Teachers' Perceptions and Experiences in Adopting "Blackboard" Computer Program in a Victorian Secondary School: A Case Study

Submitted by:

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Student Declaration

I, Edison Shamoail, declare that the EdD thesis entitled "*Teachers' perceptions and experiences in adopting "Blackboard" computer program in a Victorian secondary school: A case study"* is no more than 60,000 words in length, exclusive of tables, figures, appendices, references and footnotes. The thesis contains no material that has been submitted previously, in whole or in part, for the award of any other academic degree or diploma. Except where otherwise indicated, this thesis is my own work.

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Abstract

Over the past decade, information and communication technology (ICT) has become increasingly prevalent in our schools. With the emergence of new technologies in the classrooms, there is a pressing need to study how teachers experience and feel about the integration of new technology in their teaching practice.

This study investigated seven teachers' perceptions and experiences in adopting "Blackboard" computer program into their teaching. This research contributes to our understanding of how teachers adapt to the introduction and integration of new technology in their classrooms. The study combined theory and practice, identifying connections between the experiences of teachers and existing literature and research.

One Catholic secondary school was the focus of the study. This school was selected because of its adoption of cutting-edge Information and Communication Technologies (ICT). Data were drawn from four sources: individual teacher interviews; direct observation; email dialogues and school documents during the 2004 academic year.

Teachers were interviewed three times; the transcripts of 21 semi-structured, open-ended interviews and observation data were analysed using the system of content analysis that involved identifying, coding, and categorising the main themes in the data.

To expedite the research, I identified seven constructs to structure the data analysis: (a) change; (b) teachers' workload/time management; (c) student management; (d) enhancing student learning; (e) skill development; (f) access; (g) online pedagogy. Case profiles were created for each teacher and then compared across the seven teachers to discern both common and unique patterns of perceptions and experiences related to "Blackboard" integration and implementation processes.

Results of the study identified the importance of access to computers, ongoing professional development and leadership support for the integration of "Blackboard" and other related technologies into teaching. The results also indicated that teachers need sufficient time to practise and plan their lessons with the new technology.

The importance of a planned change process, created by all stakeholders, concerning integration of new technologies in the school emerged as an important outcome of this study. The results indicated teachers were most receptive to learning

from and with their colleagues about the integration of the “Blackboard” program into their classroom practice.

Based on these research outcomes, a set of recommended strategies to support the integration of “Blackboard” into teacher pedagogy and school curricula is included in the final chapter. Information gained from this study will provide some insights for the case study school