specific sections of the libraries.\(^9\)

Businesses can communicate by email, video-conferencing and other electronic means instantly on a worldwide basis. Horne (1998, p.233) in his latest revision of ‘The Lucky Country’ suggests that:

\[\text{It is already becoming obvious that the belief in hard work may become one of the impediments to happiness in the future technological societies: some way will have to be found in which most people will work less without suffering comparative economic hardship.}\]

As one of the giants in business and IT perhaps Bill Gates (1999, p.3) should have the last word. He suggests that the winners and losers in the business and wider community of the future will depend on: ‘... How you gather, manage, and use information’.

Gates (1999) further argues that education is vital to this process of gathering, managing and using information. If, as it has been shown, the use of IT has exploded in the wider community we need to investigate if this has then been reciprocated in the context of educational policy and the extent of this reciprocation. The role of the principal in the introduction and support of education policy on IT in schools should be shown to be pivotal to securing the future.

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\(^9\) This was obvious from my visits to many other schools as a forerunner to my case study visits.
Education policy and IT

According to Parker (1999, p.26):

Unless we get it right for the future we will see, increasingly, people who are banished to the 'new techno-coated Dark Ages'.

There is little doubt that the current NSW government has poured enormous financial resources into computers in education both in the field of hardware, Internet access and training for almost one third of all teaching staff in NSW government schools (Mawson 1999). According to Mawson other states have also followed suit. Overseas most western nations have placed an increasing emphasis on ensuring their schools are not left behind in the IT stakes in schools (McKenzie 1999).

All state and territory government education authorities supplied information on their IT initiatives to an EdNA Reference Committee in late 1998. Mawson (1999)\textsuperscript{10}, reporting on this information, reports the following has occurred in the states mentioned below.

In NSW all schools have been connected to the Internet and forty district based technology advisers were appointed. A training and development program has been put in place for fifteen thousand teachers\textsuperscript{11} and schools have received sufficient computers to establish a 1:11 ratio to students. Secondary curriculum documents have also been prepared for all Key Learning Areas suggesting how IT may be integrated into the curriculum.

\textsuperscript{10} In 'School Education Information Technology Initiatives'.
\textsuperscript{11} One third of all teaching staff.
The picture is similar in Victoria where the computer to student ratio is 1:5 and all teachers have received a notebook computer providing they voluntarily undertake forty hours of training and development. In addition, information technologies are to be integrated into the curriculum.

And so the picture continues similarly in other states and territories. Overseas the trend is similar as McKenzie (1999, p.1) argues:

_Schools across North America are rushing to network. Governments and corporations hasten forward with grant support, advice, encouragement, pressure, and products. The Internet is sold as the bridge to the future, and the 'wired' school is all the rage. Access to the Information Superhighway becomes a priority. For some it becomes an obsession. Bill Gates has compared the rapid development of the Internet to the Californian Goldrush of 1849._

We have illustrated that educational policy has seen the introduction of a large amount of computer hardware into NSW and other schools, both in Australia and overseas. This has been accompanied in most cases with some professional development of staff.

A broad picture has been painted of the general context in which the study exists, however an examination of the context of the study would not be complete without giving some detail about the case study schools and rural NSW.

**Rural NSW and the case study schools**

The majority of schools selected for this study are separated by vast distances and are situated in rural NSW. Hatton and Elliot (1998) contend that there are important questions of social justice not being properly addressed in rural schools. This view is confirmed by Sidoti (2000). The successful use of IT as a learning tool in these schools is not only important educationally but raises
equity issues for successful educational outcomes for isolated rural students. Information Technology can be used as a tool to break down many of the barriers due to isolation or further ensure inequitable outcomes for disadvantaged rural students.

The case study schools were selected by a district technology adviser and the researcher for their apparent successful implementation of IT as a learning tool. In some cases the schools selected had achieved prestigious awards for the use of IT in education. They were seen to be ‘beacon’ schools in that they were considered and recognised as schools that were well on the way to effective use of IT as a learning tool. As no detailed analysis of the use of IT as a learning tool in the schools could be carried out prior to the commencement of the research it was soon discovered that the rhetoric of being a ‘beacon’ school in the use of IT sometimes did not match the reality. Detailed background statements about each of the case study schools will be given in Chapter 5 but it is appropriate to give a basic outline here.

The teachers at the schools range from young to approaching retirement. Students come from a variety of socio-economic backgrounds. The principals also differed in age and experience. The schools range from a moderately sized Far Western primary school with a significant Aboriginal population to a large regional high school at the centre of a rural education district. They have also been purposely selected to give a cross section of schools: K-6; K-12 (Central Schools) and secondary schools (Years 7-12) and represent a variety of rural environments, both inland and coastal. From discussions with the District Technology Adviser, and my own observations, all the principals of the case study schools were committed to trying to successfully integrate IT as a learning tool in their schools.
Chapter 2  The context

Conclusion

The educational context in the past two decades has been shown to be one of rapid change. The changes have often been tied to political and economic agendas. Schools have been given increasing financial and administrative autonomy in particular but at the same time have been made more accountable. These changes, that is, devolution of financial, administrative, and educational accountability and the centralisation of other areas, have been reflected in changing leadership roles for the principal. Importantly, for the implementation of IT, principals have been given limited control over curriculum and staffing. The curriculum it has been argued, is firmly retained at the centre and is less than democratic. We have seen that devolution of authority to schools (and by association to principals) has often been spasmodic and patchy. As the focus of this thesis is on the role of the principal in the implementation of IT, not the use of IT as a learning tool, the issue of the power of the principal to implement change is seen as important.

These educational changes were also reflected in changing uses and abundance of IT. Computers have infiltrated our lives in a multitude of ways and current educational policy overseas and nationally has embraced the implementation of IT in schools. Governments, both in Australia and overseas, have poured enormous resources into schools to ensure they are on the 'Information Superhighway'. This has also occurred in NSW where both physical and human resources to assist in the introduction of IT have been given to schools in the last three years. In rural schools IT may be an efficient aid to improved learning outcomes for students.

The case study schools were selected as ‘beacons’ after advice, by the District Technology Adviser and on the basis of my own preliminary investigations, in
the use of IT. As my research later illustrated, two of these schools did not satisfy the requirements to be called a ‘beacon’ school in IT in the final analysis. The schools came from a variety of rural settings and structures. The school communities that made up the case study schools were also of a varying nature.

Summary

This chapter examined the complex context of changes in education, politics, economics and Information Technology and gave a brief outline of the case study schools situated in rural NSW.

The next chapter will examine the literature, both theoretical and practical, in relation to the implementation of IT in schools. The literature review will also investigate what role, if any, principals are playing, could or should play in IT’s successful implementation as a learning tool in schools.
CHAPTER 3

REVIEW OF THE LITERATURE

... a review should provide the reader with a picture of the state of knowledge and of major questions in the subject area being investigated.
(Bell 1995, p.35)

Outline

The previous chapter examined the context of the study. This chapter focuses on a review of the literature pertaining to Information Technology, the role of the principal in its implementation (both theoretical and practical perspectives), its use in schools and to a lesser extent, the wider community.

The underlying themes include leadership; innovation and change management; the use of Information Technology (IT) as a learning tool in schools; the role of the principal in implementing IT; barriers to the implementation of IT and factors supporting the implementation in schools. The chapter will also examine relevant teaching/learning strategies and their relationship to the use of IT in schools. Finally the chapter explains how the literature has influenced and helped guide the research.

Introduction

...by the year 2010 we can expect that the computer will be one of the dominant educational delivery systems in many parts of the world.
(Bork 1991, p.34)

If Bork is correct then there is scant time for school leaders to waste in implementing strategies to ensure its effective use as a learning tool in their schools.
In examining the appropriate literature that informed this study it is essential to ensure that there is a clear understanding of what we are focusing on and the parameters we are setting. A starting point for a review of the literature should be an examination of the research questions. The questions are listed below. The main research question has been underlined.

1. **What is the role of the principal in implementing Information Technology (IT) as a learning tool in schools?**

2. **What factors positively influence the implementation of IT as a learning tool in schools?**

3. **What are the barriers to the implementation of IT as a learning tool in schools?**

4. **How is IT currently used as a learning tool in schools?**

It is important to tease out the themes flowing through these questions and thus ensure that we are examining the literature in relation to what is significant. The first question requires us to examine issues of leadership, innovation, change management and the establishment of learning communities in schools. This is the main focus when we relate the above issues to the implementation of IT in schools. The second question deals with aspects of professional development, effective learning communities and logically leads to the third question. Aspects of change management are once again relevant in both the second and the third questions. Question three also examines structures and pedagogies in schools and the perceived need for change to fully utilise IT as a learning tool. Question four follows on from three and requires a closer assessment of the current uses of IT, and in particular its use as an effective learning tool to improve student outcomes in education. Finally, we need to go back and examine in greater detail the area of professional development of staff in schools, the barriers to that professional development and this logically ties once again into the themes of leadership and the building of effective learning communities in schools. As we can see each of the themes raises a variety of issues that defy compartmentalization.
There is no intention in this chapter to go into depth on the theoretical basis of leadership, change management, teaching and learning and other relevant issues. Rather, the approach is more to give the reader a general feeling for the current thinking in those areas and in particular, how that might relate to the implementation of IT in schools. The same view has been taken with Information Technology. The focus here remains on the use of IT as a learning tool in schools. What we are concentrating on in this study is the issue of the introduction and support of IT as a learning tool in schools and the role of the principal in that implementation.

Education is a complex process and, as previously stated, defies being put in to little 'boxes'. There has been an attempt to focus on these individual issues in each section of this chapter to enhance clarity of the review, but where it is deemed important, the issues such as leadership have been examined again briefly in relation to the new context. A starting point for the review might be to state what we understand by the words Information Technology or its' abbreviation IT.

By IT I am taking the view of Fitz-Gerald & Krumins (1991) who claim that IT refers to any technology that helps us to manage information. They further suggest that the modern day focus is on the new information technologies that blend computers and telecommunications with powerful hardware and software. To these I will also add the utilisation of digital cameras, videos and other multimedia tools either in conjunction with these computers or used separately.

Over the last decade there has been an increasing focus on the use of computers in education and an evaluation of its effectiveness (Newhouse & Oliver 1991; Rosen 1993; Sava 1998) and this appears to be accelerating. There are also questions of cost effectiveness (Sava 1998), long term impact, attitudes of the learners and teachers (Pagram 1996, Maddux et al. 1997) and Internet use in schools (Mambretti 1999). When considering the multitude of different articles
and papers which have been published reporting on the findings of various bodies and individuals, it is also difficult to determine which overall views can be followed (Newhouse & Oliver 1991). Newhouse and Oliver further contend that one study may show that the use of a computerised drill for mathematics in the primary years had outstanding results when compared to a control group whilst another study will show very little variation. They further suggest that it is difficult to compare a large number of the studies as many of these vary in the form or indices used to assess outcomes, for example, the Apple Classrooms of Tomorrow (ACOT) v the Campbell and Cordiero (1996) study. The former study involved a relatively large number of schools and the latter only two. Both studies were carried out in the USA.

In addition, it is of prime importance to compare similar things and therefore since CBL (Computer Based Learning) applications are usually innovative in nature their effect should, in their opinion, be compared with other innovations (Newhouse & Oliver 1991). This might mean that the control group should be utilising another innovative method, not a traditional one. In other words, comparing a virtual school like Cyberhigh (Alberta) with Wanaaring Public School (NSW) creates difficulties because it is increasingly difficult to remove all variables. Overall, however, there is a growing body of research that suggests there are positive aspects to the use of IT in schools (Maddux et al 1997, Smith 1999b).

When examining the main thesis question, and the underlying themes, recent research indicates that there are large gaps in certain areas under study, in particular, the role of the principal. An appropriate starting point for this review is to focus on the issue of school leadership.
Leadership

It is not the intention in this review to develop new theories on leadership, nor to give a precis of all models, rather to give an overview of the current theory and practice in this area and further, to examine the relevance of leadership in relation to the implementation of IT in schools. As Fullan (1997) and Bush (1995) suggest there is an inter-active relationship between theory and action. Bush (pp.17-18) further contends that ‘...in educational management the acid test of theory is its relevance to practice. Theory is valuable and significant if it serves to explain practice and provide managers with a guide to action.’ Let us first examine this relationship.

According to Sarason (1997, p.88):

...the empirical evidence is that principals are managers, not educational leaders; by virtue of who selects, appoints, and evaluates them the principal has a dual allegiance: the school and the system. In practice, the principal is as much, and often less, accountable to the one as the other, which is why as time goes on the idealistic principal slowly but steadily becomes a more or less passive cog in the system.

Sarason (p.91) goes on to suggest that schools may not need principals, just managers. He does suggest that there are principals who are not managers but are characterised by:

...an assertive, supporting, "street smart", charismatic principal who rarely was in her or his office but all over the school and the community. The walls between the school and community were open and the school community supported the principal against the system.

According to Townsend (1999) this nexus between management and community has been coupled with increasing advances in technology that will lead us to the development of the information age and virtual schools. He also suggests that principals will need to reclaim their roles as educational leaders. Sergiovanni
(1996), Caldwell (1997) and Hill (1999), believe that educational leaders must also be change agents and head learners, not just managers.

Early theories on leadership in education tended to reduce leadership to several variables that facilitated empirical study but ignored, to a large extent, the cultural and political contexts in which they were embedded (Sergiovanni 1994). Sergiovanni (1996) further contends, as does Fullan (1991) and Owens (1995), that it is not a matter of making others follow your vision but more of developing a shared vision. Owens (1995, p.134) puts this clearly in the context of shared power and open communication.

Creating the mutually shared vision cannot be done without sharing some of the power that was traditionally closely held by those in the hierarchy ... and creating an environment that facilitates the development of trust and open communication that is essential to collaborative group effort. This is the basis for the empowerment of teachers, parents, students, and others who were formerly shut out of the decision making of the organization.

Hill (1999) and Sergiovanni (1996) also emphasise the development of staff and community members to ensure successful leadership with the adoption of any innovation. Sergiovanni also contends that (1996, p.84), ‘schools should not function as businesses. And school leaders should not function as owners of businesses.’ There are other well-documented theories on leadership, for example, transforming and transactional leadership and Total Quality Management (TQM) developed over past decades (Owens 1995). They are but some of the variety of theories and models developed over past decades as education and educational administration tried to come to terms with a more scientific and thus legitimate approach to understanding leadership in education.

In the past two decades educational leaders have seen increasing changes in the context in which they operate (Sergiovanni 1996). Goldring (1997) suggests that the boundaries between school organisations and those outside the organisations are becoming increasingly permeable and that these have implications for school
leadership and principals in particular. The increasing calls for accountability, both educational and financial also impinge on that leadership role. It is opportune to now look at recent ideas and theories on educational leadership that reflect these changing circumstances.

Two of the prominent leaders in the field of educational leadership are Sergiovanni and Hill. Their work reflects the views of many others. A summary of their ideas on leadership follows in the table below.

**Table 3.1 Educational Leadership**

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td><strong>Theory</strong> – Community and ideas-based leadership</td>
<td><strong>Theory</strong> – Instructional Leadership</td>
</tr>
<tr>
<td><strong>Facets &amp; practices</strong></td>
<td><strong>Facets &amp; practices</strong></td>
</tr>
<tr>
<td>Emphasis is on building a shared fellowship ... not on whom to follow, but on what to follow. Members respond to substance and is idea based.</td>
<td>Need to re-connect teaching and administration and reclaim the role of instructional leader.</td>
</tr>
<tr>
<td>Shared vision but in an invitational mode, not a command or sell one.</td>
<td>Shared belief in the importance of collaboration and community.</td>
</tr>
<tr>
<td>Reciprocal process of leaders and followers influencing each other to action.</td>
<td>Establishment of professional learning teams.</td>
</tr>
<tr>
<td>Clear enunciation of roles and responsibilities. Connected to obligations.</td>
<td>Appointment and on going training of team co-ordinators to act as mentors, coaches and lead learners.</td>
</tr>
<tr>
<td>Directed to connecting teachers, parents, and students to each other and their responsibilities as defined by shared purposes.</td>
<td>Need to be expert in learning theory, school change and professional development, curriculum theory, assessment and data analysis.</td>
</tr>
<tr>
<td>Shared visions. Changes in organisation and mode of operation to attain goals.</td>
<td>Shared beliefs and values. Seek growth not constant change.</td>
</tr>
</tbody>
</table>

**Key tasks of a leader:**
- Modelling
- Maintaining harmony
- Institutionalizing values
- Motivating, managing
- Explaining, enabling
- Supervising.

**Key tasks of a leader:**
- Initiation, implementation
- Institutionalisation
- Management of the quality of teaching and learning
- Professional development of self and others
- Improve student outcomes
While there are obvious differences between the emphases of both educationalists there are also commonalities. Gone is the autocratic leader working in isolation commanding and enforcing change. Collaborative leadership, hand in hand with continuing professional development is the norm. Sharing an articulated vision is part of this educational leadership. It is interesting to note that Sergiovanni suggests that ‘modelling’ is a key task of educational leaders and Hill emphasises the necessity for professional development of all and that the principal be knowledgeable in many key areas. This is not just a recent phenomenon. Wiles (1961, p.33) emphasised the need for principals to encourage unity in the group, suggesting that:

In the process of improvement he constantly seeks to increase the unity of the group, to encourage the experimental approach, to enrich the group thinking, to build the security and self-confidence of the group, to help the group see clearly the boundaries of its authority, to increase interaction and sharing of experience, and to extend the opportunities for leadership.

It is opportune to now explore how this leadership style might be reflected in innovation and change-management.

**Innovation and change-management**

Most principals and educators know how difficult change management is. Many principals brought up on a ‘chalk and talk’ methodology find coping with devolution a big enough problem. Along comes IT, children seem to handle it with ease; young staff daily illustrate their skills. The principal, even if not technophobic (Hoare 1998), has not the time to grasp the complexities, let alone see to its successful implementation in many cases.

Writers such as Fullan (1994) suggest principals and administrators are fighting a losing battle. He contends, and many would agree, that neither top-down regulation nor locally based reforms will transform schools. The main problem is
juxtaposing a continuous change theme with a continuous, conservative system that defies change. According to Fullan, educators must create learning societies as part of a larger social agenda. He also propounds eight essentials for a change paradigm. Finally Fullan argues that continuous teacher education is essential to produce change. Although phrased differently, the NSW Quality Assurance School Review (1996) statements on educational practice and leadership for change support many of Fullan’s ideas. The following table illustrates some of the similarities and differences between the two views.

**Table 3.2 Change-Management**

<table>
<thead>
<tr>
<th></th>
<th>NSW QA School Review</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. You can’t mandate or force change</td>
<td>Provide time, resources and opportunities</td>
</tr>
<tr>
<td>2. Change is a journey, not a blueprint</td>
<td>Articulate the purpose</td>
</tr>
<tr>
<td>3. Problems are our friends</td>
<td>Organise relevant training and development establish supporting structures for change</td>
</tr>
<tr>
<td>4. Vision and strategic planning come later</td>
<td>Shape and reshape the school’s vision</td>
</tr>
<tr>
<td>5. Individualism and collectivism have equal power</td>
<td>Nurture the use of innovative and creative solutions</td>
</tr>
<tr>
<td>6. Neither centralisation nor decentralisation work by themselves</td>
<td>Build teams</td>
</tr>
<tr>
<td>7. Connections with the wider environment is critical for success</td>
<td>Influence the direction of others</td>
</tr>
<tr>
<td>8. Every person is a change agent</td>
<td>Model, advocate and support continuous learning</td>
</tr>
</tbody>
</table>

On close examination most aspects of the NSW QA School Review (except vision) are compatible with Fullan. Another outlook that appears to draw from both of the above views is suggested by Wilkinson (1997). He argues that the following are vital for school leaders in change management: meshing, empowering, communicating, interacting, responding, developing, envisioning, focusing, ensuring and having the patience and courage to let it happen.
Mottier's (1996, p.291) systems statement is also highly relevant. She suggests that:

*Any educational system is in a situation of permanent change. In order to keep up with developments in the world of which it is a part, education must adapt to these changes. Many of the developments result from technology, and the contexts are different because of that technology.*

Sergiovanni (1996) tells us that leaders must realise that the school is the centre of change and that in the end it is the teachers who will decide what happens to students. It would seem important from these and other writers (Atkin 1994, Mortimore 1996) that the principal who ignores the school as a learning community does so at their peril. This issue will be picked up once again in the section on professional development of teachers. Finally, Dawson (1997) suggests that the leader or principal should be the head learner and in addition a facilitator for technology planning as Schiller’s study (1998) has already shown. Dawson argues that any innovation will only be successful if the principal actively supports it, learns as well and supports his/her staff in the process of change. This could well be applied to IT.

The issue of leadership will filter through other issues but it is worthwhile now to examine leadership and other issues in the context of the use of IT as a learning tool in schools as the use relates directly to its successful implementation and the role of the principal in achieving success.

**The use of IT as a learning tool in schools**

*Everything has changed so quickly, in fact, in education and in society at large, that it is often difficult to determine just what is happening and what response is required of us. We teachers stand before technology as we would a mirror. What we see is determined largely by what we are and what we consider important. (...) We may see something else, something novel and original, capable of making possible the unimagined and undreamt-of - an agent of reform, change and progress.*

(Roblyer, Edwards & Havriluk 1997, p.v)
Since 1997 we have seen thousands of computers rolled out to schools in NSW. Some Singapore schools are reported to have two computers to every child (Houston 1997) and schools like ‘River Oaks’ in Canada (Smith 1999a) have made major changes to teaching methods, curriculum and obtained huge resources to implement IT. The reality is that the use of IT is increasing exponentially and that schools are just part of that incredible growth. On the other side we already have people telling us that the use of IT is a waste of time and money and that resources (in schools) could be better spent elsewhere (Sava 1993).

To obtain a clear picture of the use of IT in schools we will first study its worldwide use, then its use in Australia, finally focussing on its use as a learning tool in NSW government schools.

**IT uses worldwide**

According to Powell (1998) in ‘Australia’s Internet Directory’, the number of Internet users worldwide was about to pass the one hundred million mark, of which Australia had approximately 3.35 million. Certainly computers and Internet technology are starting to become part of many people’s everyday life with banking, shopping, news, businesses and education authorities utilising the new technologies. It has been suggested by Cuban (1996) that the number of computers in schools has gone from a ratio of 1:125 students a decade ago to 1:13 in schools in the United States. But the experience overseas suggests that the number of computers in schools bears little relationship to their use by teachers and students. The experience with Apple Classrooms Of Tomorrow (ACOT) from 1985 to the commencement of the study (Sandholtz et al. 1997) tells us that even when schools were saturated with technology the use was often spasmodic and of only moderate use as a learning tool. Schools took time to
develop IT as a useful learning tool and to change curriculum structures and pedagogy.

Cuban (1997) states that community pressure is forcing schools and educational institutions to get students ready for a ‘high tech’ work place. He contends, however, that a closer look reveals a different picture and cites the following problems:

1) White, affluent, English-speaking students use computers far more than other groups.
2) Low-achieving students tend to use them for drill and practice whereas the more gifted use them for problem solving and to enhance reasoning.
3) Individual students use machines for only one or two hours a week because of access or other problems.
4) High school students rarely use computers in academic subjects and where they do it is often to learn to use them.
5) Most teachers are casual or non-users. A small number of serious users are pioneering their use in the classroom.

Let us take this a step further and look at a reported example of the use of IT as a learning tool in schools. ACOT started overseas and has now moved to a few selected sites in Australia. David (1997) when discussing the ACOT experience states that mere resourcing or availability of computers for students was not seen as the only answer to their effective use.

This view is shared by Vines (1999, p.3) who comments:

*While many educators have enhanced learning and classroom instruction through the use of technology, few have focussed on ways to help students understand technology itself ... Developing 'technology literacy' goes beyond teaching students how to use a software program or find academic resources online.*
It has been suggested (Sandholtz 1997) that one of the most successful attempts at integrating IT into the classroom was the Apple Classrooms of Tomorrow experience. It attempted to go beyond the boundaries mentioned by Vines. Let us examine it in some detail.

THE ACOT Experience (1985 - 1996)

The Apple Classrooms Of Tomorrow is a significant attempt to see how the use of unlimited technology in the classroom might affect learning. It commenced in the USA but has now moved to other countries, including Australia. Perhaps the questions that Roberts (1996, p.5), the Director of Educational Technology, U.S. Department of Education, posed when searching for answers from ACOT might assist to sum up the significance of this study.

*What happens when computers become a significant resource in classrooms? How does a critical mass of technology affect the way that teachers teach and learners learn?*

These were the questions asked and supposedly answered by the ACOT project. Comments by Stortz (1996, p.21), ACOT Teacher, Stevens Creek Elementary School, Cupertino, California, might give a further clue to the effective use of IT in schools. He contended:

*Because of ACOT and the technology, I continue to be enthusiastic about being a teacher. But I am an altogether different teacher than I was before. I am now guiding the students. They are the masters of their own education now, creating their own knowledge and using their creativity to research and explain information to others.*

‘Apple’ decided in 1985 that they would create an environment where technology would become as common in the classroom as pen and paper. They

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1 The ACOT project is still continuing.
selected a few schools and classrooms and gave two computers to each student and teacher (one for school and one for home) and then observed the effects on teaching and learning. The investigating team was composed of university-based researchers, ACOT staff members and teachers.

Over time researchers noted that students in ACOT classrooms ‘continued to perform well on standardised tests’ (ACOT 1996). In addition to this, students developed additional competencies in the following areas. First, students explored and represented information dynamically and in many forms. Second, they became more socially aware and confident, communicating effectively about complex processes. Significantly, it was discovered that they became independent learners and self-starters, knowing their areas of expertise and sharing it spontaneously. As well as the above, they worked well collaboratively, using technology routinely and appropriately. Finally, and of importance, the students developed a positive orientation to the future. These results were re-enforced by similar findings in the ‘River Oaks’ experience (Smith 1996). ‘River Oaks’ was a K-8 school in Ontario, Canada set up in a similar fashion to the ACOT schools. The principal, Gerry Smith, adopted IT as a learning tool and won worldwide recognition for his school’s achievements in IT (Smith 1999a).

As far as the teachers in the ACOT experience were concerned it was observed that as they became comfortable with the technology they:

> ... reported they were enjoying their work more and feeling more successful with their students. Over time, they reported that they interacted differently with their students – more as guides or mentors and less like lecturers. (ACOT 1996, p.14)

The following table (from ACOT ‘Teaching Learning & Technology’ 1996) shows the paradigm shift that researchers suggested developed over time from one of ‘instruction’ to ‘knowledge construction’.
Table 3.3 ACOT Teaching and Learning

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Traditional (Instruction)</th>
<th>Extended (Knowledge construction)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity</td>
<td>Teacher-centred &amp; didactic</td>
<td>Learner-centred &amp; interactive</td>
</tr>
<tr>
<td>Teacher role</td>
<td>Fact teller &amp; expert</td>
<td>Collaborator &amp; sometimes learner</td>
</tr>
<tr>
<td>Student role</td>
<td>Listener &amp; learner</td>
<td>Collaborator &amp; sometimes expert</td>
</tr>
<tr>
<td>Learning emphasis</td>
<td>Facts &amp; replication</td>
<td>Relationships &amp; inquiry</td>
</tr>
<tr>
<td>Concept of knowledge</td>
<td>Accumulation</td>
<td>Transformation</td>
</tr>
<tr>
<td>Demonstration of success</td>
<td>Quantity</td>
<td>Quality</td>
</tr>
<tr>
<td>Assessment</td>
<td>Norm-referenced and multiple guess</td>
<td>Criterion-referenced and performance portfolios</td>
</tr>
<tr>
<td>Technology use</td>
<td>Seat work</td>
<td>Communication, collaboration, information access, and expression</td>
</tr>
</tbody>
</table>

The ACOT research also had implications for teacher development. Over the years researchers found the best staff development occurred when it:

1) Involved small-group collaborations among teachers.
2) Took place in working classrooms.
3) Built on teachers’ existing knowledge about curriculum and practice.
4) Provided opportunities to experiment and reflect on new experiences.
5) Provided ongoing support to help implement change and innovation.

Visitors to ACOT sites noticed a marked difference between traditional teachers’ roles and those displayed in ACOT classrooms.

As we examine some of the results of the research here is a thumbnail sketch of some of the achievements. It must be stated here that the following is only a relatively small part of what was reported in the ACOT (1996, p.19) ‘Teaching Learning & Technology’ paper. ACOT teachers, such as Brian Reilly and Karla Kelly, were actively involved in many of the new ideas that flowed from the ACOT experience. Some of these new ideas included:
1) Collaborative environment and tools- Brian Reilly designed a HyperCard stack that managed student work in a portfolio format and allows teachers and students to add comments.

2) Communication- Karla Kelly developed an inter-disciplinary curriculum-based model - which motivates middle school students to explore their own cultural heritage and to create interactive projects that reflect their life experiences.

3) Multiple representation of ideas- Roy Pea and Christina Allen created Mediaworks; a multi-media database and composing tool that allows students to research, create, analyze, and synthesise a wide array of information.

There were also developments in the areas of intelligent applications and modelling, information analysis and assessment.

Whilst this research is obviously supported by 'Apple', there seems little doubt that the use of IT in the classrooms targeted had substantial and continuing benefits for the staff and students involved. Whether this can be replicated in a less resource rich environment is debatable.

John Williams (1996) in 'International Approaches' (cited in Williams & Williams 1996) gives more relevant information on the use of IT in schools. The evidence showed that there has been a mixed response to the introduction and use of IT in schools worldwide. Information and statistics is at the moment, however, often anecdotal or simply part of a government report (See for example Mawson 1998)².

Many believe that most schools are not well equipped to respond to or integrate technology (Whitby 1996). We do know that there are quite a few 'beacon'

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² This report on the implementation of IT in Australian schools is detailed later in the chapter.
schools and principals, but as Pagram (1996) suggests, a visit to many schools’ websites is a static display, of little educational value. He further suggests that these schools are selling the Internet and IT short and that it should allow collaborative learning in a media rich environment.

Newhouse and Oliver (1991) suggested that the impact of IT in education had been debatable, despite the rhetoric. Nine years later many still believe this. Let us now analyse the Australian experience.

**IT uses in Australia.**

It is interesting to reflect on David Dale’s article (1998, p.4) in the Sydney Morning Herald that examined the Australian Bureau of Statistics’ data on Internet use. Whilst realising that this is just one use of IT it is a fairly reliable indicator and based on a sample of 3,226 in February of that year. Some of the findings are of interest to us to illustrate the level of usage then and by whom:

1) Three million Australians over the age of 18 years had used the Net in the last twelve months (approximately one-quarter of the adult population).

2) 1 million used it for study, 1.1 million for goods or services, 1.5 million for work and 2 million just browsed.

3) As you would expect with any innovation the greatest users were in the 18 to 24 year age group (42%) declining to 8% in the over 55 years age-group.

In the light of these statistics we can reflect on Spender’s comments (1997) suggesting that 50% of schooling may be done utilising IT by the year 2019.

One of the most up-to-date sets of information on the response by education authorities in schools was that supplied to the EdNA Reference Committee to the National Office for the Information Economy (Mawson 1998). The relevant State and Territory education authorities supplied this information.
According to Mawson (1998) the picture on the implementation of IT in schools appeared very good in Victoria where the computer to student ratio is 1:5 and all teachers have received a notebook computer, providing they voluntarily undertake forty hours of training and development. In addition, information technologies are to be integrated into the curriculum.

He further stated that large amounts of money have been committed by all states for the implementation of IT in schools, with a focus on improving student access to computers and, to a lesser extent, professional development of teaching staff. Most have done research into both the needs and direction of the use of IT in schools (see Keeves & Marjoribanks 1999 for more detail).

In addition to the government systems, the study by Wikman (1992) into the use of information technology in some Catholic schools in Brisbane appears useful in that it looks at the potential for the use of IT in schools. The study argues that the use of IT can have a variety of positive outcomes for students. Unfortunately for this study, Wikman says little about the essential role of the principal in its introduction and support.

**IT use in NSW government schools**

In addition to the information on NSW schools previously stated, Mawson (1998) comments that secondary curriculum documents have also been prepared for all Key Learning Areas (KLAs) suggesting how IT may be integrated into the curriculum. 'SchoolsNET', which will build on the Country On-Line initiative will eventually connect all schools through the DET Wide Area Network through a routed ISDN connection. Finally, electronic publishing of resources for teachers and students via the Department's Web site has been established. Addition information on the implementation of IT is available from the Ministerial Advisory Council on the Quality of Teaching (MACQT) report.
The MACQT report (1999) gives us this further information in relation to NSW government schools and the introduction and support of IT in schools and details extensively the NSW government's responses to the subject of computer proficiency for teachers. It looks at a raft of issues associated with competencies and practice by teachers from teacher education at universities to the current state of play in schools. It also examines computer applications in the classroom and how these might be further developed. It suggested (p.7) that 'best practice schools are using a variety of software packages to develop skills across all curriculum areas.' It further contended that 'teachers perceived the computer as an important tool for teaching across all faculties which encouraged students to become more capable technology users, increased their self-esteem and promoted student-centred learning'.

Of interest to this review is the position of the principals themselves. The NSWPPA\(^3\) position paper (1999, p.1) on 'Technology - Teaching & Learning' is important as it establishes the current position for a significant number of primary principals. They believe that:

\[
\ldots \text{the use of technology in the classroom has an impact on the way that teachers teach and that teachers need support to use technology in the classroom. Secondly that training and development opportunities are needed to broaden teachers understanding of the range of uses, and the value gained from using technology in the learning process.} \]

They go on to contend that:

\[
\ldots \text{students are interested in and motivated by using technology, there is an apparent incongruence between computer use and access at home and school and that the use of technology in the classroom varies from class to class and school to school.} \]

\(^3\) NSW Primary Principals' Association.
This agrees with much of the current literature on the use of IT in schools, for example (Smith 1999a & 1999b; Gunter 1999).

We have seen that extensive resources have been placed in schools in Australia (including NSW government schools) to assist in the implementation of IT. The ACOT experience suggested that where adequate resources were available it could and did improve student outcomes. The ACOT research also illustrated the implication of implementing IT on pedagogical shifts in teaching/learning for teaching staff. Finally the views of the NSWPPA were considered. Following the examination of these views of the NSWPPA the obvious next relevant investigation of the literature in regard to this study is to focus on the role of the principal in the implementation of IT.

The role of the principal in implementing IT as a learning tool

_The challenge for school leaders in an informatic society is to facilitate the educative use of information while balancing the political and social constraints of life-long learning._
(Cusaek 1997, p.197)

Like many principals, ten years ago, IT was to me a toy used by some staff in schools and a few students who experimented with their ‘Microbees’, ‘Apple Ile’s’ and fairly complex IBM clones. Today, as Caldwell (1997), Spender (1997) and many others suggest, it is part of a revolution. Duignan (1997, p.12) argues that principals should perform ‘The dance of leadership: at the still point of the turning world’ when dealing with IT. Using TS Elliot’s words Duignan suggests that leadership is no longer based on certainty and precision, but we are at the point of learning and establishing a new order of thinking and acting in regard to educational leadership. On the other hand, Wilkinson (1997), advises principals to: blend in, enable, communicate, interact, develop, prognosticate others and ourselves or lastly, look to our early retirement. Both views of the role of the principal appear a little confusing.
Considering the importance that is placed on the use of technology in schools (Spender 1997; Whitby 1996) prior to 1997, there was evidence of only a few studies in Australia or overseas into the essential role of the principal in its introduction, and use. In particular, there was very little on the workplace learning that must take place in schools for its valued use as a learning tool (Schiller 1997; Smith 1996, 1999a & 1999b). An exception to this is the case study carried out in the USA by Campbell and Cordiero (1996) in a rural and an urban school.

The latter study is especially important because it examines the roles that principals played in successful efforts to mainstream information-literacy instruction. The study also examined whether the change implementation processes associated with successful school innovation were present in two case study schools: one urban, the other rural. The main findings were:

1) In the rural school: vision building, evolutionary planning, empowerment, resource mobilisation, problem coping, monitoring and restructuring were seen as important.
2) In the urban school the same were true with the exception of the restructuring.
3) The principals played the key roles of direction setter, communicator and facilitator; modelling may have been incidental.

The study concluded that the substance of mainstreaming seems to force restructuring and that engaging in on-going communication is a key principal role.

Another study of importance was the Apple Classroom Of Tomorrow (ACOT) longitudinal research project. According to David (1997) the ACOT study consists of two main parts:
1) The Longitudinal Research Centers (LRCs), which had ongoing research at the various sites and
2) The Experimental Learning Centers (ELCs), where shorter-term research studies were carried out.

Both contributed significantly to the body of knowledge about the use of IT in schools. The ACOT research, however, focussed more on the use of technology in the classroom, not the role of the principal. They did, however, suggest some of the key areas where school leaders should have input. These were: providing time for learning, showing interest, arranging technical support, easing access problems and creating a shared school vision.

These areas of importance were reinforced by further research reported by Sandholtz, Ringstaff and Dwyer (1997) who concluded that one of the key factors on whether teachers integrated technology into their classrooms was the level of support they received from school administrators.

The study in Texas (USA) by Macneil and Delafield (1998) investigated principal leadership for successful school technology use. This study was one of the first focussed research studies carried out in this area. One hundred and twelve principals and assistant principals were surveyed. Sixty-four returned the surveys. This is a noteworthy number and first, gives reasonable credence to Macneil and Delafield’s claims that the majority [of those who returned the surveys] viewed technology as very important in their schools and second, that it was important for teachers to utilise and learn technology as a curriculum tool.

Some of the more important findings of the study were:

1) The main barriers to implementing technology in the classroom were lack of financial resources, poor infrastructure and lack of time for professional development and planning.
2) A closer alignment is needed between the amount of time given for professional development and its perceived importance.

3) At each level, funding, training and leadership issues must be addressed simultaneously if technology in the curriculum is to grow and have a significant impact on the reform of education.

4) Principals and school leaders must accept the challenge to create supportive conditions, which will foster innovative use of computers.

Whilst these studies referred to above are not conclusive, they are highly relevant to confirm or contradict any results that might be forthcoming from this study's investigations and to guide us to the important themes and issues for this study. They point to leadership, establishing effective learning communities, resourcing, professional development, collaboration and to a lesser extent, modelling as being issues of crucial importance.

There have been other attempts to guide principals in the implementation and use of IT (Dawson 1997, Caldwell 1997, Cusack 1997). It is common knowledge in educational circles that principals in NSW have their principals' packages on TILT (Technology in Teaching and Learning). It was also widely reported that school executives were also offered a course in the NSWDET Certificate of School Leadership titled 'Managing Technological Change'. In addition to the above initiatives there has been a plethora of well-documented conferences e.g. 'Curriculum for the Third Millennium', 'Shaping the Wisdom of Oz', 'Beyond the Boundaries' and 'Classroom Technology 98'. The major focus of many of these conferences has been on the use of IT in schools, not the role of the principal. Groups like APAPDC (Australian Principals' Associations Professional Development Committee) and on line support through EdNA (Education Network Australia) have tried to fill the void in the literature for principals. Schiller (1997) has attempted to satisfy that gap in the research for principals with a study conducted with several NSW school principals.
Schiller confirms (1997, p.1) the lack of relevant research on the issue maintaining:

*Little research has been done in Australia on the use of IT by educational leaders although use of these technologies for educational administrative purposes is seen as important.*

His study focused on the following areas:

1) Has the use of IT influenced the mode of operation of the school principal?
2) Do school principals integrate the applications of IT to improve the effective and efficient operation of the school?
3) Are school principals hindered or restricted in their use of IT to improve teaching, learning and management processes in schools?
4) Is the school principal a change facilitator for implementation of IT?

To examine these questions he collected data from three different sources. After consultation with the District Superintendent and the District Technology Adviser, five principals were identified as being pro-active in the use of IT. In semi-structured interviews they were questioned on their personal use of computers, their support for IT in their schools and their views on the impact of IT on their roles as principals. The other two data sources were two District superintendents and a group of post-graduate students in school leadership positions. Wide variations in use were noted (and yet these participants were people at the ‘cutting edge’). Schiller (1997, p.4) poses that one of the main things that so far has come out of his research is that: ‘... competency with IT and overcoming technophobia will only occur with frequent use of computers.’

The last two questions posed by Schiller, above, are of particular interest for this study. Schiller’s study states that each principal had a computer on his/her desk (modeling) and had been active in the professional development of his/her staff or in its encouragement. All principals had relied heavily on self-instruction and had attended in-services related to IT.
Other writers in the field of IT, such as Fitzgerald and Krummins (1991, p.139), have offered advice on the implementation of IT, contending that:

*Change needs to be supported by top management and not just the initiative of an individual or middle management...*

They further suggest that considerations for principals in implementing IT may include the following. First, adequate financial resourcing for the innovation and assistance from the Centre/District and Professional Associations. [Schiller (1997) also makes this point]. Second, that staff, parents and students must be included in the planning and that the location, that is, isolation, is an important factor in the planning and implementation. Finally, being knowledgeable about technology is essential for leaders.

The literature suggests that the context in which the principal operates is not a vacuum and that many of the above considerations are vital to successful implementation of IT. Hanson (1998) goes even further and states the following as main areas of concern that principals need to address when introducing and supporting IT in schools.

They need to:

1) Be knowledgeable.

2) Model the use of technology in their work.

3) Look at resourcing (human and financial).

4) Give staff time to explore the technology (professional development) and collaborate with other schools and their staff, for example, use ‘best practice’.

Schiller (1998) and Sandholtz *et al.* (1997) also place importance on modeling, leadership and change management. Additionally, Schiller emphasises the relevance of the context of IT.
It is opportune to examine some of these recurrent themes in relation to the principal individually, first the principal’s knowledge in relation to the use of IT.

1. Knowledge

Schiller (1998) in a paper presented to the Australian Principals’ Association Professional Development Committee (APAPDC) Virtual Conference suggested that the principals who were participating in the virtual conference were part of a relatively small minority of educational leaders who knew how to either access or utilise the new communication technologies. He further suggested that for the majority of principals these skills have not yet been developed. Gates (1999) supports the view that principals cannot be mere spectators in the introduction of IT in their schools but must have appropriate knowledge in its use and also a vision of how it might be best used as a learning tool in their schools. Parker (1999) suggests that technophobic principals will condemn their students and schools to a new 'Dark Ages'. As Sergiovanni (1996) suggested, principals might illustrate this knowledge of IT to their staff by modeling.

2. Modeling

... learning how to learn together so as to promote learning as the core business in a school, modeling .... (Duignan 1998, p.24)

The work of Sandholtz, Ringstaff and Dwyer (1997) leads us to believe that the modeling of the use of IT is vital if teachers are to take up the challenge of utilising technology as a learning tool. They also point out that principals do not have to be ‘technology gurus’ but need to show real interest by their actions and behaviour in the process of implementation and use of technology. This has been confirmed in many studies relating to any innovation in education, for example, Fullan (1991, 1994) and Caldwell (1997) support this view. Principals having
knowledge of and modeling the use of IT are of limited value, however, if adequate resourcing for innovation and change does not occur.

3. Resourcing

According to Anderson (1998) technology resources must now offer greater flexibility and schools need to consider how the technology can be used to help pay for itself and even more importantly how the money spent can maximise the outcomes for students. Makela (1996) suggests that the management of material resources in IT will be one of the major challenges for educational management. It is abundantly clear to people such as Anderson (1998) and Smith (1996, 1999a & b) that a lack of adequate human and material resources will adversely affect the level of use of IT by staff and students. This was further confirmed by the ACOT experience (David 1997).

One of the essential resources needed is good professional development for staff (including the principal). As the issue of professional development will be addressed more fully in a later section of the chapter we will only briefly mention the topic here.

4. Professional Development

This is a key issue and involves not just the principal as a ‘head learner’ but more importantly the upskilling of all staff so they become confident in the use of IT. The comments of Sandholtz et al. (1997, p.166) sum this factor up well.

... Principals seeking school change also benefit from arranging time for teachers to continue their professional development. Learning how to use technology and to teach with a constructivist approach cannot be mastered in a one-shot workshop.
In this light, let us continue with an examination of principals’ roles in collaborating with staff and school communities. The issue of establishing effective learning communities will now be discussed.

5. Collaboration and the establishment of effective learning communities

It is argued (Smith 1999a) that it is essential that principals lead their schools in the effective use of IT as a learning tool but this must be done collaboratively if IT is to become embedded in the ethos of their learning community. As Sandholtz (1997) and Owens (1995) suggest, principals are often unwilling to share decision-making. Townsend (1999, p.19) has strong views on the matter and asserts that:

... Principals will need to reclaim their role as educational leaders of communities, rather than being seen as line managers for school systems. Teachers will need to develop their role as learning facilitators for whole communities, not just children.

Townsend, Clarke and Ainscow (1999, p.361-362) further contend:

Schools are learning communities where everyone (students, teachers, parents and administrators) is both a learner and a teacher, depending on the circumstances.

Sergiovanni (1996) argues that although leaders often believe that their task is to make others do their bidding, leadership in a learning community involves influencing others by example. He further contends that unless people are willing to be led then leaders cannot lead.

Finally, let us conclude this section with a reference to a major source of information on current published Australian research. This echoes Schiller's (1997) view on the limited amount of research currently published on the role of the principal and IT.
Keeves & Marjoribanks (1999) in their 'Australian education: Review of research – 1965-1998' devote a chapter to responses to technological change and also suggest that as the technology is changing so rapidly it is difficult to conduct controlled experiments and thus much of the research is evaluative or of the action kind. They do not mention any research on the role of the principal and the implementation of IT as a learning tool in schools.

In this section of the chapter we focused on the role of the principal in the implementation of IT in schools and discovered that professional development of teachers was highlighted within this role. At this point in the literature review it is opportune to follow this up with a closer examination of the professional development of teachers, including the perceived barriers to that development.

**The barriers to the professional development of teachers**

*Unless teachers have integrated technology into their classroom practices children learn little more than how to play educational games and work a simple word processing game...meanwhile the TILT (Technology in Teaching and Learning) will only get to 15,000 out of 54,000 teachers.*  

(Parker 1997, p.15)

Parker's comments reflect the fears of many other writers. A New Zealand survey of teachers placed adequate professional development high on the list of essentials for successful implementation of IT as a learning tool (Ham 1997). Many have argued that programs such as TILT will only go so far. Real change must come from the willingness of the teacher to learn (Fullan 1993).

According to Schiller (1998) there is not any panacea to the very complex issues surrounding the use of technology in teaching and learning but that it is vitally important to plan and act. He further contends that educational leaders have a critical role in facilitating this planning. It is of importance to now examine the variety of ways that teachers might utilise IT as a learning tool so a clear picture
can be obtained on the level of competence that teachers might need to successfully apply these new technologies.

The ACOT experience (1985 - 1996) suggests that where sufficient technological resources and training are available to staff then technology can be a catalyst for change. Teachers may also change their approach to teaching from curriculum-centred to learner-centred, from individual tasks to collaborative work and from passive learning to active learning. As Fastick (1996, p.20), a Math's teacher at West High School, Columbus, Ohio suggests:

*As you work into using the computer in the classroom, you start questioning everything you have done in the past, and wonder how you can adapt it to the computer. Then you start questioning the whole concept of what you originally did.*

It was also discovered that teachers progress through stages as they learn how to utilise IT as a learning tool in the classroom i.e. entry, adoption, adaptation and invention. The professional development of teachers must encompass all of the above.

One of the greatest lessons learnt from the past is that the context in which teachers learn has a large bearing on their willingness to learn and, as a result, the effectiveness of that learning. As Retallick (1997, p.30) contends:

*The context in which schools and teachers are situated has greater significance than any other single factor in determining what and how teachers learn on the job.*

This suggests that the context itself can be a significant barrier to professional development. Pagram (1996, p.6) goes further noting that teachers are to some extent one of the major problems behind the successful introduction of the technology revolution in schools. He argues that:
Having the students more technologically literate is a situation that many technologically illiterate teachers find hard to deal with and it is a situation which will occur more and more...they (the govt.) are acknowledging the biggest stumbling block to the use of technology in education, teachers.

It is now timely to resume the arguments previously touched on in regard to the establishment of learning communities in schools. A closer examination of Retallick (1997) and Townsend's (1999) comments about learning communities may lead to an understanding of how schools might break down some of the discussed barriers to professional development and thus lead to the effective use of IT as a learning tool.

**Learning communities**

According to Retallick (1999, p.110):

> As 'economic rationalism' becomes ever more pervasive in our social institutions including schools, there is a need for educators who are community-building to resist, to challenge and to create healthy alternatives to bureaucratic and market-driven approaches. One of the most robust of those alternatives for schools is the idea of the learning community.

He draws on the work of educationalists including Habermas (1987), Sergiovanni (1994) and many others in an attempt to establish a theory of learning community. First, Retallick argues that if teachers accept that their everyday work experiences offer a chance to learn then they are on the way to establishing a leaning community. Second, he contends that because the learning is informal it is not always perceived by teachers to be professional development. He concludes this argument by suggesting that professional development can encompass many forms of learning, including workplace learning.

When examining workplace learning as a means of professional development he suggests the following are of great importance (1999, p.117-119):
1. The context in which schools and teachers are situated was found to have greater significance than any other single factor.

2. The nature of the innovation/change. For present purposes an innovation is defined as a 'product' and change as a 'process'. (...) The nature of the product and/or process is an important factor in what and how teachers learn, as is the question of who initiates the learning, i.e. teachers themselves or others.

3. The teacher as a person and learner

4. The situation of teaching

5. Learning resources and support

6. System recognition and reward

7. The culture of the school.

Cocklin (1999, p.267) furthers the idea of learning community by suggesting that:

_The notion of community adopted here is one of working together, wherein difference and even contestation are valued, and which places particular emphasis upon the everyday lived reality of the school context._

Cocklin cites Kleine-Kracht (1993, p.392) to add weight to his argument, who contends that the old concept of educational hierarchy and bottom down learning are replaced in a learning community by the following concepts, that is:

_Our traditional concept that teachers teach, pupils learn, and administrators manage is completely altered. In a community of learners, everyone is about the business of learning, questioning, investigating, and seeking solutions. The basis for human interaction is no longer a hierarchy of who knows more than someone else, but rather the need for everyone to contribute to the process of asking questions and investigating solutions._

The barriers already mentioned coupled with the technophobia (Hoare 1998) of an aging teaching profession exacerbates the issue of the effective use of IT as a learning tool in schools. Maddux _et al._ (1997) suggest, however, that fears that computers or other technologies will replace teachers is unfounded and that rejection on these grounds by teachers is misplaced. They further contend that many teachers are either unwilling or unconvincd that the use of technology
will improve student outcomes. This leads us directly to the next aspect of the introduction of IT in schools, that is, teaching learning and the possibility of establishing new pedagogies and structures in schools.

**Teaching/learning and new pedagogies and structures in schools**

_In our professional practice, the moment we qualify, we are faced with both good and bad news. The good news is that half of what we have been taught and learnt will be out of date in ten years. The bad news is that no one knows which half._ (Macara 1996, p.1)

If establishing successful learning communities is seen as essential for the introduction and support of IT then it could be argued that appropriate teaching and learning strategies are vital for the successful implementation of IT in schools. This section will first examine what are seen by several educational authorities to be essentials for teacher proficiency in these areas. We will then investigate theories of teaching and learning. Logically we can then examine what the literature suggests about using IT as a learning tool and its relationship to teaching and learning. Finally, an assessment of how these may affect or lead to new pedagogies and structures in schools to ensure the effective use of IT as a learning tool will be made.

**Teacher proficiency in IT**

The recent MACQT report (1999, p.8) on computer proficiency for teachers suggested that the major skills identified (for successful use of IT by teachers) by surveyed schools were:

... word processing skills; understanding of various software title/types and how to use them; basic survival/trouble shooting and maintenance skills; classroom management skills; skills in accessing and evaluating various software programs and using them as a teaching tool across the Key Learning Areas.
In high schools, teachers needed to accept that Computer Assisted Learning (CAL) must be integral to modern teaching. Amongst the MACQT recommendations were that all graduates of teacher education courses have minimum competencies including (p.14):

*Basic operational skills; IT skills including the ability to find information, select appropriate applications, present information appropriately; software evaluation skills; pedagogical skills such as the ability to create student-centred learning environments and awareness of values and ethics.*

These competencies are in line with many of the skills and knowledge suggested by the ACOT experiences. Another important source of information on essential teaching/learning for IT came from the DEETYA Executive Summary ‘Digital Rhetorics’ (1998). It also looked at the professional development of teachers and amongst its recommendations (pp.19-20) were the following:

*Firstly, commission a national review of preservice and inservice teacher education programs relating to pedagogical competence in technological literacies and classroom applications. Secondly, establish policies and practices to meet the principle of ‘teachers first’. Finally, establish policies and practices to guide professional development and training.*

The above sounds good but it may be just rhetoric as Cumming (2000) reports. Following a survey of over one thousand teachers in the recently published ‘Real Time: Computers, Change and Schooling’, Cumming (2000, p.34) argues that students are far ahead in advanced skills, especially in multimedia creation, for example creating music and sound, web pages, home pages. Teachers are more advanced than their students in their use of searching the web and sending emails.

She further argued (p.34-35) that students obtained most of their instruction at home and that the most use of IT by teachers at school was in accessing
information from CD-ROMs. A small percentage of teachers also claimed they never used computers with their students.

Let us now have a closer examination of the actual processes and theories behind teaching/learning keeping in mind what the supposed essential proficiencies of teachers for successful use of IT in teaching and learning.

**Theories behind teaching and learning**

How we teach should be inextricably bound up with what we teach, the context in which this teaching takes place and how students best learn. Many believe that the professional development of teachers should be focussed on these areas. Retallick (1997, p.24) when discussing the work of Schon and others adds to this argument. Retallick’s thoughts are best summarised in the table below.

**Table 3.4 Key processes in team learning**

<table>
<thead>
<tr>
<th>Framing</th>
<th>Framing is an initial perception of an issue, situation, person or object based on past understanding and present input.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reframing</td>
<td>Reframing is a process of transforming that perception into a new understanding or frame.</td>
</tr>
<tr>
<td>Integrating</td>
<td>Divergent views are synthesised and apparent conflicts resolved, though not through compromise or majority rule.</td>
</tr>
<tr>
<td>Perspectives</td>
<td></td>
</tr>
<tr>
<td>Experimenting</td>
<td>Experimenting is action undertaken to test and hypothesise or a move or to discover something new.</td>
</tr>
<tr>
<td>Crossing Boundaries</td>
<td>When two or more individuals and/or teams communicate, they cross boundaries.</td>
</tr>
</tbody>
</table>

This has relevance for both our teaching practice and the professional development leading to improved teaching practice. If we look at the use of IT in teaching/learning we can see the issues essential in its introduction and use. A closer focus on the theory of teaching and learning in relation to the use of IT will clarify the issue of how students best learn even further.
According to Maddux et al. (1997, p.85-86) there are four major theories of learning and teaching that guide the development and use of educational technology in schools. They are: the behavioral, cognitive constructivist, social constructivist and finally critical theory. The behavioral model lends itself into breaking larger parts into smaller parts and learning them one by one, a little like 'chunking'. Constructivists disagree with this approach, as they believe that learning is then isolated from its context. Social constructivists put emphasis on interaction between teacher and student and student to student. Critical theorists focus on the role of cultural bias, equity and legitimate forms of knowledge in learning and teaching.

How students encode, store and retrieve the information they need to learn is vital for teaching/learning strategies. Bruning, Schraw and Ronning suggest (1999, p.78) that metacognition (an awareness of one's learning) can be a powerful tool in this process. Rehearsal is one of the methods of encoding information for later recall. Other methods include mediation, imagery, and mnemonics. These tend to be used in lower order learning where memorisation is the key. Active learning, on the other hand, assists learners to add, organise and enrich information. Bruning et al. (1999) further suggest that several methods are viable for this more complex learning, for example: advance organisers, schema activation.

The aspects mentioned in the preceding paragraphs have given us a general view on how students learn but we also need to examine how teachers teach. The common view of many educationalists is that there are currently two main methods of teacher instruction: teacher centred, where the focus is on the teacher as the centre and fountain of knowledge; and student centred, where the focus is on the student being actively involved in their own learning. 'Chalk and talk' is the favoured teaching strategy of the former whilst reciprocal teaching and co-operative learning are the main frames of the latter. Educational opinion
(Caldwell 1997, Maddux et al. 1997) suggests that there are very few teachers who use only one strategy and that combinations of strategies are common.

There are implications from the above for the implementation of IT on how teachers teach and how students best learn. The next section of the chapter will examine what the literature suggests about how IT might be best used as a learning tool in schools while keeping the above theories of teaching/learning in mind.

**Teaching and learning using IT as a learning tool**

_The development of new educational technology has presented educators with the tools to develop almost any teaching and learning structure that can be imagined...It is important to ensure that new approaches are better approaches. New approaches should be more flexible in adapting to teacher and student needs, should be more productive, allow students to participate in learning and should develop naturally from the classroom environment._ (Newhouse & Oliver 1991, p.34)

According to Schiller (1998), despite the huge expenditure of money and in many cases the availability of both software and hardware IT has not been integrated into the learning activities of many schools on a daily basis. This point needs to be taken a little further and harks back to the literature on the barriers to the professional development of teachers.

The literature indicates that it is generally not the students who are having trouble coming to grips with the new technology. As Williams and McKeown (1996, p.47) report:

... students when left to their own devices did not simply look up the information. They found an email address and began to interact with the source of the information; the person who wrote it. The students had pointed out to the teachers that the model of information was changing and that seeking first hand sources and interacting with others were the emerging skills and processes.
These skills and computer-aided instruction (CAI) and computer-managed instruction (CMI) have implications for the way we teach and the way that students learn when using IT. Fitzgerald and Krummins (1991, p.49) define for us what is meant by the terms CAI and CMI and their use in IT to assist learning. They explain that:

*Computer Aided Instruction (CAI) is the use of a computer, together with specially written software to teach concepts to learners. (...) With Computer Managed Instruction (CMI) the computer software will also instruct students to view other media (books, videos, pictures) and then test their understanding of the material before passing them onto the next stage.*

Newhouse and Oliver (1991) also argue that Computer Based Learning (CBL) has consistently been shown to be more effective than the use of traditional teaching methods and the use of computers in instruction enables teachers to bring learners to pre-designated levels of achievement and instructional goals more efficiently. Access to CD-ROM’s, the Internet and the WWW have added another dimension to the use of IT. These views are currently supported by Smith (1999a & b), Mambretti (1999), Newhouse (1998) and McKinnon (1995).

Newhouse and Oliver (1991) also argue, first, that the time taken to learn specific information is reduced through CAL and students are able to retain information learned through interaction with computers for longer periods of time when compared with other methods of teaching. Second, younger children are seen to gain more from CAL than older children and lower ability students are seen to gain more from the interaction with the computers than higher ability students. Another factor is that the biggest difference in achievement levels appears to exist in the science and mathematics areas (perhaps this is a reflection of the teachers who use CAL) and that the use of CMI is more effective with older students who appear to rely less on teacher intervention.
Finally, that the use of CBL applications tends to increase student motivation. This increase in motivation may in turn influence time on task. CBL applications and implementations, which involve student interaction with each other, constructivist would argue, tend to be more effective than drill and practice applications. If their findings are correct then IT (in the form of CAL, CBL and CMI) is an extremely useful tool for teaching and learning.

Abbott (1996) argues that for generations schools have been instruction and teacher centred but that the new technologies will involve discovery, the ability of the mind to learn spontaneously, both independently and collaboratively. This view entails a paradigm shift on how we look at knowledge and learning. According to Hall (1996) teachers will become mentors and facilitators and there will be a shift to ‘co-active’ learning. These views are to a large extent supported by Peterson and Facemyer (1996). Ewing, Dowling and Keats’ STARS (1996) project illustrated that by students utilising technology gains were made in problem solving ability, collaborative learning skills, high level of motivation and task involvement, enhanced self-evaluation skills.

Importantly the work of McKinnon (1995) suggests that when computers are integrated with other relevant activities into the curriculum, all have a positive synergetic effect on student learning. According to McKinnon (1995, p.330) when students used computers as an integral part of their study in the secondary school after a few years they:

> Appeared to take the computer for granted, came to see it as a normal part of their working environment and used it routinely as a writing, information processing and analysis tool.

Students in McKinnon’s study used the computers as a tool to assist and enhance learning. This situates well with most educationalist in the field of IT that see IT as a tool, not an end in itself.

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4 This was part of the Freyberg Integrated Studies Project in New Zealand.
We have seen that the use of IT can enhance learning, let us now relate this to our previously stated theories on teaching learning.

Maddux et al (1997) contended that there were four major theories of learning and teaching that guide the development and use of educational technology in schools. They were:

1) The behavioral model (which has been dominant until recent years).
2) Cognitive constructivism based on Piaget.
3) Social Constructivism based on Vygotsky and finally
4) Critical theory.

They argue that an examination of these theories should lead us to different approaches to the use of IT as a learning tool in schools. The behaviorist might find that drill and practice software and tutorial software are examples of this type. The constructivist might be more likely to utilise ‘problem-based learning and cognitive apprenticeships’ (p.86). The point being made here is that no matter what theory of teaching and learning we adopt, IT has relevance for enhanced learning for each theory espoused.

Newhouse and Oliver (1991, p.96) further argue that:

*Teachers are the key to good instruction whether using computers or not. The computer literacy of the teacher tends to affect the effectiveness of CBL implementations.*

They also contend (1991, pp. 96-97) that there is a variety of ways that teachers can utilise computers as a useful learning tool. These ways are summarised in the following table. (see over)
Table 3.5 Using computers as a learning tool

<table>
<thead>
<tr>
<th>TUTOR</th>
<th>TOOL</th>
<th>TUTEE</th>
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<tr>
<td>The computer is used to present new material to the student. The student works interactively with the computer, which evaluates performance and alters the presentation of new work.</td>
<td>The computer is used to complete tasks related to the teaching/learning programme. In this context teachers and students use programs with which the computer performs the specific tasks.</td>
<td>Student becomes the tutor.</td>
</tr>
</tbody>
</table>

Newhouse and Oliver (1991) are also mindful of the fact that the educational applications of computers should incorporate at least one of the unique characteristics of the technology and that there are much potential benefits to be gained by using computers in schools. This is in sharp contrast to Sava’s (1993) comment about removing them from schools.

This section has suggested that IT can be a useful learning tool in schools and can be used to assist learning no matter what theory of learning is espoused by teachers. It is important to examine what the implications this use as a learning tool might have for changing pedagogies and structures in schools.

Towards new pedagogies and structures in schools

*Interactive multimedia technologies have that added advantage of being able to present visual interpretations of the modeling or simulation process. Such possibilities provide a means of achieving a deeper understanding of the complex interactions and relationships involved in a real world system which may otherwise be beyond their resources, as well as developing higher order cognitive skills, the type of objective so common in recent curriculum reforms.* (Laurillard 1993, p.83)
Obviously Laurillard\textsuperscript{5} is suggesting that the use of inter-active multimedia has much to offer in the way of curriculum reform. Although discussing the technologies in relation to tertiary education it also has implications for pedagogy and structures in schools. Williams (1996) further advances this point. In discussing the use of IT as a learning tool in tertiary education, he makes some very relevant comments applicable to education in general and schools in particular. He points out that the challenge for instructors is integrating the resources into the curriculum, whilst admitting that the sort of interaction available using IT has not yet advanced to the point where it can substitute for the traditional classroom experience. However, he points out that although technology assists active learning, teaching methods and roles must change. This will mean changing content and appearance of curriculum on a regular basis.

According to Hack Barth (1997), curriculum must change to meet the new possibilities offered by IT. The recent distribution of suggested strategies to integrate technology into the curriculum in all KLAs in NSW government schools (Mawson 1998) suggests that the Board of Studies is also seriously involved in bringing about these changes in the curriculum.

Considerable work has been done in some places to ensure that curriculum change occurs to keep pace with the changing technologies. Smith (1999a & b) in Canada and Leino (1991) in Finland cite successful examples of this. There are other pockets of change but curriculum seems to be the area that is changing at the slowest rate. Collis (1989) suggests that one such result of the use of IT may be a move away from textbooks to teachers creating their own instructional material and thus a new focus for curriculum in the twenty-first century.

Students of today in many schools have access to a huge range of multi-media and other IT material. As Cornish and Monahan (1996) suggest these open up a whole range of interactive and other activities not previously available. This

\textsuperscript{5} Although this work was focussed on tertiary education it is still relevant to this study.
suggestion is reinforced by comments by Dyrli and Kinnaman (1996) informing us that student users can connect world wide as their lessons are happening, communicate instantaneously globally, participate in co-operative online projects, explore content themes interactively in an infinite variety of ways.

The case study by Feehan, Hall and Hancock (1994) made the following important points about students interacting with multi-media in the curriculum. They were emphatic that it was time for visionary but systematic guidelines to be established. Despite a commendable effort to address the issue of technology in the national curriculum statements there is still ambivalence about outcomes. They further argued (p. 35)

_Multi-media should not remain at the periphery of learning. Along with communication technology it presents the opportunity to cross the established pedagogical barriers in teaching learners how to construct new meanings. Interactive multi-media and communications are not issues for future consideration, they are essentially learning tools of the present._

The problem seems to be that like the essential preparation of principals for the introduction of IT, curriculum change is also not keeping pace with the implementation of IT. Perhaps the vision of Smith (1996, p.6) comes closest to the truth.

_Restructuring education at 'River Oaks' is a major and ongoing initiative. We have just scratched the surface of what we are capable of achieving. The vision is dynamic and not only changes from year to year but from month to month. I think we tend to limit the potential of students based on our own past experiences. Given the right tools and environment, students will no doubt surprise us in their initiatives and accomplishments._

Principals must be skilled leaders in change and change management if they are to understand, evaluate and implement the necessary changes in structures and pedagogy.
It has been suggested in this section that the implementation of IT as a learning tool also requires changes in structures and pedagogies and that this change should be continuous. In NSW, where the case study was conducted, there have been efforts to implement some changes in curricula by suggesting how technology may be used and integrated into the syllabi.

The literature has painted an uneven picture regarding the role of the principal in relation to the implementation of IT as a learning tool in schools. Many questions such as adequate physical and human resourcing have not been satisfactorily answered. We have also noted the scarcity of research both in Australia and overseas on the role of the principal in the implementation of IT in schools. Logically, we now examine the implications of the literature for the research study.

**Implications**

It seems certain that little real progress will be made with the introduction of IT in schools unless the principal plays an active role. What that role may need to be requires much more research but the available literature and research suggests that knowledge of IT, modeling, adequate resourcing, breaking down barriers to professional development of staff, collaboration, revision of current curriculum and structures, establishing effective learning communities may all play a part with other factors yet-to-be fully established. The leadership and change management skills of the principal would also seem to be very important.

Whether the principal's role will be similar in schools where the context is markedly different remains to be seen. The problems of implementation at an isolated far western one teacher K-6 school, a K-12 school of two hundred and fifty students in the central west, a large rural high school with over eight hundred secondary students or a large metropolitan school either Primary or Secondary would seem to be different. The level of resourcing, effect of outside
staff, for example, District Technology Advisers, and the context in which the principals operate are other areas of concern. There is also the question to be answered of whether the principal has a major or minor impact on IT or if their position as leader can, or is, assumed by other members of staff. We need to know whether principals are merely facilitators or ‘head learners’ and leaders.

One of the problems with looking at the work of Gerry Smith (River Oaks - Ontario) and ACOT (both in the Australia and overseas) is that they had significant resourcing both physical and human, not available in most government schools in NSW. The ACOT experience, though significant, was only across a limited number of schools in the U.S. and latterly in other countries (including schools in Australia) where massive resourcing and professional development were carried out over a decade.

A further essential element for the study, coming from the literature, is a close examination of the structure and pedagogical approaches of the various schools and teachers. Coupled with this is the type of leadership style of the principal and the role that might play in change management, which, in turn, might be critical to the success of the introduction of IT. The factors that enhance or create barriers to the implementation are obviously of major concern.

This study aims to fill the gaps in the literature and enhance what is already known in the areas under study utilising data from the interviews, surveys, observation and documents. Particularly, these instruments should focus on what is being taught/learnt, how it is being taught/learnt, any perceived barriers (including professional development of staff), the uses of the technology and the input of the principal in the implementation of IT as a learning tool.

The test for the researcher will be to look behind the mirror of the schools and see what part the principal plays in initiating and supporting IT's introduction and use as an effective learning tool.
Conclusion

It is evident from the research findings that the current use of computers in education, whilst still limited by access and teacher ability, is having a significant impact on student learning where they are utilised. The role of the principal and the teaching staff are also crucial. Gates (1999, p.403) argues persuasively that IT has the potential to do the following in schools:

They (PCs and the Internet) provide every student in every school and community with access to information and collaboration that before now was not available even to students in the best schools and (...) Successful use of technology in the classroom requires leadership.

Although IT is available in most schools to a greater or lesser extent, much usage is still experimental on the part of both student and teachers. The extent of technophobia by many principals and teachers (despite TILT) is still obvious and a barrier to the implementation of IT and the successful professional development of teachers. Current theories on teaching and learning may need to be re-examined in light of the emerging technologies. While some studies have indicated successful implementation of IT they are few and far between and there is very little information available on the role of the principal in the areas of leadership and change management in relation to this new innovation. Until this lack of adequate information and other associated problems are overcome and student access improved in all schools CBL, CAI and CMI may continue to be just an add on for many students or in some cases not even that. Schiller (1998, p.6) poses the following question and posits an answer:

...will school leaders merely straggle down the 'information highway'...research needs to be carried out...answers are needed to the questions.
The literature suggests that we do not have many of the answers. Principals need the support of further research if they are to successfully introduce and support IT in their schools.

**Summary**

This chapter examined the literature on the use of IT in Australia and to a lesser extent overseas. More specifically, it focused on the use of IT in NSW government schools. Questions of leadership and change management were reviewed. The problem of the barriers to professional development of staff and building learning communities was discussed. The chapter then went on to focus on aspects of teaching/learning, changing pedagogies and structures and how these might be related to the use of IT as a learning tool in schools. Finally it examined how the literature might guide the direction of the study. The following chapter will describe the research methodology utilised in the study.
CHAPTER 4

METHODOLOGICAL CONSIDERATIONS

Outline

In Chapter 3, the relevant literature and theoretical perspectives on the major questions being asked in the study were examined. This chapter describes the study’s research methodology. The first part of the chapter discusses the pilot study and the model developed from it. This leads to an exposition of the research questions. From this basis we will examine the approach taken to the study including an explanation as to why a qualitative multiple case study paradigm was used as a research methodology and how it might lead to an appropriate 'grounded theory' in relation to the research questions posed. This section also details the researcher’s role and provides a brief description of the case study schools. The following part of the chapter describes the instruments used to collect the data. Finally, the chapter details the methods of data analysis used in the study.

Introduction

This chapter explores the methodology used in this study including relevant background to the study and the developmental process that the researcher went through that led to the research design, the data collection techniques utilized and the data analysis of the study. It will be argued that the most effective way to develop an appropriate ‘grounded theory’ (Strauss & Corbin 1998) in relation to the research questions asked was by utilising a multiple-case study method combined with a qualitative research approach.
According to Strauss & Corbin (1998, p.3), 'methodology is a way of thinking about and studying social reality' and the method is, 'a set of procedures and techniques for gathering and analysing data'. This chapter will look at how the data were collected and analysed and the methods of comparative analysis that were adopted to obtain the results from the research data that underlie the discussions in Chapter 6. This includes a brief examination of how the raw data from interviews were 'broken down' and categorised\(^1\). This collection and analysis was influenced by the work of Strauss & Corbin (1998); Glaser & Strauss (1967); Silverman (1993) and to a lesser extent Yin (1994); Stake (1995) and Cohen & Manion (1989). The researcher's role and the context of the case study schools was also seen as important to the methodology and this will also be covered briefly. There will not be a detailed discussion of the case study schools given here, as it will be fully covered in Chapter 5. Finally, decisions about the modes of analysis will be examined.

This research study grew out of a pilot study conducted in 1997 in three country schools. Prior to detailing the approach taken in the major study the pilot study will be briefly described.

**The Study**

**Pilot Study**

In 1996 two large secondary schools in rural NSW were visited. One of these was supposedly a 'beacon' school in the use of IT. Relevant principals, staff and students were interviewed and limited observations were carried out. A small number of students and staff were surveyed about their use of Information Technology. Following an analysis of the data obtained, a model was constructed from this pilot study and updated by visits to various schools before the research commenced. This was used as a guide only. Limited theory testing did grow out

\(^1\) Categories: concepts that stand for phenomena. (Strauss & Corbin 1998)
of the data collected and analysed but it must be pointed out that the following model was not meant to espouse any theoretical position but merely simplify a very complicated interaction of pedagogical, physical and educational items. This model was also useful to indicate my thinking at the time the study commenced, that is, the beginning of 1998.

Figure 4.1 The role of the principal in the introduction of IT
As can be seen the model developed from the pilot research is a relatively complex model. I felt that any further simplification, however, might fail to show the complexity of the relationships I believed existed (at that time) between the issues involved.

The pilot study also uncovered a variety of models of teaching practice utilising IT as a learning tool in the classroom. They appeared to fit somewhere between the two extreme of full utilisation as a learning tool and use mainly for games and ‘fill ins’. These were used as a guide to assist with the type of questions asked in interviews, the survey questions, my observations and the documents collected in the major study.

The pilot study, the model and a review of the literature led to the posing of the key questions for the major study. Consequently the main research question that this study seeks to answer is:

What is the role of the principal in implementing Information Technology (IT) as a learning tool in schools?

When examining this question the following sub-questions are also of significance.

- What factors positively influence the implementation of IT as a learning tool in schools?
- What are the barriers to the implementation of IT as a learning tool in schools?
- How is IT currently used as a learning tool in schools?

These questions then led to decisions about the approach that should be taken to adequately answer these questions.
Approach

The use of Information Technology as a learning tool in schools is a relatively new concept for most teachers and principals. The case study schools were selected for the research because they were seen to be successfully endeavouring to introduce IT as a learning tool and this effort was strongly supported by the principal.

Case Study

As the context of the research is of great importance it also logically leads us towards a case study approach. This contextual view is strongly supported by many educators but especially Sherman and Webb (1988) and Tuckman (1994). Sturman (1997) and Yin (1994) argue that a case study approach allows the investigator to retain a holistic view of real life events.

The object of the study, the principal's role in supporting IT as a learning tool in schools, lends itself more towards research methods that are more 'interpretive and subjective' (Cohen & Manion 1989, p.120). Whilst case study is not the only research method available that is interpretive and subjective, it has been suggested by Yin (1994) and Stake (1995) that this type of exploratory research is probably best suited to this methodology. The merit of the approach and methodology selected should reflect the problem being solved and the appropriate concepts and kind of knowledge one is seeking. Keeves (1997), to a large extent, shares this view. As Adelman (1980, p.146) notes:

*Case studies present research or evaluation data in a more publicly accessible form than other kinds of research report... The language and the form of the presentation is hopefully less esoteric and less dependent on specialised interpretation than conventional research reports. The case study is capable of serving multiple audiences. It reduces the dependence of the*
reader upon unstated implicit assumptions...and makes the research process itself accessible... They are a 'step to action'.

These views are also supported by Cohen & Manion (1989).


*It is now widely accepted that there are many approaches to educational research whose methods, traditions and theoretical positions that interchange or cut across each other to a lesser or greater extent*.²

It was felt that the most appropriate approach to finding answers or appropriate responses to the questions posed lay with the case study approach.

**Multiple-case study**

The decision to conduct the study at multiple sites was not taken lightly but it was felt that this should be acceptable to educators (especially principals) to ensure that the evidence obtained would be more 'compelling and robust' (Yin 1994, p.45): I believed it was also important to be able to compare what was happening in different types of schools and thus inform a wider educational audience. By choosing three similarly sized primary schools logic suggests that the degree of predictability of the results should be high. By using two other types of school (central and secondary) they might produce contrasting results but for predictable reasons, that is, differences in sizes and structures.

By using a multiple-case study approach 'phenomena' (Strauss & Corbin 1998, p.101) might become clearer as the issues were seen across a broader cross section of schools and principals and allowed for better comparative analysis and thus a more predictive³ 'grounded theory'. The theoretical framework initially suggests that the 'phenomena' is more likely to be evident in 'beacon' schools

² See also Walker and Evers (1994)
but under which conditions is more problematic. The multiple case studies will
guide us in answering these questions and thus allow us to tentatively predict in
similar cases.

Qualitative v quantitative research

Burns (2000, p.11) argues that qualitative research stresses the ‘validity of
multiple meaning structures and holistic analysis, as opposed to the criteria of
reliability and statistical compartmentalization of quantitative research’. I
believed that the best approach to successfully answering the research questions
posed was a holistic approach that did not seek to compartmentalize data but
allowed it to either stand on its own or cross barriers that might have been
created by a quantitative statistical approach. This is not to suggest that I do not
see the value of the use of a quantitative approach in educational research but
believe it is problematic when dealing with an innovation such as the
implementation of IT in schools. As a consequence of the stated reasoning in this
last section of the chapter I decided on a qualitative multiple case study design
for the major study.

Let us now examine more closely the appropriateness of qualitative research and
grounded theory for this study.

Qualitative research and ‘grounded theory’

According to Strauss and Corbin (1998, p.11) by qualitative analysis we are:

... referring not to the quantifying of qualitative data but rather to a
nonmathematical process of interpretation, carried out for the purpose
of discovering concepts and relationships in raw data and then
organizing these into a theoretical explanatory scheme.

They go on to further suggest (p.12) that ‘grounded theory’ is theory:

\[\text{To be able to predict in certain similar cases.}\]
... that was derived from data, systematically gathered and analysed through the research process. In this method, data collection, analysis, and eventual theory stand in close relationship to one another.

The following point-by-point detailing of the development of the method and the accompanying table (Strauss & Corbin 1998, p.7, pp.10-11) illustrate this thinking. The methods involved include:

(a) The need to get out in the field to discover what is really going on.
(b) The relevance of theory, grounded in data, to the development of a discipline and as a basis for social action.
(c) The complexity and the variability of phenomena and of human action.
(d) The belief that persons are actors who take an active role in responding to problematic situations.
(e) The realization that persons act on the basis of meaning.
(f) The understanding that meaning is defined and redefined through interaction.
(g) A sensitivity to the evolving and unfolding nature of events (process).
(h) An awareness of the interrelationship among conditions (structure), action (process), and consequences.

As a consequence the following were given as essential characteristics of this researcher as a 'grounded theorist'.

**Table: 4.1 The Grounded Theorist**

<table>
<thead>
<tr>
<th>Characteristics of a Grounded Theorist</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The ability to step back and critically analyse situations.</td>
</tr>
<tr>
<td>2. The ability to recognize the tendency towards bias.</td>
</tr>
<tr>
<td>3. The ability to think abstractly.</td>
</tr>
<tr>
<td>4. The ability to be flexible and open to helpful criticism.</td>
</tr>
<tr>
<td>5. Sensitivity to the words and actions of respondents.</td>
</tr>
<tr>
<td>6. A sense of absorption and devotion to the work process.</td>
</tr>
</tbody>
</table>

Glaser & Strauss (1967) suggest (p.1) that grounded theory is theory obtained from data and ‘... Most important, it works - provides us with relevant predictions, explanations, interpretations and applications’. This seemed highly relevant if the conclusions were to be used for future prediction.
The researcher's role

According to Hammersley (1995, p.55) the researcher is the 'research instrument *par excellence*'. My earlier biography is therefore an important part in understanding the theory building, which underpins Chapter 6, and is utilised throughout the study. Also of great relevance is an understanding of how my thinking on the use of IT developed over the past decade and how the collection and analysis of data for first, the pilot study and second, the major study developed and led to the completion of this thesis. On the following page I have summarised this thinking on IT and the collection and analysis of data. The table does not divide evenly into years as much of the thinking and action by the researcher crossed these yearly boundaries.

### Table 4.2 Use of IT (personal, schools, and education- development of concepts)

<table>
<thead>
<tr>
<th>Year</th>
<th>Relationship with the use of IT in schools and education</th>
<th>Development of personal concepts of IT as a learning tool and associated theory building</th>
</tr>
</thead>
<tbody>
<tr>
<td>1985</td>
<td>Completed course - 'Computers in the Public School' at MCAE(^5).</td>
<td>Nil - saw little use except as a word processor and a useful toy.</td>
</tr>
<tr>
<td>1993-95</td>
<td>Investigated the use of computers as a learning tool in several Nth West schools. Bought our first computer and printer at home.</td>
<td>Noticed that without the support of the principal, very little was occurring despite some 'bright' spots and some knowledgeable and keen staff.</td>
</tr>
<tr>
<td>1996-97</td>
<td>Appointed Principal of Coolah Central. Attended IT conference in Sydney and listened to Gerry Smith from 'River Oaks'(^6) on how his school had utilised IT as a learning tool. Met the new Technology Adviser for our District. Networked the school. Opened a learning centre. Put</td>
<td>Our school computers were locked up in a lab. and in a few public classrooms for games. Re-activated the technology committee and we started thinking about the use of IT as a learning tool. Surveyed students, staff and community. Conducted extensive professional development of staff. Conducted pilot study on the use of IT in schools.</td>
</tr>
</tbody>
</table>

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\(^4\) The data collection and analysis will be detailed in a later section of the chapter.

\(^5\) Mitchell College of Advanced Education.

\(^6\) Canada. See Chapter 3.
As well as the biography of the researcher another aspect of the role that is relevant to the study is the researcher’s relationship with the participants. Delamont (1992) reminds us of the necessity of giving relevant status to all participants and the avoidance of closer associations. Whilst I was conscious of these associations (my friendship with some of the principals), I believe, like Silverman (1993) that although it must be considered in any analysis it was not a major problem as I was very aware of the matter and open and forthright with all participants as they were with me. I made sure that I did not socialise with any participants and made clear to my friends that this was an academic study, not a chance to pursue our friendship. They respected the difference.

Another factor to be considered was gender (Silverman 1993), especially as myself and four of the five principals were male. I tried to obtain a more balanced view by interviewing more female teaching staff and raised gender issues with them and all principals. This gender issue was also assisted by
discussing aspects relevant to the study with the District Technology Adviser who was also female.

It is opportune to now briefly consider the case study schools.

The case study schools

All schools selected for the major study had been using IT extensively before the government rollout; referred to in Chapter 2, and were considered to be ‘beacon’ schools in the use of IT. As the results of the case studies illustrated, the outward signs of being a 'beacon' school, on closer examination, sometimes did not match the reality. In relation to being a ‘beacon’ school, each of the schools was considered to have made outstanding progress in the implementation of IT by the District Technology Adviser using one or more of the following criteria.

- Was Nationally or Internationally recognised leaders in the field of the use of IT in schools or had won awards for a particular aspect of the use of IT, for example, Rural High and River Valley Public.
- The principal was seen as a leader in the District in the implementation and use of IT in their school, for example, Explorer Public and Vineyard Public.
- The Technology Adviser suggested that the school staff and principal had reached a high level of implementation of IT as a learning tool in their school, for example, Merino Central.
- They were from rural education districts.'

Being a ‘beacon’ school was also combined with an element of purposive sampling in the selection of schools. This was necessary to obtain a cross section of representative schools with at least one isolated rural school, one Central school and one Secondary school.

Over twenty-five schools were visited prior to the selection of the five case study schools. The schools initially visited ranged from a small one-teacher school in the far North West of NSW to a large Sydney metropolitan school. It was felt that by broadening the scope of the initial schools visited a better overall selection might be made for the major study.
From my observations and with the assistance of the technology adviser of a local education district, those finally selected were considered the most representative for the research involved. As previously mentioned, an attempt was made to ensure a good cross section of rural schools by selecting one large secondary school from the Central West of NSW, one K-12 central school from the Central West, a moderately sized isolated public school and two relatively large public schools from different NSWDET education districts. One public school was from the North Coast, another from the Far West and the final public school from the Central West.

The principals of all the case study schools selected were all seen as leading educators not just in IT but also in education generally. In fact, at one of the schools I visited they had staff from two other states and one other NSW school visiting whilst I was there. Other case study schools had won major awards in IT over the past two years. The case study schools\textsuperscript{7} were:

1. Vineyard Public, a large public school in the wine growing district of Central Western NSW (student population approximately 600).

2. Explorer Public, a moderately sized isolated rural public school with a significant Aboriginal student population (student population approximately 230).

3. Rural High, a large secondary school (student population approximately 800) set in a large regional centre. It is the hub of the district and close to NSWDET education district resources.

4. Merino Central is a K-12 school of approximately 230 students between Bathurst and Dubbo in the Central West.

5. River Valley Public is a fairly large North Coast public school (student population approximately 350) set in a rural environment a little way from the coast.

\textsuperscript{7} The names were chosen to provide anonymity to the participating case study schools.
Considering the time factor and my finances it was not possible to spend long periods of time at individual schools but all schools were visited at least twice with some schools visited three times. On most visits I stayed for between two and three days with follow up visits to talk over various points with principals and staff, make further observations and to allow principals to review their personal interviews. Interviews were transcribed for principals and copies given to the respondents for final checking for accuracy.

It was felt that it was important to establish just what was occurring in schools as far as the use of technology in the classroom was concerned. Thus a great deal of effort was spent eliciting information from all affected about what was really happening in the classrooms. This was accomplished through interview, observation, collection of relevant documents and survey. Although an integral part of the study the survey of staff and students was not seen as a major source of data and no statistical analysis was carried out. It was hoped to survey approximately forty students and staff from the five schools to support the findings of the other data and to elicit responses from a greater number of students and staff than might have been possible by interview and observation alone. A descriptive analysis of the surveys was carried out. Let us now examine how the data were collected for the study.

**Data collection**

Tuckman (1994) suggests that interviews, documents and observation relating to the phenomena under investigation are all-important sources. In the collection of my data I was mindful of this and other similar comments, particularly the views of Strauss and Corbin (1998), Yin (1994) and Stake (1995).

The main sources of data utilised in this study were interviews, observations, surveys and collection of relevant documents. The data were collected over
eighteen months in 1998 and early 1999. A more detailed table of the visits to
case study schools is given as Appendix H. As previously mentioned most
schools were visited at least twice for between two to three days and the closer
schools three times. All participants in the study gave informed consent in
writing and were free to withdraw at any time. Ethical clearance was obtained
from the Charles Sturt University Ethics in Human Research Committee.
Approval was also sought and gained from the NSWDET to conduct research in
government schools.

Interviews, observations and documents were continuously conducted/collected.
Field notes were made from the end of 1997 (when schools were first contacted).
In the following section, each of the data collection strategies utilised will be
described.

Interviews

*What is covered in the interview is targeted and influenced by the
interviewers. Interviews that follow the whim of the interviewee may tell
us quite a bit about the interviewee but so often not what we need to
know...*

(Stake 1995, p.66)

I was cognizant of Stake’s words from the very start of this study and
consciously reflected before and after each interview on my approach. The
interviews were all semi-structured, that is, they all contained a group of similar
relevant questions for principals; a slightly different set of questions for staff and
similar but slightly different again for students of the case study schools. This
interview structure allowed for further questions to be added as the interviews
flowed. Initial interview schedules were arranged by the principals prior to my
first visit and were normally conducted on the first day of the first visit,
commencing with the principal. Each person or group was audiotaped. No staff
or students refused my request for audiotaping. At each interview I also took
brief notes. These notes assisted in the asking of relevant follow up questions.
All principals were interviewed at least twice. Fifteen staff from the five schools were interviewed individually. These staff included the librarian and technology co-ordinator where available and other staff seen to be using best practice in IT by their principal. Many other staff were also questioned at morning tea/lunch or during observations and these discussions entered in my field notes. Twelve groups of between three and five students ranging from Year 4 through to Year 11 were also interviewed. In all this gave over thirty-seven semi-structured interviews\(^8\) (including the principals) and a large amount of interesting raw data was collected. Baker (1982, p.109) gives us food for thought in regard to these interviews when stating:

> *When we talk with someone else about the world, we take into account who the other is, what that other person could be presumed to know, 'where' that other is in relation to ourself in the world we talk about.*

Before each day of interviews I re-read Baker’s statement and in drafting the relevant questions for the people to be interviewed I had the quote and the previous one of Stake in my thoughts. As a consequence, interview questions were mostly open ended and general\(^9\) and focused on the introduction and use of IT in schools. This allowed respondents to give more generalised information initially that might not have been forthcoming from just a list of questions.

Interviews varied in length but were approximately thirty minutes for teachers and small groups of students and approximately one hour for principals. Principals also had a follow up interview, generally about thirty minutes, after the initial interviews and observations to clarify or expand on information collected. Comparative analysis occurred throughout enabling additional follow up questions to test or illuminate categories and concepts.

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\(^8\) As well as this there were ongoing discussions with principals, staff and students recorded in my field diaries.

\(^9\) See Appendix D
All questions and discussions were based around the use of information technology in the school, the interviewee’s personal use, other staff and student use, workplace learning strategies, and how IT was being utilised as a learning tool in the school. All respondents were asked what role the principal and others had in IT’s introduction, support and integration or otherwise into the school. More specific questions flowed from matters raised from the answers to the more general questions. Although certain pertinent questions were asked of a variety of respondents, other than in the formal interviews, the approach always tended to be open ended and further flows of relevant information were encouraged from all members of the school community.

These interviews (and other data collected) were initially coded utilising an ‘open coding’ (Strauss & Corbin 1998; Glaser & Strauss 1967) process. Strauss & Corbin (1998, p.101) describe this as: ‘The analytical process through which concepts are identified and their properties and dimensions are discovered in data’. Surveys were also used as a data collection technique.

**Surveys**

The main focus of this research was on the role of the principal in supporting the implementation of IT as a learning tool. The substantial interview data collected from the principals and my subsequent observations were of prime importance. Staff interviews and surveys were used to support this data. There were twenty five students and seventeen staff surveyed from the five schools. The interviewing and the surveying of students were to ensure that information gleaned from the principal/staff interviews was supported by data obtained from the students. The staff/student survey data was used as a source of data in its own right, to inform later interviews and to confirm information received in these interviews. It was important for the purpose of assisting triangulation to be able to confirm, even by small sampling, the data collected from interviews, documents and observations.
Staff and student surveys\textsuperscript{10} were conducted on the first visit to each case study school and allowed ongoing feedback into the process. Only small numbers of staff and students were surveyed at each school as I wished to quickly analyse the results prior to staff and student interviews.\textsuperscript{11} The questions were a mixture of 'Likert' style questions requiring a rating from 1-5 to more open-ended responses. They contained many similar questions to the interviews. Early survey questions sought to establish the knowledge and use of IT. Later questions focused on its use as a learning tool in the school. In the staff surveys issues of professional development and the role of the principal were also asked. The analysis was purely descriptive (see Appendix C). It was not possible to focus on all aspects of the use of IT in the school. It should be reinforced, however, that the main focus was on the role of the principal, not the effectiveness of the use of IT as a learning tool. Such an important question as the latter needs to be the subject of further study. Interviews, surveys and observations gave a rich source of data on the role of the principal. Observations were critical to the data collection process.

\textbf{Observations}

\textit{What is observed is usually not controlled by the researchers, they go to where the things are happening, with the hope that as (things occur) they would have happened had the researchers not been there.}

(Stake 1995, p.66)

As Stake suggests we cannot set up what is happening in our observations but by a methodical and varied approach much can be learned to confirm or add to data already collected by other methods. Observation\textsuperscript{12} of the principal, selected members of staff, for example the librarian, computer co-ordinator and a cross section of other school staff and classes assisted in triangulation.

\textsuperscript{10} The surveys are included as Appendices A & B. The results as Appendix C.
\textsuperscript{11} More extensive surveys will be conducted in a follow up study.
\textsuperscript{12} Recorded in my field notes.
These observations also included timed tours of the school on a daily basis to obtain a picture of the overall use of IT at any given time by all staff. These tours were taken at different times and on different days. In each school at least ten classrooms [some more than once] were visited for periods of time ranging from thirty minutes to one hour.

I also took time to visit the local shopping centres and spend time at lunch in the playgrounds chatting to staff and students. Most morning tea times were spent in the staff common rooms interacting with staff and absorbing and soaking up the culture of the school, particularly as it pertained to the use of IT and the role of the principal in its introduction and support.

Documents and Field Notes

The examination of relevant documents and students’ work e.g. policies, projects, presentations, annual reports were also included to aid triangulation. Field notes were taken on a continuing basis, commencing with my visits to other schools prior to the selection of the case study schools. Notes were also taken at a variety of conferences I attended from 1997 to 1999 on the use of IT in schools. The field notes included the observations; relevant comments from staff and students on the use of IT other than those directly interviewed. It also included information on the communities and the IT arrangements in each school.

Comparative analysis was an ongoing process and influenced later interviews, observations and data collection. The data collected from all the sources listed in this section of the chapter were analysed using the processes and techniques delineated in the following section.
Data Analysis

According to Keeves and Sowden (1997) there are four main stages in research into educational problems. They involve the design of the investigation, the collection of the data, an analysis of the data and finally summarising and integrating the findings. They further suggest that the initial steps involve data reduction using a coding process. This view is supported by Strauss and Corbin (1998).

Miles and Huberman (1984) suggest that the process of analysis be then continued by sorting this information into a matrix of categories. Accordingly data collected from field notes, interviews and observations were analysed utilising an open coding process. This allowed grouping into concepts that pertained to the same phenomena. Factors such as frequency and extent were examined to enable comparisons for similarity and difference both intra individual case study schools and inter all case study schools selected. Although the vast majority of analysis was qualitative it was supported by a descriptive statistical analysis of staff and student surveys.

As the interviews were transcribed relevant words or statements were highlighted. These highlighted words and statements were then identified using a word or, in some cases, several words. Where necessary, appropriate memos were added to clarify the thinking in regard to the data collected and the research questions being asked. This assisted with early open coding and the writing of small memos and comments.

The interview data, observations, surveys and other material were inter-referenced and enhanced each other. The conceptualised relationships were then put in a series of hypotheses/propositions that addressed the key themes and issues to establish a ‘grounded theory’ on the implementation of IT in schools and the role of the principal. From the above analysis tentative models were
formed to allow further prediction and testing of the ideas as more data was analysed.

Throughout the collection and analysis of data, triangulation was an important issue to assist with validation of the material.

**Triangulation, validation and reliability**

No one set of data, for example interviews, is sufficient to validate a researcher’s conclusions. According to Cohen and Manion (1989) and Burns (2000) it is the triangulation of various sources of data that gives validity to the claims expounded. This study has used data obtained from interviews of the principals and compared it with interviews of staff and students within the individual schools and then across the schools. This intelligence has then been crosschecked with data obtained from staff and student surveys and finally from observations, field diaries and relevant documents. It is felt by the researcher that this has strengthened considerably the arguments advanced.

Reliability is based on the ability of a study to be successfully replicated (Burns 2000). This is problematic for qualitative research because it occurs in natural settings and as this case study is recording a change process in regard to the implementation of IT it is impossible to replicate. Burns (2000, p.417) argues that reliability in qualitative research should focus on: ‘the fit between what they record as data and what actually occurs in the setting under study’. By delineating the context (Chapter 2), various perspectives of the research questions (Chapters 1 and 2) and explaining the procedures for data collection and analysis (Chapter 4) this reliability can be achieved satisfactorily. This reliability also assists with validation of the results obtained for the study. The following figure illustrates this validation and triangulation process.
Figure 4.2 Triangulation and validation

Conclusion

It was argued in this chapter that a qualitative multiple case study was the best approach to utilize in the research. Reasons advanced included the need for a holistic approach to the research study and the dangers of using a quantitative approach in a natural setting where an innovation (the implementation of IT) was being examined. The issues of how data were collected, processed and finally analysed were detailed. It was stated that data were collected using semi-structured interviews, surveys, observations and the collection of relevant documents. Analysis was an on-going process utilizing an open coding process.

The questions of validity, reliability and triangulation were posed. It was suggested that reliability (the ability to replicate results) was problematical in qualitative research. The argument was advanced that comparative analysis and
multiple triangulation assisted in validation of the results. Finally, it was argued that the methodology that was utilized would assist in the development of ‘grounded theory’ in regard to the issues highlighted by the research questions.

Summary

This chapter focused on the methodological considerations, examining the case study approach and selection of schools. This was followed by detailing the approach, including why a qualitative multiple case study research design was used. Finally, elements of how the data were collected and analysed, including questions of reliability, triangulation and validity, were examined. The following chapter will give a detailed background of the case study schools supported by brief edited sections of appropriate interviews and, where relevant, observations and material to support this background detail.
CHAPTER 5
THE CASE STUDY SCHOOLS

... extended transcripts are rarely available; these would be very helpful in order to allow the reader to formulate his or her own hunches about the perspectives of the people who have been studied.

(Bryman 1988, p.77)

Outline

The last chapter highlighted the methodological considerations of the study. This chapter will describe the case study schools. The main body of the chapter will view each school in turn, examining the culture, locations and backgrounds of the schools and their communities. For each case study school, extracts from interviews will assist to provide the principal’s perspectives. Relevant material from surveys, observations, field diary and other material collected will be added where appropriate. In this chapter a descriptive picture of how IT operates in each school and what role the principal has played in its implementation will be painted.

Introduction

In detailing the background of the case study schools, interview text has been used to support various aspects. This text should thus give readers a broader vision, not just from the researcher’s eyes, but also from the principal’s¹ and others.

Each of the case study schools was different in many ways, not just the fact that they were years K-6, K-12 or 7-12. They were different geographically, had very different school and local cultures and the principals ran their schools in different

¹ Edited transcripts of the first interviews with principals are available as Appendix E.
ways with differing management styles and personalities. However, what they all had in common was the desire to ensure that their students would not be relegated to Parker's (1999) 'techno-coated Dark Ages'. Let us however keep in mind that the implementation of IT in most schools was in its infancy and one should not expect, even though these were 'beacon' schools, a proliferation of 'second order' (Maddux et al 1997) or higher order learning activities at this stage.

In each case the principals were very co-operative and personally set up interviews, observations, handed out and collected surveys. They were all very proud of their schools and were seen to be educational leaders, not just in information technology but also in other fields.

Each case study school will be described to give readers a background view of the community, the school, its context in regards to the implementation of IT, the principal, staff and students. This will include extracts from the interviews with the principal and selected staff to assist in setting the context for information technology in each school. The interviews will be supplemented at times from my observations, the surveys and my field diaries. Some general comments will be made as to the extent of involvement of the principal in the implementation of IT as a learning tool. This format will be followed for each school. It is hoped that by giving this background material it will be possible for emerging patterns relating to the research questions to become apparent. Principals will be identified by the first initial of their Christian name and the first two letters of the school and staff by the first few letters of their given names.² The focus will now move to Merino Central to examine background details relevant to the study.

² The principal of Merino Central becomes DMe.
Merino Central School

Geographical and educational background

Merino Central is set in the wool, and to a lesser extent, the wheat heartland of NSW. The school serves a small rural community based on the above rural industries. It is also a feeder (secondary) central school for another small town nearby. It is situated relatively close to two large rural cities\(^3\) and thus some students bus to the larger schools. There is also a tendency for the more able and wealthy students to attend private schools after year six. The town, like many small towns, is struggling to survive the rural downturn but they have a general store, hotel, newsagent, craft shop, garage, club and a few businesses that come and go. They have good sporting facilities including a bowling club, tennis courts and well maintained sporting fields.

The school and IT in 1998/9

The school is the centre of the community and is very well maintained with new sections currently being built for the secondary department. This section will be fully networked. They have a beautiful, well-resourced library, with Internet access, a computer laboratory in the secondary area and another in the primary/infants school area. A senior resource centre also has Internet access. Most of the primary/infants school classrooms have a few computers of varying ages.

The school won an award in the secondary department in 1997 for outstanding achievement in one of the areas of IT (careers). They have an active technology committee and several committed and knowledgeable staff in the use of IT. They, like all the other schools in the district, have limited access to the District

\(^3\) Both with populations between 30,000 and 40,000 people.
Technology Adviser who services fifty-eight schools. During TILT\textsuperscript{4} many more staff (including the principal) did the training than was necessary or required.

DMe (...) When I first came here, I checked if we had done TILT and the answer was, 'No', so we did TILT, ... the second half of last year. We had funding for six, but we had twelve do it. ... Some only did what they needed to ... others did the whole lot. That was important. (...) 

The school is also involved with a special program called 'ACCESS' with its senior secondary classes where several schools are linked by a number of different technologies for a variety of subjects.

DMe (...) The senior school and some staff are dependent on IT as we are part of an 'ACCESS' group, so IT across the seven schools is crucial to the program.

The principal and his perspective on IT

The principal is a keen, resourceful and energetic man. He is relatively new to the job but came to Merino Central with an excellent reputation as an educational leader that he has maintained and furthered. Whilst not an Information Technology (IT) expert he is quite at home with the technology and is keen for its integration into normal classroom practice.

DMe (...) I'd like to be able to say I'm a role model ... but I'm not a 'technocrat' myself but I can encourage and facilitate. (...) 

... The limitation is my own technological capacity. I haven't had very much training in technology. I've never had any formal training, never had training in any software program. I did the TILT program, which I found useful. I gave others priority, but I went along. (...) 

... I believe that as a school we have been successful in seeing the role of IT in teaching/learning ... especially the primary classes and we had a community funded lab. and Internet access, so I think that those people recognised the importance of IT (...) 

\textsuperscript{4} Technology in Teaching and Learning
in the future we make sure it's used as a tool and does not become the focus.

The staff and students

The staff, like many central schools, are a mixture of young, enthusiastic teachers and older staff who have been there a long time. My interviews, observations, discussions and the surveys illustrated that the staff was such a mix, with the full range of IT abilities. Very few staff seemed technophobic but some had reservations about its usefulness. The librarian and computer co-ordinators were keen to get the best use out of IT for the staff and students.

DMe (...) The librarian would like to have more desktop computers and Internet in there for access for kids. (...)  

The students ranged from upper middle class to very poor. A reasonable percentage had computers at home but very few were as yet connected to the Internet. Academically, culturally and on the sporting field they achieve slightly above the norm for the District. All the students I interviewed were very excited about the use of IT in the classroom and most were computer literate.

My first visit

It was the middle of August in 1998 before I arrived for the first of three visits. Due to the distances involved between the case study schools, I had done most of the preliminary arrangements by phone and fax. As my first appointment with the principal was not until 9.30 a.m., I toured the town, getting a feel for the place, bought a newspaper and talked to the shopkeeper about the town and school. [This scenario was repeated in every school] The school was highly respected, as was the principal. I drove up to the school and watched the students getting off the buses and entering the school. They seemed like typical country kids, big smiles and apparently happy to be at school. I drove around the school block to get a general picture of the well kept and graffiti free school.
As I walked into the school I noticed a proud sign detailing their success in the statewide IT competition at the front gate. Giving my name at the front office, where two ladies were already working on computers, I was ushered into the principal's office. It was neat and tidy with a laptop sitting on the side of an uncluttered desk. We knew each other well so I asked if I could do a quick tour of the school before we started the first interview. I wanted to see what they had in the way of technology and who was using IT in their lessons. As this was my first school, I felt this might assist and guide a few of the later questions.

The school was much as I expected. Computers in most primary/infants areas; a laboratory shared between two primary rooms; a laboratory in the secondary area; a special room with computers and radio for the secondary access program and a well-maintained library. Internet access was available in the library, 'ACCESS' room and the secondary computer room. In the primary area students were using computers in two classrooms and the laboratory was also in use. In the secondary area the laboratory was being used by a Year 10 Computing Studies class. The librarian in the library was using the Internet. No other secondary students were using any sort of IT.

**DMc (...)** The limitation in secondary has been that we haven't had computers in classrooms. We have two computer laboratories, one Mac the other IBM and then it's been dependent on teachers booking it up to use for a class or the teacher confident enough to go up and use it as part of the lesson. I've observed that in a number of secondary classes i.e. science and history. I haven't observed that in English.

The students were very well behaved and staff and students greeted the principal in a friendly and respectful fashion. I told DMc he had a charming school. We made coffee and as the common room was empty, we sat down for the interview.

**Staff/students’ perceptions of the principal and IT in the school**

The staff in particular felt that the principal was extremely supportive and proactive in the introduction of IT into their school and in addition they looked to
him for leadership in this area. The comments of firstly the computer co-ordinator and secondly, the librarian, illustrate this.

**Dar**. DMe has been very supportive since I’ve been here. (...) not only of introducing new technology but looking at software and training and development for myself. (...) DMe, myself and several others are on a technology committee and on that he's very proactive in seeing that technology doesn't stagnate. He's keen, open to suggestion, very diplomatic.

**Librarian** You couldn’t have had a better principal at this school. He’s got a wonderfully broad vision. He knows what’s happening in IT. Also he’s keen to promote IT in relation to the relative lack of facilities we have in this school ... because of its' isolation and numbers. There are many things we can't do but DMe is an excellent facilitator. ... I’ll go up to him with a written proposal and he’ll look at it and say: ... ‘Here’s something we can do now, ... here’s something we can do further down the track’. (...) 

**General Comments**

The principal assumed a leadership role in the implementation of IT and used a collaborative approach to the implementation of IT as a learning tool via the technology committee. He was very concerned that it should not be just seen as an 'add on' and that staff were adequately trained. While he used technology himself he was worried by his lack of expertise in this area. His approach was to facilitate and encourage the use by the rest of his staff.

**DMe** (...) Just that I feel as a principal I am inadequately trained and I feel it's my responsibility to do something in regards to my professional development but I'm so embedded in other things it's difficult but we need to make it a priority, ... and also to look at what other schools are doing. I’d like to look at other school sites. ... At the moment I’ve tried to give the chance to others. (...) 

**Explorer Public School**

**Geographical and educational background**

Explorer Public School is part of ‘outback’ Australia and was established in 1886. The town of three and a half thousand people is situated near one of our major river systems. Tourist brochures call it 'Mateship' country. As you walk
around the town you are struck by its outback beauty, only spoilt by a visit to the main shopping centre after closing time. You then see the bars and shutters on the shop fronts. This is the explorer country of Bourke and Wills. It has a high indigenous population that is also reflected in the school population. While mainly a rural centre with cattle, cotton and a variety of other pursuits it has some beautiful old buildings, lovely clubs, a few very good cafes and an excellent shopping centre, considering the size of the town. The climate is very hot in summer.

The school and IT in 1998/9

The school has been providing an excellent education to the local community ever since its inception. It has over two hundred students and twenty-four teaching staff\(^5\). The school and its surrounds show obvious pride. It is a pleasant place to be in. Explorer public has special areas set aside for computer learning centres and the library is extremely well resourced. Most classrooms have computers of varying ages. It is interesting to note a few relevant items from the 1997 Annual Report.

1) All children can succeed.
2) That all members of the school community should be part of the process that defines where we (the school) are going and how we will get there.
3) All students from K-6 are competent in the use of computers to publish their writing.
4) One of the school's 1997 targets was to: increase access to and knowledge of technology. N.B. The school introduced 'Ants in the Apple' to broaden our literacy delivery.
5) Students are given 'formal' time and additional time in our 'special technology areas' to enable students to extend their computer knowledge and proficiency.

The school has recently received two Director General's Awards for Outstanding Teaching and Learning Programs.

\(^5\) Including the School of Distance Education
The principal and his perspective on IT

The principal is considered to be one of the most outstanding educational leaders in the District. He has been at the school for a good many years but is still relatively young and has certainly lost little of his enthusiasm. He is a constant user of technology and is an excellent role model to his staff.

PEX (…) I love technology in relation to anything.

--- All my work I do on the computer. I use it all the time.

--- I live on that … I don’t know what I did before I had the computer. … If I leave here I’ll need $15,000 to set up my office. (…)

He is knowledgeable on many educational matters; not just IT, and wants the best for his school community. His staff strongly supports his efforts.

The staff and students

The staff is very young. In 1997 their average length of teaching service was four years. All the teachers I met were dedicated to improving student learning and highly motivated. Youth did not seem to be a barrier to this. Most were very computer literate and worked collaboratively.

PEX (…) The biggest factor in this is the number of teachers that have their own, … or aren’t embracing technology. … I’m very lucky there. … I’ve got a young enthusiastic, flexible staff, … the best in NSW! They’ll do anything for the kids … and they’ll embrace anything. They know what I do with it … but … all the programs in the school are computer based. They run off pro formas. … The day books are run off pro formas, … There’s sharing, … collaborative (…)

The majority of students live in town. A significant proportion are of Aboriginal descent but most seem to fit well into school life and observations both inside the classrooms and in the playground show a relatively pleasant learning environment. Students can access a variety of assistance programs and great efforts are made to break down the isolation. Most students are very computer literate for their varying stages.
My first visit

I walked from my motel to the school, watching the students arrive as I did. They all appeared keen and happy. I located the front office, noticing large numbers of pictures of students and school achievements in the foyer. The principal was in the foyer chatting to students. He suggested we go to the assembly and do a quick tour of the school before the interview. The assembly was full of positive re-enforcement. Several teachers spoke briefly introducing students for a variety of achievements. The principal then spoke for a few minutes, concluding by wishing them all a good and exciting week.

The tour of the school saw all classes on task, several teachers using IT in lessons and the computer room in full swing. We returned to PEx's office that had a busy appearance to it with a modern PC on the desk. He explained it was his lifeline for administration and communication. We commenced the interview.

Staff/students' perceptions of the principal and IT in the school

Staff and students had a very positive perspective on the role that the principal was playing in the introduction and support of IT into the school as these comments from first, the computer co-ordinator and second, a classroom teacher illustrate.

D. [interviewer] In what way has the principal supported the implementation of IT as a learning tool in this school?

Jo. He leads from the front. ... He is on the ball with technology and what is going on in schools. ... He uses it himself to do his work, ... allowing staff to be trained and supported in the way it's set up. ... If staff has a specialty, ... he makes sure it's used. ... Just making sure everyone has a chance to be trained ... e.g. the TILT program where only a third should have been trained. He got us a lot more, ... everyone! ... The follow up was good also, ... the way it's set up. ... myself, ... B. and the librarian are a committee. ... We report to PEx, and he says, 'yes' or 'no', ... or, 'The funding can come from here'. ... He's willing to listen.
Ke. Making computers available to us. ... Giving us the time and computers in the train. ... It's a great facility, ... basically a computer available for every kid when we need it, ... two computers in every classroom, ... computerised reporting, ... TILT. ... The extra numbers he was able to get on it. (...)

General Comments

The staff all thought that the principal was leading them in the introduction of IT as a learning tool. PEx was very supportive of the use of IT by both students and staff. The school lived and breathed innovation and an effective and growing learning community, not just in technology but also in most areas. The principal’s comment on his staff and their realisation of the importance of the use of IT sums up the picture for Explorer public.

PEx (...), It's the quality of the people that I've got ... and they know that they'll help each other ... and they realise that the technology will be the second biggest factor in the classroom of the future ... apart from the teacher ... and how that teacher handles it will be the difference between low to moderate to high student outcomes. (...)

Vineyard Public School

Geographical and educational background

Vineyard Public is in the centre of one of the state’s prestigious wine growing areas. It is also well known for its fine wool and other rural industries. The town is growing and has a population of over eight thousand. The town is typical of many country towns of this size but as a popular tourist and conference destination it has a lot of pleasant cafes, a lovely park by the river and vineyards stretching for many kilometres in most directions. The main streets are smart and tidy with a mixture of old and new shop fronts. The school was founded in 1876. Many students bus in to town to attend school.
The school and IT in 1998/9

The school population in 1998 was over five hundred and fifty with thirty teachers and eight administrative staff. They have a Special Education Unit catering for the physically and intellectually disabled. A small percentage of students are from Aboriginal or Non English speaking backgrounds. The school priorities for 1998 included ‘Technology - to broaden the experience and expertise of students and staff in the use of technology.’ It is also considered a feature of the Learning Program. In 1996 the school obtained a Director General's Achievement Award for technology. Amongst the school targets for 1998 were ‘staff development in technology’ and ‘increased computer use in the classroom as well as the computer laboratory’.

The principal and his perspective on IT

The principal was new to the school and had been noted at his previous school for his outstanding work in Information Technology. He was an extremely keen and committed leader and already seemed to have established considerable rapport with staff and students. He acted as a mentor to his staff in the use of IT and was seen as the most knowledgeable in its use at the school.

PVi (…) Here I’m currently running my own version of TILT with between ten and fifteen staff, … depending on what we are doing. … What I’ve done and I did this at the last school I was at. … G.. TILT only caters for one third … so we’ve been mopping up with those who’ve missed out.

… So I’ve taken an active roll. I’m actually running them at the moment. We also have a technology support group. … I’m the most knowledgeable person on the staff in the use of technology and I have a direct influence on the technology resources available.

As principal, he also had reservations about its current use by many staff.

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6 Details taken from the ‘Vineyard Public School 1997 Annual Report’.
D. (...) How are staff and students currently using IT in your school?

PVi Very poorly! ... Very poorly, ... which is really depressing because we have really good resources. In some classrooms they're playing with the games and very little else.

The staff and students

The staff were made up of generally very experienced executive and teaching staff. They varied in their knowledge of and commitment to the use of IT as a learning tool in their classrooms. These comments from students illustrate this.

D. (...) Would you say the use of computers varies from class to class and teacher to teacher?
Sa. [Year 5] Last year we were using them all the time... they were never off ... Now our teacher gets us to use it mainly for projects and occasionally the Internet.

D. Do you think your teachers know more about computers than the best students?
Sa. Some teachers would... some are really good but others ... ?

T. [Year 5] Last year our teacher didn’t know much.

The Assistant Principal was responsible for much of the earlier development of IT in the school and was on secondment, working with the TILT program, with other schools in the District.

The students were achieving above state norms in the Basic Skills Tests and many appeared computer literate. Many had Internet experience from home and were comfortable with the use of IT. These comments from Year 6 students illustrate this.

D. Have you got a computer at home and what sort of things do you use it for?

Aly. Yes... Sometimes we go on the Internet...
And what sort of things do you look for on the Internet?

Different web sites (...), email.

The students were also involved in a variety of sporting and cultural activities. They all seemed to like coming to school and enjoyed the interaction with their peers and teachers.

My first visit

When I arrived at the school the principal was in the front office assisting the administrative staff with a technical problem with the ‘Oasis’ software. Although I did not know him very well he was extremely friendly and helpful. After the interview he gave up his office for the student interviews and then arranged for the School Counsellor's office to be set aside for my staff interviews and a work office. After introductions at morning tea we toured the school. Although the laboratory was in use, very few staff were really utilising IT as a learning tool in their classrooms. The principal remarked on how disappointing it was that there was very little use of IT in the school but that things were slowly changing with the use of IT as a learning tool as staff confidence grew.

Staff/students’ perceptions of the principal and IT in the school

The views of the first, the computer co-ordinator and second, a classroom teacher illustrate the perceptions of most students and staff in regard to the principal and IT. They praised his knowledge, what he was trying to do and his involvement.

What role has the principal played in the introduction and support of IT as a learning tool in the school?

He has been very pro-active. Even though he has only been here a while he has been running special technology courses for staff after school. He is a techno-nut. Everyone sees him modelling the use and his knowledge is second to none.

He is much more collaborative and keen on professional development. He wants it used as a tool, not locked up in labs... He is encouraging staff to use it
and is an effective communicator. (...) Staff use is still patchy but it’s improving. He leads from the front.

General Comments

Most staff thought the principal was a definite leader in the use of IT but some still were technophobic, particularly about its use in laboratories. They saw him as a ‘techo’\(^7\), modelling its use and the acknowledged expert. They also noted that he was keen for IT to be used as a tool and not just locked up in computer laboratories. Despite the schools Director General’s award for excellence in IT many staff had limited knowledge of IT. Students I interviewed were more competent than many of their teachers.

River Valley Public School

Geographical and educational background

The River Valley community is a mixture of farming, local business people, alternative lifestyle, and people moving away from larger cities to live in a beautiful riverside environment. It is relatively close to several magnificent beaches and only twenty minutes drive from a major North Coast city. The main street meanders through the town and there seems to be as many coffee shops as businesses. Surrounding small communities and farms swell the population of three thousand. The community seems to range from upper middle class to very poor. The school is well thought of in the community and the principal, who was away on secondment\(^8\) during my two visits, highly regarded. Not only was the school a ‘beacon’ school in IT but the school’s results in the basic skills’ tests in Years 3 and 5 were well above state norms.

\(^7\) An expert in the use of technology.
\(^8\) As the principal was on secondment my interviews, of necessity, were with the acting principal. I had spoken to the principal briefly on several occasions and attended two seminars he gave on the use of IT in schools and his role in its implementation at River Valley Public.
The school and IT in 1998/9

The school is very well supported and technologically is one of the best equipped in the state, due to the efforts of the principal, the acting principal and the school community. When I visited the school there were visitors from other schools lining up to see what was happening with IT there (including a principal who had flown all the way from WA). The challenge for the acting principal appeared to be to maintain and further improve on what was truly a 'beacon' school in technology while the principal was away on secondment. Computers were networked in all classrooms and IT lessons were given in 'relief from face-to-face' as well as in the normal classes. They had a specialist technology centre with a sophisticated Intranet as well as access to the Internet. Some brilliant portfolio work* was occurring with students of all ages. The level of computer proficiency even with the infants students was remarkable.

The principal and his/her perspective on IT

The principal had carried out a lot of professional development and many staff were exceeding the standard of TILT. He was obviously very knowledgeable and interested in using IT as a learning tool. The school and the principal were regarded as the leaders in the use of IT in Australia. It should be noted that these interview excerpts were with the acting principal.

D. In what way has the principal supported the introduction and use of IT as a learning tool?

JRi The principal here has been very supportive. ... He has given afternoon workshops, ... to suit the needs of particular teachers. Some afternoons he's had some staff, other times others depending on their needs. ... We've also had staff development days with an IT focus, ... and you choose what sessions you want to go to, whether it be word processing, software for students, ... taking us through a piece of software we might use in class with our students. (...)

* See Appendix I
It was priority number one! ... And we’ve been totally immersed in it. I’ve really seen the benefits, ... personally, ... having been here for four years. ... When I arrived here I could only just turn the computer on, now I can do most things. ... I can take computers home. ... He has a borrowing system. We can then run through the software in our own time, experiment, do some programming; he’s been the backbone. ...

The current acting principal was obviously trying (quite successfully) to maintain the standards set. She was very computer literate but not near the level of the principal who was on secondment. She was committed to maintaining the use of IT as a learning tool.

The staff and students

The staff was, on the whole, mature but still committed to improving teaching practice. The majority of staff had supported their principal in his implementation of IT and the vast majority was actively using it as a learning tool in their classrooms.

The students I met and saw in the classrooms and playground seemed pleased to be at the school and very enthusiastic about the use of IT in their everyday life. I saw some truly amazing uses of IT by very young students. Some were disappointed that their brothers and sisters had gone onto secondary school and found a dramatic difference in the use of IT there. This comment by a staff member illustrates the availability of computers and the level of use.

D... How many staff at this school are using IT as a learning tool on a regular basis in their classes?

Ca... I would say all. ... Every class has at least two computers ... and they use it for reading, maths ... (…)
My first visit

I walked from my motel down to the town centre, ordered a coffee and watched the town awaken. They appeared to come from all walks of life. After my coffee I walked to a large, well-kept and attractive school. When I walked into the principal's office a computer was sitting on the desk with access to the Internet and the school intranet. She could call up student's profiles at a click of the 'mouse'. She had organised for her computer co-ordinator to be my guide for this and subsequent visits.

Staff/student's perceptions of the principal and IT in the school

The staff viewed their principal as the leader in its introduction, and the acting principal, whilst not as knowledgeable, as a very effective leader. He modeled the use of technology and staff and students saw him as the most knowledgeable in the use of IT in the school. These comments from two staff members illustrate the principal's role.

D. And what about JRi [the acting principal]?

Ca. JRi has followed his line. She hasn't his knowledge but she's good. She's a good leader. Her knowledge is fine.

D. And Wa. [the principal]?

Ca. We were using IT in a very desultory way before he [the principal] arrived. (…)

Our principal introduced the whole system we have here.

Ji. We were going to have it whether we wanted it or not. He had a vision about where we should all be with IT.
General Comments

Obviously because the acting principal was still relieving it was not possible to interview the principal who was on secondment but the comments of the other staff paint a clear picture of how he introduced and supported IT at the school. The school and staff were at the cutting edge of IT use and the principal had a key role in its implementation. The acting principal was merely managing an established system set up by the principal. Continuing professional development and the use of IT as a learning tool were prominent in all discussions. The students were engaged and highly motivated by its continual use.

Rural High School

Geographical and educational background

Rural High is one of three large government and two private secondary schools in a large Western rural centre of over thirty thousand people. It is known for its wheat, wool and cattle but, because of its size, has several reasonably sized secondary industries. There is a significant but small indigenous population. It is in addition, the District education centre. It is also a tourist destination with some important attractions. The school is well regarded in the community and has begun to establish a fine tradition in education.

The school and IT in 1998/9

The school of over eight hundred students and sixty teaching staff has a reputation for high achievement in many fields. It won an international award in Information Technology in 1997 for its school ‘web page’. Senior students under the watchful eye of the librarian accomplished this. The school is networked but for the main part relies on two computer laboratories and a wonderful library for access to technology.
A tour of the school at most times of the day will see students in the computer room doing 'Computing Studies' and the library buzzing with its use as a learning tool. Students make very little use of IT outside the above areas. There are some computers in staff rooms.

The principal and his perspective on IT

The principal models the use of IT and is a very dedicated and respected member of the profession. He is very interested in the use of IT as a learning tool and buys new items to better use IT in the school.

JRu I tend to buy useful IT stuff e.g. digital cameras, scanners and use them and then when staff say: 'I wish I could do that', then give them the resources to learn how to use them. (...) I find my greatest impediment to bringing IT successfully in is IT teachers, who are often anti computers being used across the school. They want to hold them close to their bosom in computer rooms ... where they determine the usage of them.

He is pleased about individual successes in IT but disappointed, in general by staff use.

D... How are staff and students currently using technology?

JRu ... Very poorly. We have achieved world status via our web page but thanks to a very discreet number of kids. ...

He is actively encouraging his technology committee in their efforts but there is not a lot happening in the use of IT as a learning tool with most staff.

The staff and students

The staff is made up mainly of older staff with a sprinkling of younger teachers in some faculties. I saw very little use of IT outside the library and the computer laboratories. Many staff used computers for personal use but not in their teaching.
All students spoke highly of the school. They appeared proud to be a part of the school and individually made use of the technologies at home and in the library, but felt lack of teacher knowledge and poor structures hindered its use.

D. How do you see IT enhancing student outcomes?

JRu At present very little.

D. How might it?

JRu Once it becomes a common tool, many of the concerns that teachers have in teaching will disappear. (...)

My first visit

Touring the city in which Rural High is situated illustrated the contrasts that existed in the school. There was a very run down area where some indigenous and poor white families lived but nearby some beautiful houses and large attractive shopping centres. As it was a nice morning I walked the two kilometres to the school past many motels and a lovely, well-maintained park. On arrival at the front office of the school I was shown into the principal's office where he was busily working on his laptop. After the interview we toured the school and he arranged all the interviews and gave me carte blanche to observe and tour the school.

Staff/students' perceptions of the principal and IT in the school

This conversation with several year 11 students illustrates these perceptions.

D. If you were the principal .. how would you assist teachers to use information technology in their normal classes...?

Fr. Teachers can't get access to the two computer rooms... the whole school is networked but there are no computers in rooms... we have two labs for 900 students... and 60+ teachers...

___D. How many teachers are knowledgeable about IT?
Sa. 5 or 6 maybe...less than 10...definitely less than 10. [out of 60].

D. Why might that be so...?

Sa. They're older...if it's not something they've been into...they're not going to find out...in many topics it's got nothing to do with IT... It would be the end of formal teaching.

Staff perceptions of the principal were generally positive.

D. In what way, if any has the principal supported the introduction and use of IT as a learning tool in this school...?

Li. He's supported it a lot... he's very interested in it himself...that filters down to the rest of the staff... he's been very supportive of the things I'd like to see happen in IT in my area and the school... it's taken a few years due to financial constraints, but he's been very good.

As we can see the students are aware of the problems with the implementation of IT. The principal and some staff are keen to see computers used as a learning tool, but at the 'chalk face' little is happening.

General Comments

Despite the best efforts of the principal and some obvious 'highs' in school achievements in IT many students and staff, from the principal and students' comments and my observations, appeared to have little use for IT in the school environment. The school was extremely well resourced with technology but the technology was locked up in a few laboratories. The bright spot was the library.

Conclusion

The principals at the five case study schools were obviously committed to the introduction and support of IT as a learning tool in their schools. All principals were reasonably knowledgeable and modeled the use of IT. Two principals were considered experts in the use of IT.
Despite being described as 'beacon' schools, from the principal's and other comments, it was obvious that one of the schools was finding the going hard in its successful implementation. Another school was slowly turning the corner. The other schools were indeed 'beacon' schools in the use of IT. In all schools there were positive signs for the implementation of IT. All schools appeared to be on a continuum with the implementation of IT as a learning tool. The next chapter seeks to explain why this is so as the data from the study is sifted and analysed.

Summary

This chapter detailed the background of the case study schools by using relevant sections of the principal interviews and some excerpts from staff and student interviews, field notes, observations, and some relevant documents from the case study schools. The following chapter will examine the main themes associated with the research questions, analyse the data from all sources, and detail the results pertaining to the issues and themes involved in the study.
CHAPTER 6

THEMES AND ISSUES

The case study's unique strength is its ability to deal with a full variety of evidence, documents, artifacts, interviews and observations.
(Yin 1994, p.9)

Outline

In Chapter 5 the descriptions of the context and background of the case study schools was illustrated by a variety of comments from principals and other school community members and supported by observations, documents and other relevant data. This chapter analyses in more detail the data from the study and examines the main themes and issues associated with the role of the principal in the introduction and support of IT as a learning tool in the case study schools. First, and most importantly for the focus of the study, the interview data and the other data collected [surveys, observations and documents] will be integrated to examine the themes of leadership, building learning communities in schools and the related professional development of staff. Second, the issues of teaching/learning and the associated relevant use of IT as a learning tool will be examined. Finally, the structures and policies in schools that assist or hinder the implementation of IT will be considered.

Introduction

According to Geisert and Futrell (1995) there has been no revolution in schools as a result of the implementation of IT, nor is there any likelihood of this occurring. They further contend that change will only occur if principals and teachers are actively involved and are prepared to alter the way things are currently carried out in schools. This chapter examines the issues behind the differing views of these and other players in the effective implementation of IT as a learning tool in schools. It analyses the varying case study contexts and principals' roles and how
they intertwine to create either effective leaders and learning communities or schools with a few outstanding achievements in IT, but little beneath the veneer. The chapter will make clear the role of the case study school principals in the introduction and support of IT in their schools. A further analysis of the data will also assist in answering the other relevant sub-questions posed by the thesis. These questions were:

- What factors positively influence the implementation of IT as a learning tool in schools?
- What are the barriers to the implementation of IT as a learning tool in schools?
- How is IT currently used as a learning tool in schools?

When considering the data it is important to remember the context of the selection of the case study schools. These schools were seen as ‘beacon’ schools in the use of IT. This concept of ‘beaconess’ was explained in detail in Chapter 4. Their principals were considered to be leaders in the field of school education, not just in the introduction and support of IT. Initially, the pivotal role of the principal as leader and head learner of his/her learning community will be examined. An analysis of the data suggests that the issues of relevant knowledge (in relation to IT), modeling, acting as a facilitator, creating a vision for the use of IT, leadership style, adequate resourcing and the principal as head learner were all essential sub-categories of this concept of leadership.

Of equal importance was the establishment of successful learning communities. The provision of professional development was a key in regard to establishing effective learning communities and the implementation of IT. The data suggests that where this was not adequately provided it became a barrier to the implementation of IT as a learning tool. Following the issue of learning communities, the research indicated that teaching/learning strategies were of importance and that innovative changes to school structures coupled with these teaching/learning strategies played an essential role in the successful implementation of IT. Finally, the data from all sources showed that where IT was successfully implemented it often became a motivational tool for students and led to changing pedagogies for teachers.
Each of the concepts listed above had a variety of properties. In many cases they overlapped or could have been placed in different areas. Obviously the dimensions of these categories and sub-categories were also of great importance. We will see that each of the case study schools often varied considerably in some aspects. An example of this was resourcing. There were varying levels of human, financial and physical resources in each of the case study schools. The leadership styles, while showing some obvious similarities, were quite varied. In the area of professional development some schools did far more than others and made it an ongoing priority.

The analysis of each major theme will be followed by an overview of the findings. Each main section will finish with an overview, some salient details from the surveys, and a discussion of the results. The relevant literature will also be brought into this discussion where deemed appropriate.

This thesis tells an exciting and important story about five rural schools in NSW and the role that their principals played in the implementation of IT as a learning tool. This is also a story about leadership and establishing effective learning communities. It will be shown that an innovation of this magnitude required special qualities of leadership.

**Leadership**

(...) To do this they lead by following. They lead by serving. They lead by inviting others to share in the burdens of leadership. They lead by knowing. (Sergiovanni 1994, p.202)

In Chapter 2 and 5 the context in which these school leaders operated was examined. There was evidence of increasing devolution of authority in some areas such as finance, in the NSW Public School System, but it was also argued that much of the real decision-making in the area of curriculum and professional development was still held at the centre. Coupled with this supposed devolution
was a massive injection of funds for schools in relation to the provision of computers and a real attempt to train one third of all teaching staff with some basic skills in IT. The evidence obtained from principals suggest that no real attempt was made to train them in what their leadership role should be or what might be the best way to implement IT as a learning tool in their schools. The words of the principal of Merino Central put this in perspective.

**DMe** I feel my knowledge of IT is not adequate. (…) I think I mentioned to you last time that I need some time to sit down and do the training, but when?

**D.** The Department has not really run a course for principals on IT but the Australian Principals’ Association run seminars. (…)

**DMe** I need to go to one. The Department’s TILT training helped but it was limited.

This implementation was all done at a time of an IT revolution occurring globally outside schools in the business and communication areas via the Internet and multimedia. These pressures, it was posed, impacted on the role of the principal and the schools they worked in. It is appropriate to examine aspects of knowledge, modeling and facilitation of IT as a starting point to viewing the leadership the principals gave to their schools.

**Knowledge**

Despite the protestations of the principal of Merino Central, all principals of the case study schools were knowledgeable in the use of IT. The level of this knowledge varied from school to school. At Vineyard Public the principal contended that he was the most knowledgeable person in the use of IT. At River Valley Public the librarian had the following comment to make about their principal.

**Diane** Wa [the principal] is an IT buff. … and we were going to have it whether we wanted it or not. That was his forte. Where other principals in the past thought about it… they [the teachers] didn’t have the knowledge base… he had the expertise.
A similar picture could be painted at Explorer Public where the principal used it consistently. Again at Rural High the principal explained to me that he ‘did all his email at school (...)’ and used it as a communication tool with other principals. At Merino Central the principal was less forthcoming in stating his knowledge of IT. He had attended TILT, was seen by his office staff as being very knowledgeable about ‘Oasis’ (a NSWDET administration software package) and used one of the school laptops for his personal use. The views of the principals were supported by my own observations and by a variety of interview data from staff. According to the acting principal of River Valley Public, ‘...Wa was just so knowledgeable. (...)’. The staff at all schools supported the view of their principals being knowledgeable. In three cases they actually in-serviced the staff in its use (River Valley Public, Vineyard Public and Rural High). Not only were the principals knowledgeable about the use of IT but they also modeled its use.

**Modeling**

As I traveled between the five case study schools I spent varying lengths of time in each of the principals’ offices discussing their use and the school’s use of IT. I was very interested to discover whether they modeled the use of IT in their everyday work. The following two comparative extracts from my field diaries illustrate this modeling at four of the five case study schools.

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**Comparative Extract 6.1  Modeling – The Principal’s Office No. 1**

<table>
<thead>
<tr>
<th>Explorer Public</th>
<th>River Valley Public</th>
</tr>
</thead>
<tbody>
<tr>
<td>It’s Friday afternoon and I hear loud music from PE’s office. When I walk in he is doing the Weekly Newsletter on his new computer...graphics and all. I think to myself, ‘Well, he’s certainly using the technology himself.’ (*21/05/98)</td>
<td>Am shown into JRi’s office. She is looking up a student’s record on the Intranet. She appears quite at home with the technology. She comments that she can look up a student’s profile, including a photo and the latest portfolio of every student in the school. (*9/06/98)</td>
</tr>
</tbody>
</table>
Comparative Extract 6.2  Modeling – The Principal’s Office No. 2

<table>
<thead>
<tr>
<th>Vineyard Public</th>
<th>Rural High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Met PVi at the front office where he was fixing an ‘Oasis’ software problem for</td>
<td>Arrived early at the principal’s office.</td>
</tr>
<tr>
<td>the staff. Went to his office where he was completing his email. Stated that he</td>
<td>He had a laptop on his desk and on another table had a scanner he was showing another staff member how to use. (*28/05/98).</td>
</tr>
<tr>
<td>does a lot of his communication by email now. (*27/02/99).</td>
<td></td>
</tr>
</tbody>
</table>

All principals modelled the personal use of IT in their everyday work life. At Merino Central the staff I talked to were well aware of their principal’s use of the laptop for reports, newsletters and a variety of word processing tasks. He explained that,

I use it [laptop] for spreadsheets, for finance, records. I use it for my personal use, ... word-processing, letters. (...) We have three laptops. I have exclusive use of one.

These comparative extracts are supported by interview data from staff at the various schools. A typical response from a staff member at Vineyard Central serves to illustrate this.

Sandra  PVi is a techno-nut. Everyone sees him modeling the use and his knowledge is second to none.

Despite their knowledge and modeling, very little would have occurred in relation to the use of IT at their schools if the principals had not facilitated the use of the technology.

Role as Facilitator

The principals were facilitators, ensuring the learning and the use of IT by others as the following comparative extracts suggest. The first illustrative interview extracts were with the principals, the second and third with their staff.
Comparative Extract 6.3  Facilitating the use of IT

<table>
<thead>
<tr>
<th>Merino Central</th>
<th>Explorer Public</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DMe</strong></td>
<td><strong>PEx</strong></td>
</tr>
<tr>
<td>I guess my role as far as the introduction and implementation goes is as a facilitator ... to encourage people through their own interests. (…)</td>
<td>I did sixteen through TILT [Technology in Teaching and Learning], even though we should have only have had eight! (…)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stewart</th>
<th>Carol</th>
</tr>
</thead>
<tbody>
<tr>
<td>There are many things we can't do, but DMe is an excellent facilitator. ...</td>
<td>...be trained and supported in the way it's set up ... If staff have a speciality he makes sure it is used.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Daryl</th>
<th>Jill</th>
</tr>
</thead>
<tbody>
<tr>
<td>DMe is an excellent boss (...). He listens to everyone.</td>
<td>Everyone had a chance to be trained ... e.g. the TILT program where only a third should have been trained. He got us a lot more, ... everyone!</td>
</tr>
</tbody>
</table>

Certainly the principal of Rural High also saw himself as a facilitator. He explained to me that:

**JRu**  I think as a generalisation the principal's role is to make things happen, ... which usually means to find those people who will be proactive and to make sure they have all the backing to achieve and to see that their dreams can be passed on to others and become part of the school plan. ...

When we examine the work of the other principals a similar pattern emerges. In regard to their modeling, each principal's office I walked into had a computer sitting on the desk or a laptop in a case alongside. The principal at River Valley Public ran the school via email whilst overseas for a month on a study tour.

Their personal knowledge, modelling and facilitating also carried over to a vision of how IT could best be used. This aspect appeared to be a key to IT's successful use as a learning tool by teachers.

**Vision for the use of IT**

An analysis of the interview data suggested that the principals all had a vision for the use of IT in their schools and what the priorities for that implementation by themselves and the teaching staff might be. DMe from Merino Central illustrates
this concept when he suggests that he saw the benefits of IT's use as an effective learning tool in the following way.

**DMe**  Well I guess as a teaching learning tool it's highly stimulating and motivating and likewise it opens the gate to accessing up to date information either on line or on CD-ROM. As a teaching/learning tool in literacy it enables students to draft, edit, process etc. ... It's a time saving tool in that way and enables them to produce a quality product they might not have been able to do otherwise. I see that as significant. It's assisting them in being lifelong learners and coping with change. (...) Allows IT to be used as a tool.

The principal of Vineyard Public's view also supports this perspective:

**PVi**  ... I've got a firm philosophy, ... and this is born out by the old Primary computer use documents, ... that computers should be used as a learning tool in Primary schools.

At Rural High the principal was concerned that most technologies were locked up in computer laboratories and had a vision that he would, in the near future, have laptops in every staff room so 'staff have got time ... in their own time to access it... play with it... learn'. He also believed that IT would see more opportunities for students to become scholars and that schools would need to teach new skills such as narrowing and searching (*28/05/98). The visions at River Valley Public and Explorer Public were similar with the principals insisting that staff be adequately trained and that the technologies be used as a tool for learning, not a toy or a 'fill in'. The principal of Explorer Public contended that whilst he used IT on a daily basis that he had never played a game on his computer.

Like most other innovations in education, resourcing is a vital aspect in successful implementation. The leadership role of the principal in this regard was crucial as they, through their school councils to a large extent, were responsible for allocation of financial resources. It has been previously noted (see Chapters 2 and 3) that the contribution of NSW DET policy was considerable in this area.

**Resourcing**
...as most schools struggle to find resources for these new tools, innovative programs have shown there is a payoff for the effort.
(Gates 1999, pp. 387-388)

Many of the staff and principals were happy with the level of physical resourcing in the areas of hardware and software, particularly after major computer rollouts. The level of physical resourcing is best illustrated by an examination of Merino Central, Explorer Public and River Valley Public. The comments by these principals sum up a common picture in Vineyard Public as well. As the principal of Merino Central makes clear.

**DMe** We have ‘computing studies’ (9/10 and 11/12 computing studies) which most students’ access; 7/8 in ‘design and tech.’ which incorporates it as well. ... [in their two secondary computer laboratories] We’ve also got our library as well which has traditionally been very much book and audio-visual based. We do have an Internet site in their now and more and more students are encouraged to use other software e.g. CD-ROMs. ... We’re providing opportunity and access for students there. In the Primary ... every classroom has access to at least one computer [and access to a computer laboratory] to use on a day-by-day basis.

And a similar situation at Explorer Public as the principal relates.

**PEx** Classroom wise,... being CAP [Country Areas Program] and DSP [Disadvantaged Schools’ Program], we have always had access to computer hardware and a good range of software, ...

____ I think to have five machines in the Library and next door we have another thirty machines and then three in every classroom (...).

At River Valley Public the acting principal explained that:

**JRI** Every class has at least two networked computers (...) and we have two computer laboratories used for RFF and other IT programs.

These views on resourcing were supported by staff. The Relief from Face to Face Teacher at River Valley Public had this to say.

**Jane** We have two laboratories and networked computers in every classroom. Teachers use them all the time.
I made it my business to visit every classroom at each school, no small task at Rural High, and in all the Primary/Infants areas there were computers in every classroom. At Explorer Public and River Valley Public there were at least two computers in most classrooms. The secondary department at Merino Central and the rooms at Rural High were limited to computer laboratories, learning centres and the library. Whilst they were in obvious use in most primary rooms, little use was being made of them outside the laboratories and libraries in the secondary areas.

As other principals and staff contend, just having the resources is not enough as the structures in the schools and the placement of the hardware are important. There was concern, particularly in the secondary area, at the trend to put computers in laboratories. The suggestion was that this was also hampering their use as a learning tool by all students. The comment from a Year 11 student at Rural High illustrates this.

Colin I agree with Phil. There are no computers in classrooms. Only Computing Studies students use the labs. The library is our only access point.

This view was supported by his principal who explained:

JRu Teacher use is very limited. (...) This may come in the future but as I said at our last interview, staff use is generally minimal.

Even Bill Gates (1999, p.402) contends that, ‘Computer labs are a lousy place for computers. They need to be in classrooms.’
Having examined the issue of physical resources in relation to supply and placement of equipment, it is relevant to consider another resource factor that was mentioned time and again in the interview data, namely the maintenance of the computers and the systems.

The NSWDET supplied computers to schools in the ratio of one computer to every eleven students but did not supply the personnel or money to maintain the systems. The librarian at Rural High explained the problem as she saw it.

Dianne (…) We need a support teacher to help look after the hardware and the software.

The acting principal of River Valley Public paints a similar problem.

JRI Even with all the computers set up … we still have problems. … and I haven’t got a clue. I didn’t go to Uni and learn about computers. The department hasn’t given the technical backup to go with it.

Other teachers, principals and my own observations supported these views. On my visits to a number of schools I was often asked, ‘could I fix this computer/printer, … load this software?’ Having examined the physical resourcing, a consideration of the aspect of human resources is now appropriate¹.

TILT was used by all schools as an important factor in the training of their staff. Schools such as Merino Central and Explorer Public were pro-active in obtaining additional places in this training program but at all schools, even at River Valley Public, it was still an issue. Students often believed that their teachers were inadequately trained.

This is illustrated by this exchange between Allyson, a Year 7 student at Rural High who had been frustrated by the lack of use of IT in her class, and myself.

D. [interviewer] If you were the principal how would you get them used as a learning tool in the classroom?

¹ This will be covered more fully in a later section on professional development.
Allyson Make the teachers do more training. ... do courses that help them use them.

Finally the issue of the Technology Adviser\(^2\) as a human resource to schools was seen as very important. The principal of Explorer Public explains.

D. (... Last question. ... We previously discussed the role of the technology adviser and suggested having two instead of one. Do you still feel that you would prefer two?

PEx Would I ever! ... Look what they did to L... She's a wonderful girl. ... She can't do the job in this District with the distances she's got and then be called off to Sydney all the time.

These comments are re-enforced by a staff member at Vineyard Public.

Sandra There's no point in having the network... everything else ... if we can't use them... more teacher training ...get out ... look around... We need more technology advisers...

Resourcing obviously played a significant part in the successful implementation of IT in the case study schools. Even before the NSW DET computer rollout the school communities had poured considerable resources into the case study schools. Continuing and adequate human resourcing were seen as essential to the successful implementation of IT.

In any school the way that the principal interacts with the school community is considered important for the smooth running of the school. The data suggests that the leadership style of the principal is vital in any school that is faced with the implementation of IT.

**Leadership Style**

The principals in the case study schools were all forceful leaders and shared commonalities in their leadership styles but varied in some aspects. These important and relevant aspects of the leadership styles of the various principals can best be illustrated by comparing comments made by themselves and their staff members. When we examine comments by the principal and the staff the

\(^2\) There was only one Technology Adviser in this District to service 59 schools.

136
following picture appears. On the available evidence the principals were all innovative, pro-active, authoritative and used a collaborative approach. First, we will examine the leadership style of the principal of Merino Central. The principal contends that:

**DMc** I guess my role as far as the introduction and implementation goes is (…)... to encourage people through their own interests ... through the technology committee to obtain new ideas ... to look at what we have in the school as a collaborative group.

This view is supported by his staff that claim:

**Librarian** DMc uses a collaborative approach. He encourages anyone with an interest. He is an excellent principal and has worked with staff to achieve progress.

At Explorer Public the staff explain the leadership style of the principal.

**John** He sets the example. He listens but leads. He is knowledgeable and as you have seen is a leader in the use of IT. (...) Our committee has input but he also is committed to us helping each other. PEx knows where we are going.

Carol continues in the same vain.

**Carol** He got the majority of staff to do TILT… when only a 1/3 should have…just setting up all the computers around the school… finding the money… working out where it goes… delegating various jobs… we have two computer co-ordinators… and a committee.

The principal at Vineyard Public describes his style in this fashion.

**PVi** (...) We also have a technology support group. (...)Since I've been here I've replaced every machine in the front office, ... and I'm in the process of replacing them in a few other places as well. (...). I know how IT should be used as a learning tool and my staff development is aimed at that.

His staff suggest:

**Jim** He is collaborative and very keen on professional development. (...) He encourages staff to use it and is a good communicator. (...). PVi knows where he is going.
Secondary schools are different in many ways from primary and central schools. At Rural High the principal, JRu, considers that:

**JRu** I think as a generalisation the principal’s role is to make things happen, ... which usually means to find those people who will be proactive and to make sure they have all the backing to achieve and to see that their dreams can be passed on to others and become part of the school plan.

and

(...) We will have to start teaching skills ...like searching, narrowing searches... (...)The way we define literacy and numeracy will need to be redefined on the web... subject matter is also a matter in question... the notion of years of study ... discreet units etc...The net is going to allow global learning ...just as the invention of print allowed us to learn... not just from the church.

From my observations and interviews with staff, the principal of Rural High did not have the structures in place to ensure effective collaboration. Finally, let us turn to River Valley Public. First, let us hear from the acting principal and then members of staff.

**JRI** [acting principal](...) The way we are structured here we are divided into four teams. We’ve trained different teachers to specialise in different components. ... So computers are, ... shared within my team. (...) I’ve had to support. (...)

**Dianne** Well ... WRi is an IT buff... and we were going to have it whether we wanted it or not.

**Jane** The principal here has been very supportive. ... (....), he’s been the backbone.

**Carol** Our principal introduced the whole system we have here.

The interview data clearly supported the contention that all principals were proactive and had a vision for the use of technology in their schools. The principals were also seen as very collaborative.

**Overview of leadership**

The literature supports much of the data obtained from the case study schools in regard to leadership. Parker (2000, p.28), when commenting on a recent secondary principals’ conference on technology argued that:
...principals were left with the indelible message that strong leadership is needed in any school that wants to get its act together as far as technology goes.

This leadership Boyle (2000, p.5) further contended, when reflecting on the role of the new style principal, suggests that they need to be a ‘strategic thinker with an in-depth knowledge ... and the ability to model excellent teaching and learning strategies.’

The staff survey data supported the interviews and observations. In the surveys staff commented that their principals ‘took the lead’; ‘encouraged them’; ‘offered continual support’ and ‘provided adequate resources’.

An analysis of all the data reinforced the proposition that principals who wished to successfully implement IT in their schools needed to be knowledgeable, model the use of technology and facilitate the use of Information Technology as a learning tool. In addition, they needed a vision for where they wanted to go in relation to IT and to adopt a collaborative and proactive leadership style. Finally, they needed to be seen as the head learner of their learning community. This short extract from an interview with the librarian of Rural High illustrates the position of the principal in the implementation of IT.

D. Who and what has been crucial to the successful implementation of IT in your school?

Librarian The principal!

The diagram on the following page helps to summarise the theme of leadership.
While the theme of leadership has been shown to be of great importance to the successful implementation of IT in schools, the establishment of effective learning communities is of equal importance to the story of the introduction and support of IT.

**Learning communities**

Principal have special stewardship obligations. They must plant the seeds of community, nurture fledgling community, and protect the community once it emerges. (...) (Sergiovanni 1994, p.202)

Sergiovanni (1994) argues that being a leader in a learning community involves laying the groundwork, allowing all members to grow and also following others. These points were brought out vividly in the study. Building learning communities in schools and the related professional development of staff assumed
major importance in the study. The issues of teaching/learning in relation to the use of IT as a learning tool, the structures and policies in schools that supported or hindered the use of IT in the classroom, as previously mentioned, were also found to be highly relevant.

This section of the chapter will appraise the establishment of an effective learning community, the principal as head learner and how the principal might enable others. The relevant aspect of professional development will be dealt with in this section. This will be followed by examining the important issues of change management and innovation. Finally, this section on learning communities will consider what the research study shows in regard to relationships, planning and goal setting. As a starting point it would be useful to think about how and what sort of learning communities were established in the various case study schools in the context of the introduction of IT as a learning tool.

**Establishing an effective learning community**

The majority of schools examined in this thesis had established effective learning communities. An excellent example of this was Explorer Public School. The school was a thriving learning community built on mutual respect, utilizing everyone’s talents and empowering people with particular skills to lead. At the same time the principal protected these fledgling leaders. As one walked through the school, chatted in the staff common room, talked with students, teachers, local community members and the principal you were left with a lasting impression of a group of people with common purpose, helping each other, following a shared vision.

**PEx** ... Everyone here is given credit for what they do. I give them the money and the power if they’re doing something. ... I don’t interfere unless I think it’s going off the rails. (...) The only time I use my power is on the rare occasion I see someone interfering in what one of the teams is doing.
The principal had managed to create an educational community that was focused on learning and improving student outcomes. An important part of this was the attitude of the staff and their willingness to help each other. As PEx stated:

PEx  ...There’s some things that you might want to do on a personal basis and there’s some things we do as a team ... and if there is an area that they need help in all they have to do is ask ... (...)

PEx made it very clear that staff were also willing to share their expertise with their peers. When I looked back at my field diaries I was reminded of the little section in the 1998 Annual Report for Explorer Primary, which stated in part (p.2):

*That all members of the school community should be part of the process that defines where we (the school) are going and how we will get there.*

My observations as I followed PEx around the school and confirmed when I walked into any classroom, spoke to teachers at morning tea or privately, were that they were all involved in the process. As one staff member commented, PEx assisted by:

Jan  ...allowing staff to be trained and supported in the way it’s set up. ... If staff has a specialty, ... he makes sure it’s used. ... Just making sure everyone has a chance to be trained.

Similar patterns emerged at Merino Central and River Valley Public and to a lesser extent Vineyard Public. This comment from a teacher at Merino Central illustrates this.

L.e.  DMe works through a committee and is very supportive. He utilises everyone’s talents.

There was little evidence of this occurring at Rural High where teachers appeared locked in their little boxes, emerging briefly at morning tea, lunch and staff meetings and returning to their scattered and isolated rooms. The principal commented on this lack of use of IT by staff on several occasions. This restricted view on the use of IT is supported by these comments from Year 9.
D. How often would you use computers on a weekly basis?

Ian Three.

D. And what are those three times...?

Fay In our computer class.

D. OK... Does any other teacher use them?

John Library, careers...electronics...tech drawing.

D. Fine... Of the sixty plus teachers at your school... How many do you think would use it on a regular basis?

Tim Seven or eight

The Year 7 perspective was even more pointed.

D. How often do you use them at school?

Alyson Not at all.

Guy Once.

Blair Once for DT last term.

Cherie Twice this year...in music.

There were a few people at Rural High trying to lead the others, albeit with the support of the principal, but little was happening. The staff was not pulling together as a learning community. This comment from the librarian showed the lack of cohesion.

Last year... the computer studies teacher, myself and the Art head teacher said... 'Look, we've got to do something. ... also Ca. had $25,000 from this competition... So what are we going to do?' ...The computer committee came back together and started saying, 'Our vision is to have a whole school with access to IT, not just a few (...)'. Unfortunately we looked at our staff and there are very few who have a passion for using computers. We find it so interesting, ...why?... I hope we can upskill more teachers to a high standard.

My observations recorded in my field diaries note the lack of cohesion at Rural High. The following is an entry made on my second visit.
The boss wants IT, the librarian wants it, the Art teacher does. Everyone else is so busy doing their own thing. They all need to own it. Good school, great website but very limited use of IT. The boss is right. It is used poorly! (*22/08/98)

The 'gap' in the ineffective schools was that there was no effective learning community established. The dimension of the commitment by the staff did not approach that of the other schools. This appeared to be especially related to the secondary area, although at Merino Central, in the secondary area, much was still being done. One of the key factors in the establishment of an effective learning community, from the research, was having the principal as head learner. This has already been covered to some extent in the section on leadership but it is worth adding to the previous analysis as part of this issue.

**Head learner**

All principals were keen to learn more about the use of IT. In the case of River Valley and Vineyard Public schools their expertise was of the highest standard. They had learned, often self-taught, more than most teachers would be expected to know. They were experts not just in the area of the use as IT as a learning tool but extremely knowledgeable about hardware and software utilized for IT.

When I look back over my field notes (*1997-1999) [I visited many other schools other than the case study schools] and the interview data, I noticed a continuing comment by many principals of schools, other than the case study schools, in respect of the lack of their own professional development in the area of IT. One of the problems recognized by many principals was the lack of Departmental support for principals to become head learners in IT. The principals who had gained the expertise in the case study schools had not obtained this from Departmental intervention. What they all attempted to do was to enable others to learn.

**Enabling others**

It is opportune to enable staff to continue the story by speaking for themselves on the matter of whether the principals assisted others in their development in IT. We
have already seen the collaborative approach to learning by the principals of Explorer Public and Merino Central where they enabled their staff to access essential additional TILT training but let us now focus on Rural High and River Valley Public to see if the same occurred at these schools. This comparative extract illustrates this.

**Comparative extract 6.4  Enabling others**

<table>
<thead>
<tr>
<th>Rural High</th>
<th>River Valley Public</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Karen</strong> (…) JRu is very helpful in the introduction of IT. He gives anyone who asks assistance.</td>
<td><strong>RVi</strong> [Acting Principal] I’ve had to support. ... Make sure that no one is overburdened. We have one teacher trained in 'filemaker' to produce the newsletter. ... She’s finding it very time consuming. Being aware of that I’ve rostered her onto 'pgd' [play ground duty] in the computer lab. so she can use that time ... to ease her burden. It's remembering who needs help.</td>
</tr>
</tbody>
</table>

The degree of support provided to staff varied with each school. At Explorer Public it was very high, as it was at Merino Central. Principals at River Valley Public and Vineyard Public enabled the staff to develop and set up structures to assist that development but at Rural High such support was patchy. Staff who were interested were certainly enabled but there did not appear to be the same level of commitment with the introduction of this innovation. Adequate professional development was seen by all stakeholders to be an integral part of the principal’s support for the introduction of IT.

**Professional development**

*The central task of educational leadership is fostering, and then sustaining, effective learning in both students and staff.*

(Law & Glover 2000, p.161)

Although professional development was briefly discussed previously in the context of leadership it is essential to revisit the issue in more depth. As Law and Glover (2000) contend, for any innovation to succeed, effective and continuing professional development is essential. Even in these ‘beacon’ case study schools
professional development was still an issue. Where there was effective professional development, teacher 'technophobia', which had been a barrier to the successful implementation of IT, began to disappear. Let us first find out what the students thought on this issue.

At Rural High the year Year 9 students saw it this way.

D.. Of the teachers who use technology ... how many are more IT literate than you?

John Not many... some just look up the book.

Tiffany They need to do a course or something.

D.. If you were the principal, ... how would you get them used as a learning tool in the normal classroom?

Anne Train the teachers ... make them do relevant courses.

This is at one end of the spectrum. At the other end of the spectrum, to year 5 and 6 pupils at River Valley Public teacher training is not an issue.

D.. So the use has been the same from say Year 2 to Years 5 & 6.?

Cindy We use it more now... but we always used it. We do more complex things now...The use has changed. The teachers are good.

However, the issue of adequate and continuing professional development is never far away. This comment from the Relief from Face to Face teacher at River Valley Public suggests that the battle is not yet won.

D.. What concerns if any do you have about the use of IT in the school?

Jill With new staff members coming in ... they need the support that we had and I'm not sure they're going to get that. He's not here now. [Wa.. the principal was on secondment]

Every school listed professional development as an issue. Survey data supported this concern. Of the seventeen teachers surveyed in the case study schools only two suggested they had adequate professional development. Others suggested they needed additional training or training in specific areas. Several teachers
reflected that they needed to know more about how to integrate IT into the classroom and that, as an innovation, IT was completely different from other innovations they had dealt with. Students surveyed painted a similar picture. This comment by a teacher at River Valley Public further exemplifies the comments from the surveys and adds another dimension, that of fear of the unknown.

**D.** How is this innovation different from others you've had to cope with?

**Carol** Mainly because its been terribly foreign to me... most innovations have been bandwagon things that I can weigh up... also a lot are based on things I know a little about... This was completely foreign... at least the technical side... I did some of Wa.'s courses and TILT (...) 

The students, as we have already seen, were even more outspoken. This is not to suggest that a lot was not already occurring in schools. It is important to remember that IT was still in its infancy in its introduction in many schools and much of the data was collected in 1998. Let us leave the last word in relation to professional development to the librarian at River Valley Public.

**D.** What concerns, if any do you have about the use of IT in your school...?

**Dianne** Lack of Department in-servicing... give you the stuff... cut down T&D that could be used to go with it... that's my biggest gripe. They have given us the technology but not the support that goes with it...

**D.** What about the cost? Cost versus benefits...?

**Dianne** Oh I think you'd see more benefits if there was more training... We live in a computerised world and whether we like it or not... that's where we are. The teachers, if properly trained will have the expertise... then you'll really see the benefits!

**Change management and innovation**

This is a key issue as it considers the main research question of the role of the principal in the implementation of IT as a learning tool. Each principal and staff
member was asked what the role of the principal was in the introduction and support of IT.

In the case of the principal of Merino Central we have already seen that he saw himself as a facilitator. His staff supports these views.

**D.** In what way has the principal supported the introduction and use of IT in your school?

**He.** DMe has been great. ... Besides TILT he has given me additional days to learn how to use it in class.

At Explorer Public the staff describe the principal’s role as:

**Ja.** He uses it himself all the time, (...) ... allowing staff to be trained... He ensures we help each other to, ... makes sure the technology is used etcetera. ...

and

**Karen** Making computers available to us. ... Giving us the time and computers in the train. ... It’s a great facility, ... basically a computer available for every kid when we need it, ... two computers in every classroom, ... computerised reporting, ...TILT. ... The extra numbers he was able to get on it.

At River Valley Public a similar picture was apparent. The principal had transformed the school into the leading IT school in NSW. His staff explains how this occurred.

**D.** How did Wa introduce and support IT into the school?

**JRI [acting principal]** He ran a lot of courses after school, ... weekend in-services. When I first arrived here I was given an email IT checklist to see my skills, ... and what I needed. He had TILT support of course. (...) What teachers really need is time, ... time to sit down with the systems or programs to sit down and play. ... The kids show me. ... I rely on the kids a lot. .... They show me. (...) 

**D.** How many staff at this school are using IT as a learning tool on a regular basis in their classes?

**JRI** I would say all. Every class has at least two computers ... and they use it for reading, maths and every class here does IT as part of RFF [Relief from Face to Face teaching], that’s another hour per week. ... Most have two hours. We have two computer labs.
The principal at River Valley Public ensured adequate resourcing and even changed structures to ensure the success of the innovation. At Vineyard Public, in response to the question,

D.. What has been your role in the introduction and support of IT in your school as a learning tool for students?

the principal contended that:

PVi In this school... I’ve only been here a short time, ... so I guess it hasn’t been substantial as yet ... (...) Strictly with what’s here so they can work with what they’ve got at the moment. ... So I’ve taken an active roll. (...) I have a direct influence on the technology resources available. I have a personal philosophy that the office should have first class up to date equipment. (...)

Previous interview data illustrated that the principal was actively involved in staff development as part of a coherent change management strategy. The staff confirms this view as these interview extracts indicate.

D.. What role has the principal played in the introduction and support of IT as a learning tool in the school?

Sandra Even though he has only been here a while he has been running special technology courses for staff after school. He is a genius. ... His knowledge is unbelievable.

John He is very collaborative, keen on professional development. ... He is encouraging staff to use it and is a good communicator. (...) Staff use is still patchy but it’s improving.

Finally, the principal of Rural High gives his point of view.

JRu I try to facilitate staff use. Whilst its [IT’s] use here is still problematical, I encourage where I can.

The following excerpt from a staff interview supports this statement by the principal.

D.. In what way, if any, has the principal supported the introduction and use of IT as a learning tool in this school?
Sandra  He’s supported it a lot. ... He’s very interested in it himself.
.... That filters down to the rest of the staff... He’s been very supportive
of the things I’d like to see happen in IT in my area and the school. ...

As has been indicated, in all the case study schools, the principal was actively
involved in the introduction and use of IT whether it was as a facilitator (Merino
Central and Rural High), a pro-active instigator (Explorer Public) or as a visionary
and expert change agent in the process (Vineyard Public and River Valley Public).
At Explorer Public and River Valley Public the data suggests that the principals
were very skilled in change management. They realised what was necessary for
the successful implementation of this innovation into their schools. The other
principals were also relatively skilled in the process of change management.

Another aspect of the issue of change management and innovation was to
discover how this innovation might have been different to other changes in
schools. The principal at Explorer Public when asked about how this change was
different to other changes did not reply in part to the question but when you
examine his words carefully he really explains how he set up a learning
community where this type of innovation or others might be successfully
introduced.

D.  What is different about this change process with IT than other
change processes you’ve been involved with?

PEx  When I came here in 1992 people said you would have one of the
worst schools in the cluster or NSW. I now think it’s one of the best. I
put a lot of work into looking after the staff. ... I made sure there were
structures. ... We use the 'Hegley' processes so we are all involved in
decision making. ... They know their roles and responsibilities. I have
mine. ... (...) ... and they realise that the technology will be the second
biggest factor in the classroom of the future ... apart from teaching ...
and how that teacher handles it will be the difference between low to
moderate to high student outcomes.

The data suggests that this innovation, like many others, requires strong
leadership and an effective learning community to become more than a passing
‘fad’. In any effective learning community the relationship between the leader and
the staff and between individual staff members is often seen as crucial (Hill 1999).

Relationships

**PEx** The whole thing here is the attitude of the staff. It’s a totally genuine feeling. ... Our grievance committee hasn’t sat all year. ... Yes, they have their little disagreements. It’s the quality of the people that I’ve got ... and they know that they’ll help each other.

These sorts of positive relationships were mirrored in all the case study schools I visited. There was a genuine caring. As PEx put it, staff had their little disagreements but they were concerned about helping each other, but even more importantly, assisting the learning of their students.

Not only did the staff learn collaboratively but also there was evidence of a variety of types of collaborative learning in the schools I visited. At Rural High I saw evidence of peer tutoring, a variety of group work and co-operative learning (*28/05/98). Perhaps the outstanding incident that springs to mind is Kindergarten students at River Valley Public (*10/06/98). These young five and six year olds were working in small groups at several computers during their ‘Relief from Face to Face’ lesson as they assisted each other with their portfolios. The teacher was merely a facilitator of their learning but the planning involved was of prime importance.

Planning, goal setting

At each of the case study schools the principal and the school community had a plan. Not necessarily a formalised one, except at River Valley Public, but the schools (through their technology committees) had an idea where they were going with IT. The principals and school community had set goals. Even at Rural High the principal had a plan to get computers into staff rooms and out of the laboratories. The four other schools had a scope and sequence plan for the teaching and use of IT in the various years. They had set goals for achieving those plans in their Annual Reports. My observations suggested that Merino Central,
Explorer Public and Vineyard Public were well on their way to achieving those goals, whilst River Valley Public had become a world leader in the use of IT.\(^3\)

More than anything else the staff of the case study schools as a whole were committed to the use of IT as an integral part of their learning communities.

**Overview of learning communities**

Lassey (1998) suggests that learning organisations require commitment from all staff, not just the leader and further, the organisation must collectively learn. Additionally, Boyle (2000, pp. 4-5) considers that principals have moved away from 'bureaucratic line management and dependence, to the new role of leading a learning organisation.' These points on collective learning and the principal leading a learning community were starkly brought out by this study.

The staff survey data supported the interviews and observations. In the surveys staff commented that their principals ‘supported the technology committee and computer staff’; ‘encouraged participation in TILT’; ‘supported staff and students use of IT’; ‘facilitated development of systems training’ and ‘resourced staff development’.

An analysis of the interview data in particular suggests there is a strong correlation between the establishment of effective learning communities within organisations and the successful implementation of IT. No better example of this could be cited than at Explorer Public where all staff worked in a collaborative fashion, sharing their knowledge and expertise. As the principal so aptly put it, ‘they help each other, they share, they’ll do anything for a positive outcome for the kids’. A key part of any effective learning community is adequate and continuing professional development.

Professional development is a key issue and involves not just the principal as a ‘head learner’ but more importantly the ‘upskilling’ of all staff so they become

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\(^3\) On my second visit to River Valley Public there were visitors from Western Australia and two other NSW schools. Their principal is now in charge of Technology in the NSWDET.
confident in the use of IT. The comments of Sandholtz, Ringstaff & Dwyer (1997, p.166) sum up this factor.

... Principals seeking school change also benefit from arranging time for teachers to continue their professional development. Learning how to use technology and to teach with a constructivist approach cannot be mastered in a one-shot workshop.

Retallick (1997, p.21) further argues that 'professional development is a dynamic process of working and learning'.

Both these views are supported by this research. First, it was shown that there needs to be ongoing professional development, not just a reliance on TILT and second, that relevant professional development needs to be associated with working and learning in the work place. Additionally, the research data illustrates that there appear to be two key factors that effect the professional development of staff, namely, the level of resourcing and the establishment of an effective learning community. Where this professional development was successful, teachers’ fear of the use of technology began to disappear. The study also illustrated that adequate professional development assisted in translating knowledge of IT into the teaching/learning process.

**Teaching and Learning**

According to Law and Glover (2000, p.167)

*The manifest purpose of the teacher’s role performance is to produce learning in students, but this cannot happen directly. The best the teacher can do is to induce students to engage in activities deemed instrumental ...[to that learning].*

The data suggests that the case study schools that were successfully using IT as a teaching/learning tool had implemented a planned scope and sequence to ensure relevant IT skills were taught to all students in a meaningful way and had also made changes in pedagogy. This involved changes in classroom management/organisation and the assessment of students’ work. Much of the material in this
section came from observations recorded in my field diaries and backed up with material from other sources. Initially we will examine the scope and sequence of IT learning for students, and then aspects of pedagogy including the following:

- Student centred learning
- Teacher focussed learning
- Teacher as a facilitator of learning, including collaborative learning (including peer tutoring and mentoring) and teacher and student as experts.
- Classroom management/organisation and assessing students’ work.

As a first step to reviewing this issue we will examine scope and sequence for the use of IT in the case study schools.

**Scope and sequence, lesson planning and the use of software**

Although four of the five schools had a planned sequence of learning for IT skills, only two of the case study schools had a written scope and sequence targeting student learning of relevant IT skills. These schools were Explorer Public and River Valley Public. My observations suggested that this planned scope and sequence enhanced the use of IT in these schools. An example of the scope and sequence is included as Appendix K. They utilised the ‘Release from Face to Face’ (RFF) time for each class to teach the skills required for students to fully utilise IT as a learning tool in their normal class. This was an innovative approach to the problem of teaching students relevant skills in IT and ensured an ‘expert’ teacher was available to work with the students in a ‘laboratory setting’ to develop the requisite skills. Jill, a teacher from River Valley Public, takes up the story.

> Well the children are really switched on and confident with the use of IT. ... Carol and two other teachers have developed a scope and sequence that has been very good. ... The improvement in skills in kids has been great.

The students learnt basic typing skills, word processing and higher-level skills in a meaningful way. These skills were not taught in isolation from the KLAs but were integrated as a part in projects on HSIE, English, Science and Technology and other KLAs. Often a thematic approach was used so that the learning occurred
across several KLAs. This integration is further explained by Jill from River Valley Public.

It takes a lot to work co-operatively but I wanted that. (...) Often we’ll work together on the same theme. (...) It integrates well with English, Science and HSIE.

The only school not to have some planned sequence of learning across all the years was ‘Rural High’ where the teaching of technology was left to teachers in ‘Computing Studies’ to develop the relevant skills in students. From my observations and discussions with staff, this was as much a result of the unavailability of computers in the normal secondary classrooms, as lack of knowledge or interest from staff. Whilst Merino Central and Vineyard Public had not established an effective scope and sequence, the teachers in those schools were conscious of developing a staged approach to the learning of IT. Both schools were working on developing a scope and sequence.

The four schools with some relevant scope and sequence or staging had also limited software applications to a single platform, for example ‘ClarisWorks’ for word processing, spreadsheets and other elements. They did this in the belief that it was much easier for staff development to work with one program [and a staged learning of IT skills] than to expect staff to become familiar with multiple software programs and to teach IT skills in a haphazard fashion.

The principal of Merino Central sums up the approach in regard to software.

DMel Another concern was the proliferation of software across the school. So through the technology committee, ... myself and others were pushing to decide on a standard platform: ‘ClarisWorks’. Also site licenses. ... That was last year ... Our new co-ordinator DS and a couple of others says there are limitations and want ‘MS Office’.

‘Hypercard’ and ‘Hypercard Studio’ were popular choices for student portfolio work. ‘PowerPoint’ was also being used, but only in its infancy, at River Valley Public. Perhaps of even greater importance than the scope and sequence and use of relevant software is the issue of how the teaching/learning in IT took place.
Teacher focussed learning

It would be unrealistic to expect that there were still not a lot of teaching/learning strategies occurring in the case study schools that were focused on the traditional role of the teacher as the purveyor of knowledge and the student as recipient. At River Valley Public my observations suggested that this was not the norm whereas at the other end of the scale at Rural High, with a few exceptions, it was the accepted *modus operandi*.

This comment from a Year 9 student at Merino Central typifies the approach of many teachers in secondary classrooms.

D.  (...) What sort of teaching strategies do most of your teachers use?

Tim  In Maths they give us an example, then get us to work out piles of examples from the textbook. In a lot of other subjects we just copy notes from the board or overheads. It's so boring. (…)

D.  Do you discuss things? Do you have time for you to say what you think or know?

Tim  In English we often do. Sometimes in History.

D.  How often do you use technologies such as computers in your classes?

Tim  We only use them in Computing Studies. (…)

The other case study schools fitted between these two extremes. The survey results also indicated a mixed use of IT. The major use of IT by most teachers (except River Valley Public) was still for word processing. When I visited classrooms I was very attentive to the particular use of IT by students. Many teachers used the technology for drill and practice, it was only at River Valley Public that I consistently saw the technology being used interactively. What was significant however was, where IT was being utilised as a learning tool during a lesson, the approach tended to be student centered and collaborative.
Student centred learning

As previously discussed, there are two main types of learning that occurs using computer mediated techniques. They are Type 1 (one) and Type II (two). In Type I the student simply follows instructions from the computer and could be called computer centered. Type II learning tends to be interactive and student centered (Maddux, Johnson and Willis 1997). I did not expect, even though the case study schools were ‘beacon’ schools in the use of IT, to find huge pedagogical shifts by all teachers at this relatively early stage of the introduction of IT.

Visiting River Valley Public for the second time allowed me to observe many more lessons than on the first visit when I was involved with a large number of interviews, arranging surveys and collecting relevant documents. I did not think that I would see a student-centered lesson in a computer laboratory, but I was wrong. On my visit to Year 4 RFF (*11/09/98) I arrived ten minutes after the lesson had started. I found many students collaboratively involved in groups of two or three working on a variety of projects. Some were using interactive CD ROMs; some were working on portfolios using ‘Hyperc cardio’ [a piece of software where the student decides on formats, information, input and output] and others doing research or other activities. As I walked around and chatted to the students it was obvious the joy they had in their learning. The teacher walked around much like I was, helping out with problems, guiding when required, but mainly facilitating the students’ learning. The same scenario was repeated time and again, not just in the computer laboratories but also in many classrooms at River Valley Public.

I could not resist asking several teachers what they thought of the use of IT in the classroom. Many teachers, not always with the same words, repeated the following comment wherever student centered learning and the use of IT as a learning tool was occurring in the classroom.

D. I noticed that students seemed to be very actively involved in their learning in the class. Was it always like this?
Carol: I was frightened at first. It took a while to be comfortable with the technology but once I knew what I was about … RFF meant the kids learnt a lot and Year 6\(^4\) helped me to start with. I also noticed it changed the way I taught. Having only a few computers in the classroom led to group work, working in groups gave the kids more control of their learning. … I was negative to start with, but now... (…)

This experience was repeated at Explorer Public and Merino Central, to a lesser extent at Vineyard Public and rarely at Rural High. The exception at Rural High was the library. The librarian had a vision of how students’ learning might be enriched by IT and she actively promoted its use as a tool to use alongside other learning tools. The library was an enormous collaborative\(^5\) classroom (*29/05/98).

**Mentoring and collaborative learning**

One of the most fascinating aspects in regard to mentoring came from River Valley Public where the principal had senior students mentoring various members of staff (*09/06/98). This appeared to be readily accepted by the staff members involved in the mentoring and the students. The principal of Explorer Public also mentioned the aspect of mentoring and collaboration.

And also the attitude of the 'youngie's. ... Every one gets in and helps each other, ... and I've got some 'wizz bang' kids here! (…)

This evidence of sharing knowledge was obvious in all the schools. I would see it happening on a daily basis no matter which school I was in and at River Valley Public and Vineyard Public it was the principal who was often doing the mentoring. At Rural High it was one of the principal’s methods of expanding his staff's knowledge of IT.

**Teacher as a facilitator of learning; Teacher and students as experts.**

The principal of Rural High had a vision for student learning for the Twenty First Century. He suggested the following would occur:

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\(^4\) Year 6 students acted as mentors for teachers starting out with IT.

\(^5\) Collaborative learning including peer tutoring and mentoring
JRu Once IT becomes a common tool many of the concerns that teachers have in teaching will disappear. ... We will have to start teaching skills, like searching, narrowing searches. (…)

___ Now that’s a completely different concept of teaching. (…) The net is going to allow global learning, ... just as the invention of print allowed us to learn, not just from the church. (…)

He went on to argue that teachers would always be needed but perhaps in a different role. He saw them as facilitators of student learning. IT often changed the way they taught. Often the children in the case study schools unconsciously slipped into a peer tutoring or mentoring mode. Collaborative group learning was commonplace. The teacher was not always the expert. Year 4 at River Valley Public saw it this way.

D.. Has any of the new technologies changed the way that any of your teachers teach?

Fred Oh ... yes!!

___D.. In what way have any of you helped others use technology?

John When others are a bit slow or having problems I go and help...

D.. Very good ... and do you help your teachers too?

Cindy Sometimes ... but mostly other kids.

Fred Yes... particularly if they don’t know how to do something...or if they’re busy.

D.. How are you and other students currently using IT in your classes and in the school?

Cindy We mostly do it in groups.

At all the case study schools teachers were coming to grips with the use of IT. While many were hesitant at first, most, when having worked with it over a period of time and with adequate professional development and support were like John, a teacher at Merino Central.

D.. Do you have computers in your normal class?

John Yes, two... At times I send students to other rooms... I’d like every kid to have one now. (…)

159
D. Was it always like this?

John I used to think how am I going to integrate IT ... Now I think... what’s the problem?... It’s like second nature now.

Even at Rural High there were bright spots as the following interview excerpt illustrates. Some students were acknowledged by the librarian as experts. Notice how she illustrates student and teacher as co-learners. This kind of integration was more common at the other schools.

D. Do the students use IT in lessons here?

Librarian In the library the children use the enquiry terminals to locate resources... There are children who know more than I ... so I say, ‘I’m a learner to... so we can share as we learn... I’ll teach you what I know and you teach me what you know.’

Classroom management/organisation and assessing students’ work.

As I wandered around the classrooms, computer laboratories, learning centres and libraries of the case study schools, I saw few teachers standing out the front of the class for long periods of time. What I saw were classes immersed in what they were doing with the teacher often kneeling or sitting with a small group, discussing, listening and often learning. I saw a generally constructivist approach to learning and integration across KLAs evidenced by teachers facilitating students to construct their own meaning.

At River Valley Public much of the assessment was by portfolio (*10/06/98). There was very little norm referenced assessment but where this did occur the results were often well above state norms. As the acting principal explained.

JRI We were pleasantly surprised to notice that our Basic Skills results in Years 3 and 5 also improved. Perhaps it was also to do with the motivation students got from using the technologies. They were more willing to learn.
Overview of teaching and learning

The staff survey data supported much of what has been discussed in the interviews and observations. Staff commented in the surveys that their principals ‘offered continual support in the area of teaching/learning and in updating of knowledge opportunities’ and ‘supported staff in their teaching needs in IT’. Staff and students both commented that IT ‘facilitated student/their learning’.

According to Geisert and Futrell (1995) the teacher’s involvement in the student’s learning is significantly reduced as computer use is transferred into student’s hands. Teachers become facilitators in the learning process. They also point out that the decisions that teachers make on the uses of the technology are of great importance. These arguments have been supported by the study.

Abbott (1996) further argues that for generations schools have been instruction and teacher centered but that the new technologies will involve discovery, the ability of the mind to learn spontaneously, both independently and collaboratively. The research data supports these contentions. The study at River Valley Public illustrated the type of constructivist approach that was possible in teaching and learning posed by Maddux, Johnson and Willis (1997). It was also shown that aspects of mentoring and collaborative learning existed in all case study schools. There was a move away from teacher centered learning to student centered learning in classrooms where IT was being used as a learning tool.

The figure on the following page represents the relationships of the sub-categories of teaching and learning as they relate to IT’s use in the classroom.
First, this diagram illustrates the idea that in teaching and learning the focus in the 'beacon' schools was on learning to use the technology, learning with and from the technology and how this often leads to a more student centered approach with aspects of collaborative learning; students as experts; teacher as facilitator and what this might mean for classroom management and organisation. Second, it points out that teacher centered learning is still occurring and the use of information technology ties in aspects of the use of relevant software, the assessing of students' work and must contain a relevant scope and sequence for the students.
School Structures & NSWDET policies

*Schools will continue as in the past, with computers in a peripheral role, unless it is acknowledged that the present structure of schools is not the ideal or final one, and that change needs to occur in the basic pattern of school operations. If the future of computer technology is to get any brighter, you educators must look more seriously toward change in yourselves.* (Geisert & Futrell 1995, p.305)

The final theme that arose from an analysis of the data was in regard to school structures and NSWDET policies. Evidence suggests that these structures and policies could have either a positive effect on the use of IT as a learning tool or place barriers in the way of its effective implementation. The structure and policies were a key to the successful implementation of IT into the case study schools. In examining this theme it is essential to first consider where the computers and other technologies were placed in the schools, as student and staff access was vital if they were to be used as a learning tool. Second, the research data suggested that special structures within the schools aided the introduction and support of IT. Finally, the policies of the NSWDET were found to have a significant impact on the role of the principal and the use of IT as a learning tool.

**Administrative structures**

Geisert and Futrell (1995) warned that school structures and pedagogies must change to encourage the implementation of IT. School administrations often had a choice where they placed their computers. This structure [the placement of the technologies] was often a key to the successful implementation of IT. River Valley Public [NSW] had already made those structural changes, placing computers not just in laboratories but in the classrooms. At each school [both case study and other schools] I visited they had computer laboratories. The difference, where the students were using them effectively, was that they also had access to the technology inside their normal classrooms. My notes suggest that (*1997-1999) every teaching space at Explorer Public, River Valley Public, Vineyard
Public and the K-6 section of Merino Central had at least two computers and in many cases three computers less than three years old. At Merino Central the new secondary department was to be fully networked with computers in every room. At Rural High they were locked up in two laboratories and the library. In all the teaching spaces at Rural High I only saw three classrooms with any computers in them (*29/05/98), and in the staff rooms that they were in, they were used as word processors and for record keeping. As JRu, the principal, has already explained, the teachers who ran ‘computing studies’ wished to keep control of their ‘little empire’ and lock other teachers and students out.

Whereas, at the other schools, this comment by a staff member at Vineyard Public is illustrative of a different approach.

**John** He [the principal] is much more collaborative and keen on professional development. He wants it used as a tool, not locked up in labs (…)

The placement of computer technology in the normal classroom was indicative in many cases of the approach to learning. At all except Rural High they were in the classroom and being used by students and teachers. Principals saw them as a great motivator with the technology being used consistently throughout the day. At Explorer Public the principal confirmed my observations of consistent use of the technology and the fact that it was a great motivator.

**D.** It's a motivator ...?

**PEX** It is! You can see kids as you walk around the classrooms. ...The machines are never off ... and the kids spend a lot of time on them ...and the kids love it. ... and no matter what they’re doing, they’re learning. (…)

The placement of the computers in classrooms was only one aspect of the structure in schools. It could be argued that the way the Relief from Face to Face Teacher in the Infants/Primary sections of the four relevant schools improved the implementation of IT.
Special structures to assist learning and the use of IT as a learning tool

At River Valley Public the school had special structures to ensure the effective use of IT. The Relief from Face to Face Teacher (RFF) took all classes in a computer rich learning centre to ensure adequate scope and sequence with the learning of IT. What was different from the other case study schools was that the students were not just using the computers in isolation from the curriculum but were integrating the use and learning into the various KLAs. A great deal of liaison went on between the RFF teacher and the classroom teacher.

D. How do you integrate their use in the classroom?

Carol I liaise with the RFF teacher. It’s a lot of work but we manage. She might start something off and I finish it or vice-versa. If they are researching on the Intranet often she’ll help.

At Merino Central a computer laboratory was placed between the Years 5 and 6 rooms to allow easy access during lesson times. Explorer Public had converted a train carriage into a learning centre/computer laboratory with all classes timetabled into it. Principals and staff had adopted innovative solutions to ensure the successful introduction and use of IT.

The final part of this story deals with the NSWDET and the policies that led, in no small part, to the revolution in IT in the case study schools.

Devolution and NSWDET policies

In NSW government schools, responsibility for the introduction of IT was thrown squarely on the shoulders of the schools and their principals. They were supplied with the hardware, significant support in professional development through TILT, but little guidance or personal support. There are conflicting views from principals in regard to this aspect of the implementation of IT. The principal of Explorer Public sang the Department’s praises.

D. (...) ... Anything you want to add?
**PEX** No. ... I’m really pleased with the attitude of the Department given the cutbacks in other areas. It might have been a political decision but it’s one of the best they’ve ever made. If you get a chance to pass that on, please do.

The principal of Vineyard Public also weighed in on the side of the NSWDET and their policies on IT.

**PVI** Well, there has been a degree of support [with IT] that there hasn’t necessarily been with other innovations. They’ve put their money where there mouth is. They’ve put a technology adviser in every District. ... They could have put in two. They have a help line.

Other teachers felt that the NSWDET had put in the computers, trained a third of the staff to a minimal level and left the schools to it. As Karen from Rural High stated.

**D.** Anything you’d like to add?

**Karen** Only about training. ... I don’t know what they are doing at Uni or in the Department now, but we need better training.

All principals and staff had concerns that the policies of the NSWDET might affect the effective implementation of IT. These concerns mainly focussed on professional development and continued resourcing, however, the policies of the NSW DET had obviously had a positive effect on the use of IT in the case study schools.

**Overview of school structures and NSWDET policies**

An integral part of the successful implementation of IT into the case study schools was the innovative and special structures to enhance the introduction and support of the new technologies. These included the strategies of the placement of computers in classrooms and in the case of River Valley Public the use of the RFF teacher to enhance student learning in IT.
Chapter 6  Themes and Issues

The staff survey data supported the interviews and observations. In the surveys staff commented that their principals ‘were willing to have technology running effectively in school’ and ‘run computer courses in using them and ensure an appropriate curriculum’. On the negative side they contended that their schools ‘did not have enough good software’; ‘needed computers in the classroom’; ‘needed more consultants in IT’ and ‘needed to have access to IT for all teachers and students’. The staff also argued that ‘there were problems with the telephone network system’ and ‘they needed a policy that mandates minimum skills for all teachers’.

On the whole, most principals were supportive of the Department’s efforts but professional development was a continuous and persistent problem mentioned by all principals, most staff and interestingly enough, many students. The surveys supported this view with 75% of staff suggesting that adequate and continuing professional development was essential to the successful introduction of IT. Principals also did not seem to have the devolved authority to do what Gerry Smith did at River Oaks in the curriculum area or to employ specialist technicians to keep the technology running.

Conclusion

An analysis of the data illustrated the components of leadership required to successfully introduce IT as a learning tool into the case study schools. The qualities of modeling, knowledge of IT and a collaborative approach to leadership were obvious. The principals had a vision for the implementation and, in the cases of River Valley Public and Vineyard Public, were experts in the field. It was also shown that, where the school community worked together as a learning community, the introduction of IT as a learning tool was far more effective.

In all schools the issue of professional development was a vexed one. Even at River Valley Public it was seen to still be an ongoing problem. Without adequate training and development for staff, teachers tended to be ‘technophobic’ about the use of IT. Students and teachers at the four case studies schools where IT was
successfully implemented noticed a slow progression from teacher centered learning to student centered and collaborative learning. Adequate structures were deemed essential in all schools and innovative solutions to problems were common. Many of these structures were different from the norm. The position of the NSWDET was praised in some schools, although generally staff and principals were concerned about some issues, the Department was seen to have devoted considerable resources to the introduction of IT. The problem of devolution and the real authority of principals in making important decisions were not highlighted by data flowing from the semi-structured interviews but became obvious from numerous discussions with principals and staff over lunch and morning tea.

Most principals, students and staff saw the potential to improve learning outcomes using IT in a meaningful way. The results obtained suggested that each case study school was at different levels in the introduction of students to the ‘Information Superhighway’. The leadership role of the principal was confirmed by this study to be essential to the successful implementation of IT as a learning tool in the case study schools.

**Summary**

This chapter examined the results obtained from the research in the case study schools and discussed the relevant issues supported by a qualitative analysis of the data collected. The main themes of leadership, learning communities, teaching and learning and finally, structures and policies, were clarified using the research data supported by relevant literature, where appropriate. The next chapter will revisit the research questions and discuss them in relation to the findings and the resultant theoretical and methodological perspectives. A revised model to illustrate the role of the principal in the implementation of IT will be proposed. From an examination of the research questions and the above perspectives tentative conclusions will be made in relation to the thesis as a whole and recommendations proposed for future action and research.
CHAPTER 7

CONCLUSIONS and RECOMMENDATIONS

The computer is, in some ways, my hands and feet. It even gives me wings to fly to other countries and far away places.
(Moraitis 1999, p.44)

Outline

The previous chapter analysed the data and examined and discussed the results from the themes and issues arising from the case studies. This chapter briefly restates the limitations of the study, discusses the themes in relation to the research questions asked in Chapter 1, makes recommendations on the theoretical perspectives, methodology used, future areas of research and the current educational policies on IT in NSWDET schools. Finally, the chapter draws tentative conclusions from these discussions using a model to illustrate the inter-relationships of the context and themes.

Introduction

The main research question that this study sought to answer was:

What is the role of the principal in implementing Information Technology (IT) as a learning tool in schools?

When examining this question the following sub-questions were also seen to be of significance.

- What factors positively influence the implementation of IT as a learning tool in schools?
Chapter 7
Conclusions and Recommendations

- What are the barriers to the implementation of IT as a learning tool in schools?
- How is IT currently used as a learning tool in schools?

This chapter will restate the limitations of the study, draw relevant conclusions for each of the associated research questions in turn, drawing on the relevant research data and information contained in previous chapters to assist. The findings will focus on the main research question and attempt to tie in aspects of the other questions where relevant. A model to tie the theoretical perspectives together will be offered. Tentative recommendations for change and further research will flow from these findings.

Limitations of the study

As previously stated in Chapter 1, case studies are of greatest relevance to the particular sites under consideration but because of their nature, cannot always be used to forecast what might be appropriate on a more general basis. This study was limited in that only five schools were studied. This in no small way has been made up by the depth of the study at each of the sites. The question of ‘beaconess’ of schools was also problematical. In fact it was seen that some schools that were initially seen as ‘beacon’ schools were found to be on a continuum from extensive use of IT as a learning tool by all staff to isolated ‘beacons’ within the school. Another limiting factor was the decision to study only schools in rural NSW. The researcher had, however, visited several sites in the Sydney metropolitan area and made visits to over twenty other rural schools. The choice of the five schools was made after a pilot study where two large rural secondary schools were also visited. A broader perspective has also been possible through attendance at a variety of international, national and state conferences to speak with principals.

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2 Including a fascinating discussion with a principal from Uganda who said that 90% of their schools had no computers but that they were trying to work on teacher training to ensure that when they did become available they would be used in the best possible way.
and educators from a range of backgrounds and at a variety of stages of implementation of IT in their schools.

Finally, it is limited in that the research design focuses mainly on the use of interviews, observations and the study of a variety of relevant documents. Surveys have played an integral part in the research methodology but there has been no attempt to survey large numbers of teachers or students and to interpret those findings either qualitatively or quantitatively in any great detail. Further research using a more quantitative approach is thus needed in the future. No attempt has been made to closely examine what is effective use of IT as a learning tool, the focus has remained on the principal and their role in the implementation of IT.

The Research Questions

What is the role of the principal in implementing Information Technology (IT) as a learning tool in schools?

It would seem from the results of the case studies that the key roles for the principal are as a leader and a facilitator. It is further suggested that a priority for principals might be the establishment of effective learning communities where the implementation of IT might be encouraged and developed. As Sergiovanni (1994, p.202) so aptly puts it:

No one person can pull it off. Community building asks a great deal from everyone. It asks, for example, that principals, teachers, and students care for each other, learn together, inquire together, and share together in the obligations of leadership.
This is of particular concern with the introduction of IT. Other essential aspects of this role might include adequate knowledge of IT, modeling its use and adequate resourcing.

From the comments of the principal of Merino Central and a number of staff it could be argued that principals need training outside the TILT package to become knowledgeable in the use of IT and how it might best be implemented. The introduction of IT into schools appears to differ in that IT is an innovation targeted across all levels and KLAs and the crux appears to be to get sufficient ongoing professional development to ensure that IT is used in a meaningful way and, as previously mentioned establish an effective learning community. The principals still need the skills espoused in the earlier theoretical perspectives (Sergiovanni 1994, Hill 1999 and Hoare 1998) but they also need the new skills relevant to the new technologies.

**What factors positively influence the implementation of IT as a learning tool in schools?**

As previously stated, the leadership role of the principal had a positive influence on the successful implementation of IT. The provision of adequate and continuing professional development was seen as another key factor. Where an effective learning community had been established then the success rate of implementation was high. Changing school structures and the resource input from the NSWDET was also seen as essential to ensure the successful implementation of IT as a learning tool.

It is argued here that whilst the case study schools did not have devolved control over curriculum and staffing in most cases the evidence suggests that this did not stop the successful implementation of IT. The case study schools appeared to have sufficient devolved authority to implement the necessary changes and fulfill
their vision. Despite Fairservice’s warning (1994, p.20) that the ‘collegiality of teachers has been replaced with suspicion’ following devolution, the collegiality of the staff at Explorer Public in particular, belies that argument. In an ideal world they might have the same devolved authority as Smith (1999a & b) had at ‘River Oaks’ in Canada, but this was not deemed by the researcher to be essential on a careful analysis of the evidence.

It was suggested that in the case study schools where IT’s implementation was successful then the teachers approach to teaching/learning was changing from a teacher centered model to a more collaborative and constructivist one. Innovative changes in administrative structures to assist learning had also taken place. In the secondary area it was argued this was less obvious and was of concern to the principals involved.

**What are the barriers to the implementation of IT as a learning tool in schools?**

The structures at Rural High made the implementation of IT difficult. With the technologies locked up in computer laboratories and the library, these factors hindered the implementation despite the principal adopting a positive leadership role. The lack of cohesion caused by the absence of an effective learning community was also seen as a barrier as was inadequate professional development.

According to Gerry Smith (1999a, p.21): ‘It was imperative that staff hired to the school were willing to learn about Information Technology.’ Other writers (Parker 1999) suggest that the ‘technophobia’ of teachers is a huge stumbling block to the successful implementation of IT. This study illustrated that where staff was given adequate and continuing assistance they could overcome their initial fears and become competent users of the technology. As previously stated, one of the
greatest barriers appeared to be adequate human resources in the form of professional development despite the best efforts of TILT.

**How is IT currently used as a learning tool in schools?**

According to Williams (1996, p.21):

> Technology is pervasive and it will affect all people in all aspects of their lives. It is therefore essential that technology is taught well. Historically there has been a tendency to repeat mistakes of the past.

This study showed that even in some of the ‘beacon’ schools IT’s effective use was patchy. Two principals commented that staff use was ‘poor’ or that some teachers kept the technology to themselves. It is suggested here that where it was being used effectively it was often used in higher order interactive learning inside individual classrooms. In other areas it was used mainly for games, or in some cases, little if at all. One could argue that if these were ‘beacon’ schools, what was happening in other schools?

This topic was not a focus of the research but observations, interviews and survey data painted a mixed picture of the use of IT. I remember an incident at River Valley Public where, on several occasions, I visited Year 4 students who were collaboratively and interactively working with a variety of technologies. This aspect was balanced by my visit to numerous classes at Rural High where computers and associated technologies were not being utilised at all. Only further research can adequately answer this question on the effective use of IT in schools.
Theoretical implications

The ‘grounded theory’ formed from this research supported many of the theoretical perspectives examined in Chapter 3. When we refer back to the work of Hill (1999), Retallick et al. (1999) and Sergiovanni (1996) we see aspects of collaboration, community, mentoring, principal as head learner, change management, and other similar issues.

The important new aspect that is relevant here is the essential prerequisite of adequate professional development to overcome the ‘technophobia’ of, in many cases, a completely new innovation that many teachers and principals had little prior knowledge of or skill in the use of the technologies involved. Learning communities also became a greater focus than initially expected where principal, teacher and student were often co-learners.

Methodological implications

The qualitative multiple case study method was deemed to be an effective tool in researching the issues involved. The semi-structured interviews allowed a depth of understanding of the issues that guided observations. By inter-referencing all data it was possible not only to enhance individual perspectives but also to assist triangulation and validation of the material collected. The study would have benefited from more detailed and objective observations of staff utilising IT to determine whether it was being used as an effective learning tool or simply as an ‘add on’. A return visit to interview principals again at the end of 1999 to examine any changes in their thinking or methodology of implementing IT would also have been extremely beneficial.
Finally, a more detailed study is obviously needed that also draws on the strengths of a quantitative approach but this issue will be dealt with in the following section.

Further research issues

It would seem obvious that a great deal more research needs to be carried out in this area as this study, like Schiller’s (1997), was essentially an exploratory exercise. There is a need to examine many more ‘beacon’ schools to see why they are effective and additionally visit schools both in Australia and overseas where IT is not being implemented successfully and compare the two. This has been done to some extent (Macneil & Delafield 1998, Campbell & Cordiero 1996) but many more studies need to be carried out to give a sound basis for decision-making.

Recommendations

The following recommendations are posed as a result of this study. First, recommendations in relation to policy for principals, teachers and students, second, for school structures, personnel and curriculum are detailed. Finally, recommendations are made specifically for further research.

Policy

1. Principals

Principals should immediately be given hands on training in the educational uses of IT as a learning tool in schools and the personal use of computer technology utilising a range of software including: word processing, databases, spreadsheets and the use of PowerPoint. In addition, they should be in-serviced in the future possible directions of IT in schools and be given sufficient knowledge about the
setting up of computer technologies in schools so that subsequently they can make meaningful decisions on financial and human resources.

Finally, but of no less significance, there should be a renewed emphasis at all levels (not just for principals) in regard to the importance of creating learning communities and the possible use of constructivist approaches to teaching/learning in schools.

2. Teachers
In the area of teacher training the following should be implemented: the professional development of all staff in the use of IT be continued with schools being given control of professional development funding. Additionally, training in the establishment of learning communities in schools be implemented. Finally, professional development in the use of constructivist approaches to teaching be carried out in conjunction with other inserviceing.

3. Students
Students should be given more access to supervised educational on-line forums. One of the computer's greatest benefits is as an interactive communication tool.

4. Structural
The study showed that at least three networked computers should be made available for every classroom (K-6) and in at least every second classroom in secondary areas. In the case this was deemed essential so that students would have sufficient on-line access and computer availability to work in individual classrooms without need to access computer laboratories all the time. In secondary classrooms placement in every second classroom would allow relatively easy access for all students.

5. Personnel
Technical Assistants who can maintain computer systems should be appointed and shared between schools. Additionally, a second Technology Adviser should be appointed in areas where travel consumes large amounts of time for the currently appointed adviser.

6. Curriculum
The appropriateness of the separated contexts of KLAs (K-8) should be examined to allow greater integration and linking across current KLAs.

Research

1. A more in depth study be undertaken with principals focusing both on ‘beacon’ schools and schools that are seen to be having problems with the implementation to confirm or alter the ‘grounded theory’ tentatively formed in selected rural schools. This should involve both quantitative and qualitative research.

2. It was felt that there is also a need to examine the professional development needs of teachers to ensure they can successfully use IT as a learning tool in their schools.

It was considered that there is already considerable research being carried out in schools about the effectiveness of the use of IT in education to improve student outcomes.

Conclusions

It is contended that the results of this study illustrated that for the effective implementation of IT in the case study schools the following factors needed to be addressed if the principal was to assume a role that led to the successful
introduction and support of IT as a learning tool. First, the principal needed to be knowledgeable. This did not mean that they necessarily had to be responsible for the professional development of staff as was the case at River Valley Public and Vineyard Public but, like the principal of Explorer Public, they had to understand the technology, IT's potential uses as a learning tool, and importantly model the use of IT. Second, the results of the study illustrated that it was necessary for schools to establish effective learning communities with the principal as head learner, where staff, students and community worked together to develop a shared vision that saw all members of the community as equal partners in the learning process, where collaborative learning and the sharing of skills and knowledge by all parties became part of the school culture.

Another important finding was that adequate and continuing resourcing was essential, both physical and human. This factor required principals to ensure adequate professional development to overcome the 'technophobia' of many staff and ensure that the technologies were placed where students and staff could effectively use them. This often led to changing structures, such as the placement of computers in classrooms, not just computer laboratories and the innovative use of staff. An example of this was the way River Valley Public utilised their RFF teacher in Infants/Primary. When this did occur often pedagogical shifts took place from a teacher centered to a pupil-centered approach to teaching/learning. Students were thus empowered to construct their own knowledge.

Finally, the study illustrated that the principal needed to be an effective change agent with excellent change management skills. Above all, the principal needed to lead. The following model illustrates how all of the above findings might be linked.
An examination of the model illustrates the complex nature of the relationships between the themes and issues. Below the thesis question we notice the varying contexts. Each one has an influence on the other. The school culture has an effect on any innovation that the institution (NSWDET) may wish to introduce. They all influence the effectiveness of the implementation of IT either directly or indirectly. We notice the barriers between the use of IT as an effective learning tool and improved student outcomes and the forces that might be positively affecting the implementation. An analysis of the data suggested that all of the positive factors needed to be in place to ensure that the principal was successful in the introduction and support of IT as a learning tool in their school.
Summary

This chapter revisited and briefly discussed the research questions. It showed that there were significant barriers to the successful implementation of Information Technology in the case study schools. Perhaps of greater significance for the introduction of IT as a learning tool was the discovery that these barriers had been successfully overcome in four of the five schools visited. The successful implementation occurred as a result of the positive elements that derived from the establishment of effective learning communities, sound and visionary leadership and operative professional development that met the needs of all staff, including the principal. The role of the principal was also shown to be crucial to the successful implementation of IT as a learning tool in the case study schools.

From these considerations the researcher examined the relevant theoretical perspectives, methodological considerations and suggested further research issues that emanated from the answers to the research questions and the study. This perspective then enabled the researcher to make recommendations for future policy involving the principal, staff, students, structures and curriculum in schools.

Finally, tentative conclusions were drawn from an analysis of the data and the literature that attempted to answer the questions posed by the thesis ‘The role of the principal in the implementation of Information Technology (IT) as a learning tool in schools’.
ABBREVIATIONS


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APPENDIX A

USE OF TECHNOLOGY

Dear staff member,

This survey will assist in the gathering of data that might help improve the effective use of Information Technology (IT) in the classroom. It is part of an Ed.D. thesis study conducted through Charles Sturt University by myself on IT and the role of the principal. The research topic is:

*The role of the principal in introducing and supporting Information Technology (IT) as a learning tool in schools.*

To effectively explore this topic I need to know what is actually occurring in your school and this can best be done through your eyes and those of your students. As it is impossible to interview each staff member and student this questionnaire will support the observations and interviews carried out.

**PLEASE CIRCLE THE CORRECT ANSWER OR PRINT INFORMATION AS REQUIRED.**

1. **SCHOOL:**

2. Faculty/Class taught:

3. (a) Number of years teaching experience:
   - 1-3
   - 4-10
   - 11-20
   - 21+

   (b) Number of years at this school:
   - 1-3
   - 4-10
   - 11+
4. I have access to a computer at home: 
   
   Yes/No

   If NO go to 7

5. If YES (a) How long have you had this computer (in years)?: 
   
   1-3
   4+

   (b) What are the main types of uses for it?: 
   
   word-processing
   email
   data base
   games
   other

6. No. of hours per week I use it: 
   
   1-3
   4-10
   11-20
   21+

7. If YES - why did you buy the computer, if NO why not?

   

8. Circle the software programs you are familiar with: Microsoft Word
   Microsoft or Claris Works
   Publisher
   HyperCard/studio
   Oasis
   Others

9. Are you confident using email? 
   
   Yes/No

10. Are you confident using the Internet? 
    
    Yes/No

11. Have you used computers or related technologies in any lessons this year? 
    
    Yes/No

   (if YES go to 13)
12. If NO, why not? 
   access
   lack of expertise
   lack of software
   no need
   other __________

   (Go to 15)

13. If YES, how many times per week: 
   1-3
   4 -10
   other ______

14. If YES, describe the use ________________________________

15. Have you done TILT? Yes/No
   If NO go to 17

16. How did TILT training assist you to use IT as a learning tool in the classroom?
   ________________________________

17. What other relevant training (besides TILT) have you had that has assisted in
your use of IT in the classroom? ________________________________

18. What sort of additional training (if any) do you need to be able to use technology
as an effective learning tool in the classroom?
   ________________________________

19. Have you used the ‘computer-based technologies’ in the KLA documents?
   Yes/No

20. If yes, comment on their usefulness and effectiveness; if no, why not?
   ________________________________

21. What role should a principal assume to ensure the effective introduction and/or
support for the use of Information Technology in the classroom?
   ________________________________

22. Describe the role the principal has played in this school in introducing and
supporting the use of IT as a learning tool in the classroom.
   ________________________________
Please provide any further comment you would like to make about technology and teaching/learning, either in broad terms or as it specifically relates to this school.

(Use the bottom of the page if space is insufficient)

Many thanks - Des Wilsmore
APPENDIX B

USE OF TECHNOLOGY

STUDENT SURVEY

Dear student,

Answering this survey will assist in the gathering of information that might help improve the use of technology in the classroom. It is part of a study conducted through Charles Sturt University by myself on technology. I want to know how different kinds of technology are being used by you and your teachers.

CIRCLE THE BEST ANSWER OR FILL IN THE INFORMATION IN THE SPACE PROVIDED.

1. SCHOOL: _________________ 2. YEAR: ___

3. I have a computer at home: Yes/No

4. If NO go to 7, If ‘yes’ (a) Age of computer in years: 1-3

4+ (b) Type: IBM clone

Macintosh

5. If Yes, what are the main uses for it:
games
word processing
internet
e-mail
other _________

6. I use it for how many hours per week?: 1-3

4-10

11+
7. Circle the software programs you are familiar with:
   Microsoft Word
   {Microsoft or Claris Works}
   Publisher
   HyperCard/studio
   Others

8. Are you confident using email? Yes/No
9. Are you confident using the Internet? Yes/No
10. Has your school got its own web page? Yes/No
11. Have you used computers or digital cameras in any lessons this year? Yes/No
    (if YES go to 13)
12. If NO, why not?
    access
    teacher does not use
    other
    (Go to 15)
13. If YES, how many times per week:
    1-3
    4-7
    8+
    other e.g. once a term
14. If YES, what were the main uses?
    {'Computing Studies'}
    word processing
    internet
    other
15. How do you rate your knowledge and use of technology?
    (1 is poor, 5 is excellent)
    Poor 1 2 3 4 5 Excellent
16. What sort of additional skills (if any) do you need to be able to use technology in the classroom?

17. What should the principal and teachers do to ensure the best use of technology in the classroom?

18. How does your teacher use technology in the classroom?

Please write down any other comments you would like to make about technology and learning in the classroom.
APPENDIX C

Survey Results

1. Students

1. There were 25 students surveyed from 5 schools. *River Valley Public only
2. 4 x y10; 4 x y7; 6 x y6; 6 x y4; 3 x y5; 2 x y3.
3. 18/25 students had computers at home.
4. (a) Of the 18, 11 had computers between 1-3 yrs old, rest 4 or older.
   (b) 11 were IBM, 7 were Mac or Apple
5. Main uses were: Games x 16; WP x 12; Internet x 2; email x 1; other: schoolwork x 1; art studio x 1.
6. Use in hrs per week: 1-3 = 13; 4-10 = 4; 11+ = 1.
7. Programs familiar with: MS Word = 13; MS or Claris Works = 19; Publisher = 9; Hypercard etc. = 4*; Other = CDs x 4, Ami Pro x 1, games x 2.
10. School has own web page = 3.
11. Used computers/digital cameras in class this year = 24
12. If NO why not: access = 1
13. Times per week: 1-3 = 22; 4-7 = 1; NIL = 1; other = 1 x 1 per term
14. Uses: Computing Studies = 11; WP = 17; Games = 4; drawing = 1.
15. Knowledge (poor)1 – 5 (excellent)
   1 = 3; 2 = 4; 3 = 6; 4 = 5; 5 = 7.
16. Additional skills needed to use IT in class?
   3 x typing; 3 x Internet access; 1 x better teacher knowledge; 1 x how to set up
   programs; 1 x use of calculator; 3 x email; 6 x none

17. What should the principal and teachers do to ensure the best use of technology
   in the classroom? Some examples:
   - show us how to use properly, give everyone a fair go, make people more
     aware of its uses, learn more about its potential, assignment and most
     work using them
   - more and updated technology, make them more readily available,
   - have a computer in every room, give more lessons so we understand,
   - keep teaching IT in the classroom, have computers in the classrooms, put
     more games and learning programs on comps., put more software on
     them, better access to Internet in class, more time, relevant activities x 2,
     more time, unsure, better access in classrooms,
   - give us more time on the computers, buy IBM compatibles- easier to use

18. How does your teacher use technology in the classroom?

   Some examples:
   - Calculator x 4, lathe, games, WP x 14, research x 2, computer x 2, most
     don’t, teaching, maths x 2, games x 3, free time play, Internet/Intranet x
     3, reading groups, database, scan x 2, slide shows x 2, helps kids with the
     computer, worksheets, publishing
   - homework to use it, Claris home page, teach

19. Any other comments about technology and learning in the classroom.

   Some examples:
   - put computers in the classroom, everyone their own PC, teachers need to
     learn, need computers in rooms, computers in every classroom,
   - computers in more rooms, need more computer time, all schools should
     have them, more computer time x 2, relax the brain, ensure computers in
     classroom work all the time, want to become computer literate, I’m
     learning a lot more this year and it’s worth it

2. Staff

   Q1. 17 staff surveyed from 5 schools.

   Q2. Faculty/stage etc.: Stage 1 = 5; Stage 2 = 1; Stage 3 = 5;
       Maths = 1; Science = 1; V.Art = 1; Careers/Art = 1; English = 1; History =
       1; STLD = 1.
Q3. (a) Years teaching: 1-3 = 4; 4-10 = 4; 11-20 = 4; 21+ = 5.
    (b) Number of years at this school: 1-3 = 12; 4-10 = 3; 11+ = 2.


Q5. (a) How old: 1-3 yrs = 6; 4+ = 9.
    (b) Main types of uses for it? word-processing = 13; Internet = 3; email = 3; data base = 4; games = 5; other = store programs

Q6. No. of hours per week I use it: 1-3 = 4; 4-10 = 10; 11-20 = 1
    21+ = 0

Q7. Why bought or why not have one?
    Not have: Couldn't afford x 2
    Why bought: Some examples: organise school work/husbands business, keep information & easy update, have comp. Same as school, school use, keep up with technology x 2, do work in lieu of typewriter x 2, work reasons, university studies x 3
    use for variety of reasons, school/business, keep information, easy update, same as school

Q8. Circle the software programs you are familiar with:
    Microsoft Word = 14; Microsoft or Claris Works = 16; Publisher = 4; HyperCard/studio = 7; Oasis = 4;
    Others = learning games for students x 2, numerous, photoshop ami-pro x 2, lotus, printshop, pagemaker, file maker x 2,

Q9. Confident using email? Yes = 14

Q10. Confident using the Internet? Yes = 13

Q11. Used computers or related technologies in any lessons this year? Yes = 16

Q12. If not, Why not? = not confident
Q13. If YES, how many times per week: 1-3 = 13; 4 –10 = 3

Q14. If YES, describe the use. Some examples:
   Word Processing x 10, , typing x 2, games x 2, Internet x 8, 
   research, email, story writing x 2, reports, spreadsheets, graphing, 
   scanning x 2, card creation, maths, as release & with own class, 
   publishing, follow up lessons taught by other teachers, data base, 
   cross words, literacy, writing tasks, completing a report, making a 
   book, hypercard

Q15 (a). Have you done TILT? Yes = 10
Q15 (b) How did TILT training assist you to use IT as a learning tool in the 
   classroom? Some examples: new ideas, email x 2, internet x 3, 
   variety of software, programming ideas x 2, improved knowledge 
   in Mac and IBM, internet section useful, confidence with internet 
   & multimedia, basic typing skills, hypercard, programming, made 
   me more confident, improved knowledge,

Q16. What other relevant training (besides TILT) have you had that has assisted 
   in your use of IT in the classroom? Some examples: 
   Training with W.. x 2, post-graduate Uni. X 2

Q17. What sort of additional training (if any) do you need to be able to use 
   technology as an effective learning tool in the classroom? Some 
   examples: 
   visit to classroom which integrates into all KLAs, how to sort out 
   computer problems e.g. printing, programs not loading, TILT 
   probably have enough x 2, net sorting skills, time to practise x 5 
   none, how to encoporate it effectively into every day teaching 
   hyperstudio - how to use it with 25-30 kids, more T&D x 3 
   visit to classroom which use it as a learning tool 
   how to sort out problems, networking

Q18. Role of the principal? Some examples:
   take the lead x 2, adequate & appropriate hardware/software, 
   support, T&D, offering continual support & updating of 
   knowledge opportunities, support staff in their needs x 2, don’t 
   know x 2, resources, staff development x 4, encourage, up to date
with current use of IT, willing to have technology running effectively in school, computer course in using them, appropriate curriculum, activities, depends on principal and executive structure, encourage

Q19. Have you used the ‘computer-based technologies’ in the KLA documents? Yes = 1

Q20. If yes, comment on their usefulness and effectiveness; if no, why not? Comments: Useful if had time to read x 1, no time to read x 2

Q21. Describe the role the principal has played in this school in introducing and supporting the use of IT as a learning tool in the classroom.

Some examples: support for tech c'ee, computer staff, planning for new hardware been very supportive in introduction x 3, TILT course early last year encouraged participation. supported staff & students .use of IT, facilitatd development of systems training promoted technology, resourced staff development, encouraged x 4, has taken lead x 2, excellent, listens to staff, uses funding wisely, wants students exposed to technology support for TILT, major role because of knowledge and interest promoted technology, ran staff development

Provide any further comment you would like to make about technology and teaching/learning, either in broad terms or as it specifically relates to this school.

Some examples: not enough good software, need computers in classroom, best educational aid a teacher can have, more consultants in IT, more courses on computer troubleshooting, would like to feel more confident in the use of IT, access to IT for all, problems with telephone network system, need policy that mandates minimum skills for all teachers, too much emphasis on IT, not enough on reading resources
APPENDIX D

Interview questions - principals, staff and students

Semi-structured *Ask all

Principal
Q1 What has been your role in the introduction and support of IT in your school?*
Q2 How are staff currently using IT as a teaching/learning tool in your school?*
Q3 Does it vary from class to class and teacher to teacher? Give some examples.*
Q4 In what way, if any; have you assisted staff in their use of IT?*
Q5 What concerns if any do you have about the use of IT in your school?*
Q6 What are some of the achievements in IT in this school?
Q7 How do you see IT enhancing student outcomes?*
Q8 Has the use of IT assisted you or hindered you in your job?*
Q9 Who and what has been crucial to the successful use of IT in your school?*
Q10 Has the use of IT changed your role as a principal or is it likely to?
Q11 How is this innovation different from others you have had to cope with?*
Q12 Did you need to use additional change processes to ensure its successful introduction?*
Q13 Is there anything you would like to add?*

Staff
Q1 In what way has the principal supported the introduction and use of IT in your school?*
Q2 How are you and other staff and students currently using IT as a teaching/learning tool in your school and*
Q3 Does it vary from class to class and teacher to teacher? Give some examples.*
Q4 In what way; if any; have you assisted other staff in their use of IT?
Q5 What concerns if any do you have about the use of IT in your school?
Q6 What are some of the achievements in IT in this school?
Q7 How do you see IT enhancing student outcomes?*
Q8 Has the use of IT assisted you or hindered you in your job?
Q9 Who and what has been crucial to the successful use of IT in your school?*
Q10 Has the use of IT changed your role as a teacher?*
Q11 Is there anything you would like to add?*

Students
Q1 How often do you use computers in class?*
Q2 How are teachers currently using IT as a teaching/learning tool in your school?*
Q3 Does it vary from class to class and teacher to teacher? Give some examples.*
Q4 In what way; if any; have you assisted other students or teachers in their use of IT?
Q5 What concerns if any do you have about the use of IT in your school?
Q6 What are some of the achievements in IT in this school?
Q7 How have you used Information Technology in classes this year, e.g. Word Processing, Internet, email, CD Roms?*
Q8 Has the use of IT assisted you or hindered you in your learning?*
Q9 Who and what has been crucial to the successful use of IT in your school?
Q10 Is there anything you would like to add?*
APPENDIX E

Principal interviews

These are edited interviews with the principals of the case study schools. In most cases they pertain to only the first interviews. Where material from other interviews is included they are shown by the sign ___ before the text.

Merino Central

Date: 18-08-98 Time: 10.00 a.m. [D. = interviewer, Da. = principal]

D. What has been your role in the introduction and support of IT as a learning tool in your school?

Da. I guess my role as far as the introduction and implementation goes is as a facilitator ... to encourage people through their own interests ... through the technology committee to obtain new ideas ... to look at what we have in the school as a collaborative group ... what we would like to see in the future both through resources' training and development of teachers. From the support point of view, I'd like to be able to say I'm a role model ... but I'm not a technocrat myself but I can encourage and facilitate through the technology committee and working with individual teachers. There's the community there as well. (...) We are all looking at various projects, so I guess as a facilitator.

D. How are staff currently using IT as a teaching/learning tool in your school?

Da. The senior school and some staff are dependent on IT as we are part of an 'ACCESS' group, so IT across the seven schools is crucial to the program, with such things as the program that incorporates computers into the program. We've also had staff off for professional development. We've also tried to have computer access for our senior secondary group with limited resources, motorised mark book, reporting. We have computing studies (9/10 and 11/12 computing studies) which most students access; 7/8 in design and tech. which incorporates it as well. ... We've also got our library as well which has traditionally been very much book and audio-visual based. We do have an Internet site in their now and more and more students are encouraged to use other software e.g. CD-ROM's. ... We're providing opportunity and access for students there. In Public ... every classroom has access to at least one computer to use on a day by day basis. From my observations most public classes will have some group work that includes the use of computers. (...)

D. I like that concept. (....)
Da. The limitation in secondary has been that we haven't had computers in classrooms. We have two computer laboratories, one Mac and the other IBM and then it's been dependent on teachers booking it up to use for a class or the teacher confident enough to go up and use it as part of the lesson. I've observed that in a number of secondary classes i.e. science and history. I haven't observed that in English. ... Well as far as program budgeting is concerned the science teacher has put in a budget submission for the science lab. We actually enabled them to have it with the last rollout ... but that's in his lab ... not other classrooms. ...

(...) As far as public is concerned, our K/1, 1/2 and 2/3 classes have a computer in the back of the room. Our two other upper public classes are on either side of the Macintosh lab. ... and so they tend to use it more and that's worked very well. Of course, we have the library which has limited computer access at the moment. The librarian would like to have more desk top computers and internet in there for access for kids. 

(...) D. Is that where you have your internet access?

Da. Yes. The important thing for the library is that there is sufficient access for students to do research and to use the Internet or CD-ROMs. At the moment we've just set up an Internet access library policy for lunchtime, four days a week, which is limited. They have to book in but that way we can monitor what they are accessing and who is accessing, so that will be useful. At the moment we have four internet access points. There's one that is available to our years 11 and 12 in the senior learning centre and that's used regularly. There's one that comes into the library and is a community funded one. There's one in the IBM lab. and one in the Mac lab .... They tend to be used only for students who have agreed access ... staff sometimes after school. I'm not sure how many use them. ... We've got approved plans for new works, we'll be fully cabled by the end of 2000 with a full intranet. That's exciting! 

(...) D. Does the use of IT vary from class to class and teacher to teacher?

Da. Yes ... Depends on their expertise and access. ... 

(...) D. In what way, if any, have you assisted staff in their use of IT?

Da. Number one, When I first came here, I checked if we had done TILT and the answer was, 'No', so we did TILT, ... the second half of last year. We had funding for six, but we had twelve do it. Some only did what they needed to ... others did the whole lot. That was important. Interestingly we still have some funding for days not used which I offer people if they have particular projects they wish to do. We still have some left which means we are covering it in other ways or they are too busy with other things. The other was to be part of the technology
committee. I wanted to make sure it was seen as a technology committee not a computer committee. There's still a chance it focuses on computers and computer acquisitions. ... The resource is sometimes the gateway to other things but I've tried to keep it broad.

D. Good. (…)

D. So, through the tech committee that has reps. from students, teaching staff, parents, ancillary etc. to try to facilitate e.g. library. (…) If someone comes up with an idea from a teaching/learning view we try and assist. ... TILT has helped nudge along our coordinators. They decided to split the role. ... It's a big job. They decided to use the resources for hardware, not time, but my concern is I might overload them in doing the planning and research that the money would have bought time with. Can I just add, I see the school as a community resource. I see the library as a community resource. In liaison with C… Shire, … we decided to site a 'cyber' cafe here. We'll use one of our lines. That will give community access.

D. Fine ... What concerns, if any, do you have about the use of IT in your school?

D. Number one, that the people that are using it have the time to be trained and to therefore be able to use it efficiently and effectively. My observation is that unless the teacher knows how to use it effectively they become frustrated. Secondly it's not an instant access on the Internet and it requires planning, so we are setting up a virtual sight and encouraging people e.g. the librarian, to identify and download information or sites. Another, and this comes down to teacher competence, is that in the future we make sure it's used as a tool and does not become the focus. I'm really pleased in the public where they use it as a part of the lesson e.g. maths for group work, where it is highly stimulating and motivating. (…)

One of my concerns was how to encourage but monitor and limit student access during lunch times, where they simply want to play games. I don't mind them playing games if it's building their skills but its limiting other groups because they're playing. ... That's a different philosophy to last year when, if they were used, it was fine. (…)

I am also concerned that I am not necessarily a role model. (…)

Again when I stepped into the school I was interested in IT in Admin. We have an old 'oasis' setup. I researched that. The advice with 'oasis' is to wait for the new package. The waiting limits and is a bit frustrating. ... Another concern was the proliferation of software across the school. So through the technology committee, myself and others were pushing to decide on a standard platform: ‘Claris works’. Also site licenses. ... That was last year ... Our new co-ordinator DS and a couple of others says there are limitations and want 'MS Office'. …
Appendices

Change means: How do I make judgements as a principal? Do I say: ‘Look we have this policy’? ...

Another concern was that we have ‘Oasis’ but the rest of the office is Mac. I guess it was user friendly. Now we have ‘Windows’ which makes it more user friendly. We have different programs that we duplicate on ‘oasis’. We don’t use ‘Oasis’ for student rolls etc. ... I’m waiting to see what ‘son of oasis’ will be like. I’m now told its just being updated. (...)  

Des  What are some of the achievements in IT in this school?

Da.  Besides the state wide award for IT in ‘careers’, ... I believe that as a school we have been successful in seeing the role of IT in teaching/learning ... especially the public classes and we had a community funded lab and Internet access so I think that those people recognised the importance of IT and secondly through the ‘ACCESS’ program we’ve been forced to use it as a means of communication and students realising IT helps in overcoming the isolation. There’s also been a committee that’s worked for several years. It’s waxed and waned. People with expertise have come and gone, some have made significant contributions, ... but it’s worked.

D.  How do you see IT enhancing student outcomes?

Da  Well I guess as a teaching learning tool its highly stimulating and motivating and likewise it opens the gate to accessing up to date information either on line or on CD-ROM. As a teaching/learning tool in literacy it enables students to draft, edit, process etc. It’s a time saving tool in that way and enables them to produce a quality product they might not have been able to do otherwise. I see that as significant. It’s assisting them in being lifelong learners and coping with change. ... (...) Allows IT to be used as a tool. 

(...)  

D.  Has the use of IT assisted you or hindered you in your job?

Da.  We have three laptops. I have exclusive use of one. I use the laptop. ... Mind you, I still scribble a lot. I use it for spreadsheets, for finance, records. I use it for my personal use, ... word-processing, letters. I guess in a way I’ve taken on some of my own clerical work that traditionally I wouldn’t have. Is that a positive or a negative? The limitation is my own technological capacity. I haven’t had very much training in technology. I’ve never had any formal training, never had training in any software program. I did the TILT program, which I found useful. I gave others priority, but I went along. ... (...)  

D.  The Australian Principals’ Association runs courses at CSU.
Da.. I need to do one. I don't have a computer at home. I take the laptop home. The frustration that I have is I don't have access on my desk to email, ... on line communication.

D.. I don't either. Why don't you?

Da.. Because I saw a greater need in the classroom and I can get around it. I have 'Novel' money and I hope the Department will do something about it. I can go to one of the access points.

D.. Yes, I go down to the library at 8.00 a.m. and 4.30 p.m. each day.

Da.. I haven't. We are limited in our resources, ... so it's a matter of priority.

D.. Who and what has been crucial to the successful use of IT as a learning tool in your school?

Da.. The computer co-ordinators have been critical. That role is critical. I really believe that the teacher/librarian has a key role. I see the individual teacher as critical because they actually determine what happens in the classroom with the kids and some are running with it. Some are not. I like to support those who are doing the running and then I'm hoping others might jump in and join. ...The students play a critical role. ... In many classes the kids are saying; 'We want access'. ... It's encouraging the teacher to develop.

I see my role as critical, very critical ... so much as there's a leadership role. I feel my limitations but I can see the opportunities and try to encourage others. (...) 

D.. ...What about the what? (...) 

Da.. The resources; the fact that we have the money. If we have limited resources what do you do? e.g. our leasing is coming to an end. Do we renew? I need to get advice. Source of advice is critical. I feel inadequate at times with my knowledge. L.. is very good. She plays a key role. That sort of support is critical. Departmental recognition of the need for her type of quality support and help is vital. (...) 

D.. Has the use of IT changed your role as a principal or is it likely to?

Da.. As the educational leader, ... I've had to think in terms of IT and of new teaching/learning strategies, the use of IT in teaching/learning, ... new thoughts for the library. From a management point of view, certainly as far as planning goes ... management, leadership planning for the new school and the use of IT in it. ... I guess

1 The District Technology Adviser
my role in the broader community ... a site for IT ... a natural transition from traditional use in the library to other.

D..  How is this innovation different from others you have had to cope with?

Da..  IT's different in that it impacts on everyone in terms of training and level of skills needed. ... Number two is cost. Larger and larger proportions of the school budget is needed and the fact that it is constantly evolving, the level is changing constantly. One of the challenges is ... and for me as a leader ... to be comfortable ... as well, is to be working in an environment that is constantly changing. ... So you muddle along. ... You have to be flexible and adaptable.

D..  We're all muddling along but some are muddling better than others. (...)

Da..  I think also the scale of change and training and the need to make decisions on something that's changing.

D..  Did you need to use additional change processes to ensure its successful introduction?
Da..  I guess. ... Sometimes change is just a change in direction with other changes, ... sometimes however this change in IT, ... is an ongoing change and so you're planning for continual change. The telltale change is whether the kids in the classroom are using the broader range of tools and whether the teachers are. (...)

D..  Is there anything you would like to add?

Da..  Just that I feel as a principal I am inadequately trained and I feel it's my responsibility to do something in regards to my professional development but I'm so embedded in other things it's difficult but we need to make it a priority, ... and also to look at what other schools are doing. I'd like to look at other school sites. ... At the moment I've tried to give the chance to others. (...) 

**Explorer Public**

Date: 19/05/98  Time: 10.00 a.m. [D.. = Interviewer, P.. = Principal]

D..  What has been your role in the introduction and support of IT (Information Technology) as a learning tool in your school?

Pa..  I think I walked into a real 'bunfight' as far as technology goes when I walked in here initially. ... When they took some of the parents off 'school of the air' and made them go to the decentralised, integration
centre. They changed from HF to VHF and there was a lot of problems. ... The Department did their usual trick and didn't make sure it worked. I found about radio rather quickly then. ... The benefits of it and also the alternatives. That was my first initiation as a boss into the use of technology. ... Then I found out a little about where we may go if the dollars were available, ... with our own satellite from DE [Distance Education] we can pick up Houston in Texas ... and then the other technology from a teaching perspective that really impresses me is the use of video. ... It isn't real in the sense that you aren't right there but it's almost as good. ... I love technology in relation to anything. We have used the electronic classroom in the DE. ... We found some money when it first started kicking around, ... then we progressed to the Internet and other various options before the Internet, ... but now with the 'net' you can get nearly anything from it that you could get from the electronic classroom. (....)

Myself. ... I often wonder what we did before fax machines and computers. All my work I do on the computer. I use it all the time. I don't think I've ever played a game on it. The whole school admin. uses computers. Proformas are run off from it. ... Classroom wise, ... being CAP [Country Areas Program] and DSP [Disadvantaged Schools' Program], we have always had access to computer hardware and a good range of software, ... biggest problem was, when I came most of it walked out. There was no accountability! Even though over the years these schools have had a lot of money spent on them, they don't necessarily retain their resources. That's been a big push of mine. ... To retain what we buy and there has been progression from the old Apple 11Es to the new IMACS. I've got one, ... but I'm not installing it until after I've done the annual report, ... but even to what kids do. ... We use technology for presenting and finding out things. ... We're also lucky we've got an ISDN [A special phone link that allows STD calls for local value] line in the 'train'. ... Our technology set up will be second to none. We try not to put barriers in front of the kids. ... It's more a problem here of utilising what we have than for shouting for what we haven't. I continually say. ... 'Well we got this resource and we've got that resource', ... and sometimes I'm a bit high in my expectations of what I expect teachers to do with them, ... but I often think, ... 'would they be screaming if they didn't have them'? Faxes are good, ... and we're setting up an Intranet site inside the school. We don't charge anyone or put on any limit to Internet access. ... Kids can jump on any time they like. (....)

In the library we have 'Oasis' and 11es [Apple 11es computers]. I think to have five machines in the Library and next door we have another thirty machines and then three in every classroom. ... I think maybe our kids take it a little bit for granted too. (....)

The biggest factor in this is the number of teachers that have their own, ... or aren't embracing technology. ... I'm very lucky there. ... I've got a young enthusiastic, flexible staff, ... the best in NSW! They'll do anything for the kids ... and they'll embrace anything. They know what I
do with it ... but ... all the programs in the school are computer based. They run off proformas. ... The day books are run off proformas, ... There's sharing, ... collaborative programming and smart planning where they're not using a lot of time on planning. ... It's on needs based in relation to learning style ... and the delivery of an appropriate curriculum for the kids and within that technology takes a big lead, ... but I still think we're just at the beginning of where we are going to be in a few years.

I would only have one person who was reluctant to get on a computer. ... We've purchased a few E-mates. We have a few laptops that we lend out ... (...) Anything that's any good we buy. I've never said 'No' to a piece of software that will give an outcome to a kid in a Key Learning Area. Again I get frustrated when I want someone to do something. ... You know you can't do it all yourself but we've got some excellent young kids here. (...) Another aspect of technology is that we do all our reports. ... They're all computer generated.

D. Yes. ... We just changed to that recently. (...) 

Pa. Yeah, ... they used to get upset with me when I turned reports back. I used to say, ... 'look reports have got to be accurate. ... They've got to be professional. ... They've got to be mistake free!' ... I think the computer generated reports have done a lot to solve this. ... They do look good. You can modify them to suit the needs of kids. ... (...) We've just bought a couple of IMACs, ... and I've just got a zip drive. ... (...) 

D. Well you've answered about six of the twelve questions ... but never mind. ... You can fill in any detail as we go along. ... How are staff and students currently using IT as a learning tool?

Pa. Well I've already said. ... They'll have a crack at anything ... and if they can get an outcome for a kid they'll use anything. Also I think there's two aspects to it. They see the personal fun they get out of it, ... and they see how it can help them in their delivery and the professional thing, ... but I think the big thing is they see how much the kids love it. ...

D. It's a motivator .... ?

Pa. It is! You can see kids as you walk around the classrooms. ... The machines are never off ... and the kids spend a lot of time on them ...and the kids love it. ... and no matter what they're doing, they're learning. (...)
Appendices

D. Does it vary from class to class and teacher to teacher?
Pa. ... It does. ... That's the only problem. The best thing about this place is we offer a consistent delivery K-6. ... Everything we do has a scope and sequence and a K-6 perspective. ... We haven't got that with how people perceive technology. ... That's not the teachers' fault because up to the first round of rollout, ... we only got one machine, ... then we got eighteen machines because all the machines we got we owned ... and we were only able to get it into the classroom when that rollout occurred.

... What we have done however to overcome that is to offer support to anyone who needs it. ...

D. So what you're saying, ... without the government support ... you'd be a lot further back then you are now?

Pa. Without the government support, ...well we were between a rock and a hard place. ... If we took them out of the 'train' we couldn't take a class in there. ... They start learning how to type in Kindergarten. ... and they have to do two one hour sessions on typing skills ... and computers throughout the week. ... That's what the parents wanted. They wanted the kids accessing the machines straight away. We could have put those machines in the classrooms, ... but what the rollout has done is allowed us to do both. What it has done now is create a curiosity for the kids in the classroom, ... and we have been lucky enough to pick up $80,000 worth of 'Country On Line' [A special program targeting isolated and disadvantaged schools]. ... We probably would have got it anyway, ... but we got it first. We've also had a big emphasis, ... particularly on computers in how much of our own money we've spent on technology. We've spent a hell of a lot of our own money!

D. Likewise. (…)

Pa. ... To get back to your question. ... What we do here is personal and professional development. There's some things that you might want to do on a personal basis and there's some things we do as a team ... and if there is an area that they need help in all they have to do is ask ... but they have to be up front and ask.

D. Fine. ... OK. ... What concerns if any do you have about the use of IT in your school?

Pa. ... The only concern I have, ... I think it's great, ... you know the Department has put in all this money for the rollout, ... the ISDN line, ... the Internet. ... We've chased money through CAP, our own sources. ... It's been a good partnership. ... I just hope the Department continues to fund it, if not at the same level at a greater level.

D. That's good ... one of my concerns is money for professional development for my staff, what about you? …
Pa. I did sixteen through TILT [Technology in Teaching and Learning], even though we should have only had eight. So TILT's been great for us ... and also the attitude of the 'younge's. ... Every one gets in and helps each other, ... and I've got some wizz bang kids here! (...

_D_. (...) Fine. ... All right. ... How do you see IT enhancing student outcomes ..?

Pa. Well you look at personal aspects, ... self esteem, ... to help them get involved ... and I'll use any tool to get an outcome for a kid. ... Then you can look at, ... it can help you monitor, ... it can help you evaluate. ... I think one of the big ones for us is to help kids present their work. ... You are only limited by your own imagination!

_D_. Well, ... after what you've said, ... this is a bit stupid. ... Has the use of IT helped you or hindered you in your job?

Pa. Mate. ... I don't know what I would have done without it! (...

_D_. I'm a bit the same.

Pa. I live on that .. I don't know what I did before I had the computer. ... If I leave here I'll need $15,000 to set up my office.

_D_. That's sounds great. ... Who and what have been crucial to the successful introduction and use of IT in your school?

Pa. My little support base of teachers. I have three teachers who take an hour after recess every Friday. ... They're the 'guns' and the 'fixits', ... because without them it all falls down. That's the most important part. TILT's been very good and the young kids on staff who've been more than ready to share their expertise.

_D_. Following on from a previous question. Has the use of IT changed your role as a principal?

Pa. Well I'd like to kill the fax machine. Yes. ... On a positive note, ... It just makes such a difference. ... It's there so you can refine, ... revamp, ... replace. ... You can produce stuff in a thoroughly professional manner. You can make yourself look really good and I think in our game it's paramount that you present yourself and your school in the best image possible, ... and there's nothing like being able to go to your machine and be able to say I need this and here it is. I think one of the best things is, ... you immediately, ... at your fingertips have a snapshot of what things were like when you last touched it. Then you can say, ... 'Well that hasn't changed much but this has'. It's evolutionary. If you look at your past management plans you can see how your school has evolved.
D. What is different about this change process with IT than other change processes you’ve been involved with?

Pa. When I came here in 1992 people said you would have one of the worst schools in the cluster or NSW. I now think it’s one of the best. I put a lot of work into looking after the staff. ... I made sure there were structures. ... We use the 'Hegley' processes so we are all involved in decision making. ... They know their roles and responsibilities. I have mine. ... I don’t let anyone play power games. ... Everyone here is given credit for what they do. I give them the money and the power if they’re doing something. ... I don’t interfere unless I think it’s going off the rails.

The whole thing here is the attitude of the staff. It’s a totally genuine feeling. ... Our grievance committee hasn’t sat all year. ... Yes, they have their little disagreements. It’s the quality of the people that I’ve got ... and they know that they’ll help each other ... and they realise that the technology will be the second biggest factor in the classroom of the future ... apart from teaching ... and how that teacher handles it will be the difference between low to moderate to high student outcomes.

D. Very good. ... Anything you want to add?

Pa. No. ... I’m really pleased with the attitude of the Department given the cutbacks in other areas. It might have been a political decision but it’s one of the best they’ve ever made. If you get a chance to pass that on, please do. (…)

D. I will. Last question. ... How would you like two technology advisers?

Pa. Would I ever! ... Look what they did to Li... She’s a wonderful girl. ... She can’t do the job in this District with the distances she’s got and then be called off to Sydney all the time.

Vineyard Public

Date: 02/06/98 Time: 9.30 a.m. [D. = Interviewer; Pe. = Principal]

D. What has been your role in the introduction and support of IT in your school as a learning tool for students?

Pe. In this school. ... I’ve only been here a bit over a Term, ... so I guess it hasn’t been substantial. ... Here I’m currently running my own version of TILT with between ten and fifteen staff, ... depending on what we are doing. ... What I’ve done and I did this at the last school I was at. ... G. ... TILT only caters for one third ... so we’ve been mopping up with those who’ve missed out, ... but the program is based on using resources that are already in the school not showing what else is
available. ... Strictly with what’s here so they can work with what they’ve got at the moment. ... So I’ve taken an active roll. I’m actually running them at the moment. We also have a technology support group. ... I’m the most knowledgeable person on the staff in the use of technology and I have a direct influence on the technology resources available. I have a personal philosophy that the office should have first class up to date equipment and in the time I’ve been here I’ve replaced every machine in the front office, ... and I’m in the process of replacing them in a few other places as well. (...) 

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D.. What about yourself personally? (...) 

Pe.. Myself personally. ... I use computers extensively. The office doesn’t do any of my typing. I find it easier because I can compose my thoughts on the screen. The quality isn’t necessarily as good as the office but it’s certainly satisfactory. ... I fax direct to all the principals. I’m secretary of the B.. District Principal’s Council... (...) 

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D.. Fine. ... How are staff and students currently using IT in your school? 

Pe.. Very poorly! ... Very poorly, ... which is really depressing because we have really good resources. In some classrooms they’re playing with the games and very little else. 

D.. But even that’s a start? 

Pe.. It’s a start, but considering how long it’s been available. It’s a bit disappointing, ... and that’s why I’m running this course. As a direct result of that teachers are now using computers in their rooms. They’ve been given homework between sessions. They’re doing the old ‘show and talk’, ... and it seems to be working very well. At the moment we’ve just focussed on Claris Works, the package, ... and the resources in it. They’ve done painting/drawing/word processing, ... and they’ve learnt how to combine the kids’ paintings with their own stories. (...) Last week we did the internet. As a result of that we have staff downloading material and feeding in script etc., ... just little things like that. It’s just getting people started. 

D.. (...) OK. ... Out of your thirty teachers, how many would be using it as a learning tool, ... say once a week? 

Pe.. Oh, ... all would use it once a week. It’s what they’re using it for that’s the problem! 

D.. Fine. ... Then, the next question. What concerns if any do you have about the use of IT in your school? ... Now you mentioned playing games, ... are there any other concerns? 

Pe.. I’m concerned about the lack of knowledge in some quarters and the community as well, as to what the use of computers in schools
should be. ... I’ve got a firm philosophy, ... and this is born out by the old public computer use documents, ... that computers should be used as a learning tool in public schools.

D. ... and possibly secondary schools... :)) [Smile]

Pe. ... Which means they should be in the classrooms rather than in labs... If they’re going to be a tool, they need to be accessible to kids in the classroom. I believe in the area of resourcing there has been a lot of political knee jerking. ... They’ve gone ahead and provided an internet facility, but not internet access because they’re not accessible to classes unless you network. (…) 

D. ... Thanks, ... next easy question. ... How do you see IT enhancing student outcomes?

Pe. ... Well, ... it’s a learning tool, particularly in an age where so much more content is being added. We need to show students quicker and more effective and efficient ways of getting that, ... and technology does that. It’s also a part of life now, ... in fact it’s becoming as big a part as walking or talking, ... almost we’re preparing kids for life ... and we simply can’t get through life any more without the use of technology ... and an understanding and the ability to use that technology.

D. ... Fine. ... How has the use of IT assisted you or hindered you in your job?

Pe. ... In some ways it hinders. There’s a temptation to be really pretty, ... and the pretty ends up being a lot more time consuming then manually, but it’s helped me in lots of ways. I’ve been a major resource in the last four schools I’ve been in ... and it’s the perception as well. ... It’s very obvious what I do, ... each school I’ve been in I’ve been a valuable resource person. There’s a danger in that of course, they might become dependent on you. At the last school I was at this occurred. I’ve refused to do that here as Principal. I don’t go and fix switches. ... I have two computer co-ordinators, one for infants and one for public and they both get time, ... but not necessarily to fix things. ... I’ve still got a major responsibility for ‘Oasis’ and that stuff. (…)

___D. Who and what have been crucial to the success of IT in this school?

Pe. ... The AP/TILT co-ordinator. ... He’s on leave at the moment but he got the network up and running, ... but that was a problem too, ... because all the ideas were his ideas and not necessarily the staffs, ... and now the computer co-ordinators are about to take over ... and people at the grassroots want computers in their rooms, ... not a second lab. (…)

D. And what else ....?

Pe. ... Obviously cash. ... The school is in a very sound financial position ... and the communities very strong. ... They’ve put thousands
in. ... There were computers in every classroom before the roll out, ... so resources were good already.

D.: Has the use of IT changed your role as a principal or is it likely to?

Pe.: Yes! ... Yes, ... changed my role dramatically. ... In terms of what I do, ... and how I manage my work, and not always for the better. Some of the things I do now which make things more impersonal. I've avoided putting memos on the network. It’s too impersonal, and things like that. ... It could happen though, some people have suggested I do it to make staff use it.

D.: Yes, some unis. are doing that. (...) How do you see this innovation or change different from other innovations or changes the Department has brought in?

Pe.: Well, ... there has been a degree of support, which there hasn’t necessarily been with others. They’ve put their money where their mouth is. ... They might not have put it in all the right places. They’ve had a go. They’ve put a technology adviser in every district. They could have put two in. ... They have a help line, but sometimes I could do better. (...) 

D.: ... And how has staff taken this innovation?

Pe.: Oh, ... I think mostly fairly well. If it’s any indication we could only send three people to the latest TILT and there were thirteen who wanted to do it. The fact that they wanted to update their skills. They want to use it, ... get in there. ... They’re all at different levels. We are hoping to go down the path of a mentor system. We are limiting the systems we use and we are going down the ‘Apple Computers of Tomorrow’ line.2

D.: Well that’s all. ... Hope that wasn’t too painful. Thanks very much!

River Valley Public

Date: 09/06/98 Time: 10.30 a.m.
[D.: = Interviewer; Ci.: = acting principal]

D.: From your experience, ... how can principals support the implementation of IT as a learning tool in schools?

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2 ACOT - details were given in Chapter 3.
Ci. I've only been at the school eighteen months. ... I came from a school that had very little technology to this place that is unbelievable. ...Wa.\footnote{3}{The principal currently on secondment.} was just so knowledgeable. (…)

D. No just you. ... We'll get to W. in a sec..

Ci. OK. ... sigh. ... It's so hard here. The way we are structured here we are divided into four teams. Wa. has trained different teachers to specialise in different components. ... So computers are, ... shared within my team. My side was the welfare side. ... I can track every child through 'Oasis'. I can track their levels, time out etc.. As the acting principal I haven't had to be the leader. I've had to support. ... Make sure that no one is overburdened. We have one teacher trained in 'filemaker' to produce the newsletter. ... She's finding it very time consuming. Being aware of that I've rostered her onto 'pgd' [play ground duty] in the computer lab. so she can use that time ... to ease her burden. It's remembering who needs help.

D. How do you help, besides what you've mentioned to keep it running? (…)

Ci. As a principal, at the moment. ... I don't really. ... The other teachers who have the knowledge do. (…) The biggest problem is the service. The teachers are so good. We have progressed too quickly to cope with what we have here. ... We have technical problems, ... not necessarily integration problems. W. trained specialists so not everyone would be trying to get in and fix things but there is still not enough knowledge here. ... We are doing a T&D\footnote{4}{Training and Development.} update of all teachers.

D. How did Wa. introduce and support IT into the school?

Ci. He ran a lot of courses after school, ... weekend inservices. When I first arrived here I was given an email IT checklist to see my skills, ... and what I needed. He had TILT support of course. ... (…) He organised the whole thing. (…) What teachers really need is time, ... time to sit down with the systems or programs to sit down and play. ... The kids show me. ... I rely on the kids a lot. ... They show me. (…)

D. How many staff at this school are using IT as a learning tool on a regular basis in their classes?

Ci. I would say all. Every class has at least two computers ... and they use it for reading, maths etc. and every class here does IT as part of RFF [Relief from Face to Face teaching], that's another hour per week. ... Most have two hours. We have two computer labs..

D. Where do you see information technology and teaching going here in the next five years? (…)

Ci. I can see it just streaking ahead, but I don't think we are getting the support to do that. ... I would like every staff member with a
computer at home. ... to be able to work from home as well as the students, ... after school time. (…)

D.. What are the computer labs. used for?

Ci.. for RFF, ... also as a reward for Level 8 at lunchtime. ... Some teachers use them as well, ... but our computer labs. Can't be classed as such by the Department as labs. ... Crazy! (…)

D.. Thanks very much. Finally, two points. Has the use of IT made your job harder or easier and has its use improved student outcomes?

Ci.. Firstly easier, in that I can access material very easily but harder in keeping it all up and running. To the second question, undoubtedly, in a multitude of ways. Look at some of the portfolios and our test results have improved as well.

Rural High

Date: 28/05/98 Time: 9.30 a.m. [D.. = Interviewer; Jo.. = principal]

D.. What has been your role in the introduction and support of IT in your school?

Jo.. I think as a generalisation the principal's role is to make things happen, ... which usually means to find those people who will be proactive and to make sure they have all the backing to achieve and to see that their dreams can be passed on to others and become part of the school plan. ... I tend to buy useful IT stuff e.g., digital cameras, scanners and use them and then when staff say: ‘I wish I could do that’, then give them the resources to learn how to use them. (…) I find my greatest impediment to bringing IT successfully in is IT teachers, who are often anti computers being used across the school. They want to hold them close to their bosom in computer rooms ... where they determine the usage of them. We also need to get at least one laptop computer in every staffroom so staff have got time, ... in their own time to access it, ... play with it, ... learn. (…)

D.. How are staff and students currently using technology?

J.. ... Very poorly. We have achieved world status via our web page but thanks to a very discreet number of kids. ... My personal observation re learning with IT and particularly using the net for learning, ... they will spend hours and hours on task. ... It's a form of learning that really galvanises kids. ... It's quite unlike the old book learning. The net does provide the opportunity for thirty-forty percent of

5 Welfare student achievement levels. Level 8 is the highest.
students becoming scholars as opposed to two percent in my day. ... In
general those kids also have a platform at home, therefore they can
work at home or here.

D. How do you see IT enhancing student outcomes?

Jo. At present very little.

D. How might it?

Jo. Once IT becomes a common tool many of the concerns that
teachers have in teaching will disappear. ... We will have to start
teaching skills, like searching, narrowing searches. ... From an academic
point of view it can't be done unless you have a very keen insight into
the nature of the subject the students are learning. To give you an
example, I helped a group of students do some work on Yeates. We
initially had over one hundred thousand hits. ... We narrowed it down
but it became obvious to them that they first needed to know what
Yeates was on about etc. before they could go any further. ... Now that's
a completely different concept of teaching. It can improve spelling and
grammar. It will affect spelling etc.. The way we define literacy and
numeracy will need to be redefined on the 'web'. Subject matter is also a
matter in question. ... The notion of years of study, ... discreet units etc..
The net is going to allow global learning, ... just as the invention of print
allowed us to learn, not just from the church. (…)

D. Has the use of IT changed your role or is it likely to?

Jo. Yes. In practical terms it means I can work in this District and
have instant communication with people all around me. Teachers are
weakest in their pedagogy, ... it's not taught anymore. ... What the
government have also done by giving us 'stand alones' is giving us
fountain pens in a ball point age. We have the most conservative group
of people who want to work with their doors closed. If you work that
way you won't get on the 'net'. ... and my role is going to change even
more. (…)

D. Is there anything you'd like to add?

Jo. It's exciting. (…)

239
APPENDIX F

Newspaper Report on IT (Kate Parsons)

'The Sunday Telegraph'. June 18th, 2000. P.55

Internet students out-savvy teachers

BY KATE PARSONS

SCHOOLTEACHERS lag behind their students in computer literacy skills, a Federal Government study has found.

A Department of Education, Training and Youth Affairs report found many young Australians were more net-savvy than their teachers.

The first major investigation into students' computing ability found youngsters were outsmarting teachers with their technology skills.

The study, by Queensland's Griffith University, involved a survey of more than 6000 students, 1200 teachers and 220 principals from 203 government and independent schools.

Opposition employment spokesman Patricia Forsyth said the figures showed teachers were struggling because of a lack of training.

The study found most teachers had basic skills, but many lacked techniques such as drawing with a mouse, using video and sound clips and creating websites.

Those most likely to lack skills were female primary teachers over the age of 50.

Ms Forsythe said teachers could not be expected to develop IT skills alone.

The report also found private and public schools "varied markedly" in their computer resources, for both staff and students.

The study also found:
- Most teachers and students had some basic computer skills.
- Proportionately more students than teachers had advanced computing skills.
- More boys than girls had higher levels of skill.
- Students from small rural or remote schools or who were indigenous were less likely to have acquired basic skills.

Net-smart: Six-year-old Alice Robertson on Thursday

Picture: Simon Cocksedge
APPENDIX G  IT in education – Presentation

IT in Education
The Literature & the Theory

Mendooran Central

Students
They are the focus
Curriculum

Teachers

Information technology
Class or Lab?

How do students best learn?

Primary, Daily

Programs, Lessons

Principal, Community, World/World

Chair, Task

CHANGE??
(Routine/ Unknown)

How to best learn

Relevant

Structures & Time

Motivation

IT
IT as a learning tool in schools

School of the Future - Now!

Teaching or Learning Institutions
Students - They are the focus
Curriculum/Learning

Teachers
Teacher or Co-learner/Instructor

Information Technology
Class or Lab? Real or Virtual

Students
How do students best learn?
What do they need to learn?

Education for what?
Community
Wider World

Chalk Talk
Visual

Crash or؟
Known
Unknown

If
Teach each other?

Change Structures
Pedagogy

Model
Knowledge
Resources

Whole school
Prof. dev. for all

A Model
Quotations

- "A firm grasp of the essential facts." - Robert H. Bork
- "The most important function of education is to teach us which questions to ask." - Bertrand Russell
- "The use of technology in the classroom has an impact on the way that students learn and how they have been exposed to the technology in the environment. Specifically, this learning and digital media appropriation are tied to students' background, understanding of the range of tools, and the interaction with using technology in the learning process." - [Author's Name], [Year]"
The Theory

- According to Maddux et al (1998: 85-86) there are four major theories of learning and teaching that guides the development and use of educational technology in schools. They are: the behavioral, cognitive constructivism, social constructivism and finally critical theory. The behavioral model lends itself into breaking larger parts into smaller parts and learning them one by one, a little like ‘chunking’. Constructivists disagree with this approach as they believe that learning is then isolated from its context, social constructivists put emphasis on interaction between teacher and student and student to student. Critical theorists tend to be more active as critics of other theories than expounding their own but they do have much to say about cultural bias, equity and legitimate forms of knowledge.

- It should be obvious that all the information/knowledge that students need to learn in schools is the same. How students encode, store and retrieve that information is vital for teaching/learning strategies. Bruning, Schraw and Ronning suggest (1999: 78) that metacognition (an awareness of one’s learning) can be a powerful tool in this process. Rehearsal is one of the methods of encoding information for later recall. Other methods include mediation, imagery, and mnemonics. These tend to be used in lower order learning where memorisation is the key. Active learning, on the other hand, assists learners to add, organise and enrich information. Bruning et al (1999) further suggests that several methods are viable for this more complex learning, for example: advance organisers, schema activation.

The Literature

- The research also had implications for teacher development. Over the years research to best staff development occurred when it:
  1) involved small-group collaborations among teachers
  2) took place in working classrooms
  3) built on teachers’ existing knowledge about curriculum and practice
  4) provided opportunities to experiment and reflect on new experiences
  5) provided ongoing support to help implement change and innovation

- (…) the use of technology in the classroom has an impact on the way that teachers teach and that teachers need support to use technology in the classroom. Secondly that training and development opportunities are needed to broaden teachers understanding of the range of uses, and the value gained from using technology in the learning process.

- They go on to contend that (third):
  1) students are interested in and motivated by using technology. There is an apparent incongruence between computer use and access at home and school and that the use of technology in the classroom varies from class to class and school to school.

- Unless teachers have integrated technology into their classroom practices children learn little more than how to play educational games and work a simple word processing game…meanwhile the TILT (Technology in Teaching and Learning) will only get to 15,000 out of 54,000 teachers.

- (Parker 1997: 15)
How Do Students Best Learn?

- Reading
- Writing
- Listening
- Doing/experimenting
- Discussing
- Teaching
- By using all of the above

STATISTICS
Technology as a learning tool

- Tool, not an end in itself
- Interactive
- Do not change from horizontal to vertical page
- Use when appropriate
- Student & teacher decide
- Teacher as facilitator

Teaching Styles

The rain in Spain falls mainly on the pl...
Close

- Ensure understanding.
- Describe first steps.
- Technology Plan/Cost/Priority
- Get commitment.
- Closing remarks
- Thank you!!
- Questions???

"Computer labs are a lousy place for computers... Computers are a tool, not a subject." (Gates; 1999)
## APPENDIX H

Case Study and other School/University Visits (1996-2000)

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>Merino Central</td>
<td></td>
<td>June (2 days) August (3 days)</td>
<td>February (1 day)</td>
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<td>Explorer Public</td>
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<td>May (2 days)</td>
<td>March (3 days)</td>
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<td>Vineyard Public</td>
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<td>February (2 days) April (2 days)</td>
<td>March (1 day)</td>
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<td>River Valley Public</td>
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<td>Rural High</td>
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<td>May (3 days) August (2 days)</td>
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NB: Also visited Tamworth High, Wee Waa High, Narrabri High and Coolah Central (1995-96)
APPENDIX I

Student Portfolio (River Valley Public)

Primary School
Student Portfolio

Rebecca Wells

This is my personal electronic portfolio. You can select various samples of my work to view. If you want to see the full size version, simply click on the picture. I have included a sample of my reading, you can listen to this if you have the correct software available on your machine.

When you choose to view full size pictures or listen to recordings, you may have to wait for the program to load, please be patient.

Thank you for looking at my portfolio.

Contents

• About Me
• Art Work
• Book Presentation Skills
• Reading Sample
• Handwriting
• A Story
• Report Card
• A Video of My Pets
• A Piece of Craft Work
• Unit Profile

About Me
# APPENDIX J

## CATEGORIES

<table>
<thead>
<tr>
<th>Concept</th>
<th>Categories</th>
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<tbody>
<tr>
<td>Leadership</td>
<td>1. Knowledge of IT</td>
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<tr>
<td></td>
<td>2. Knowledge of the use of IT as a learning tool</td>
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<tr>
<td></td>
<td>3. Modelling use of IT</td>
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<td>4. Facilitating the use of IT</td>
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<td>5. Leadership style</td>
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<tr>
<td>Learning Communities</td>
<td>1. Establishing effective learning community</td>
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<tr>
<td></td>
<td>2. Head learner</td>
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<td></td>
<td>3. Enabling others</td>
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<tr>
<td></td>
<td>4. Change management/change agent</td>
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<tr>
<td></td>
<td>5. Innovation – introduction and support</td>
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<tr>
<td></td>
<td>6. Mentoring</td>
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<tr>
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<td>7. Relationships with colleagues</td>
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<tr>
<td></td>
<td>8. Peer tutoring</td>
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<tr>
<td>Structures &amp; Pedagogies</td>
<td>10. Administrative structure i.e. Where are the computers: labs, classroom?</td>
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<tr>
<td></td>
<td>11. Lesson planning</td>
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<tr>
<td></td>
<td>12. Learning &amp; teaching strategies</td>
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<tr>
<td></td>
<td>13. Classroom management organisation</td>
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<td>14. Assessing students work</td>
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<tr>
<td>Use of IT</td>
<td>1. Playing Games</td>
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<td>2. Word processing</td>
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<td></td>
<td>3. Communication</td>
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<td>4. Integrating IT into KLAs</td>
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<td>5. Motivating students</td>
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<td>6. Inadequate guidance and support</td>
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<td>7. Inadequate school equipment</td>
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<tr>
<td>Teaching/learning</td>
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<td>16. Pupil centered</td>
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<td>17. Groups</td>
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<td>Policies</td>
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<td>2. Devolution</td>
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## APPENDIX K

Scope and Sequence

### INTRANET

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<tr>
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<td>Use of toolbar for navigation of web page</td>
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<td>C</td>
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<td>CSI01.02</td>
<td>Use addresses to access school intranet</td>
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<tr>
<td>CSI01.03</td>
<td>Identify and use links</td>
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<td>E</td>
<td>T</td>
<td>C</td>
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<tr>
<td>CSI01.04</td>
<td>Can use pull down menus</td>
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<td>E</td>
<td>T</td>
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### INTERNET

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<td>CSI01.05</td>
<td>Use search engines</td>
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<td>CSI01.06</td>
<td>Use the different elements of a web site</td>
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<tr>
<td>CSI01.07</td>
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<td>T</td>
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<td>CSI01.08</td>
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<td>CSI01.09</td>
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<td>Compare searches using different search engines</td>
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### EMAIL

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<td>CSE01.03</td>
<td>Sending an email</td>
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<td>CSE01.09</td>
<td>Sending attachments</td>
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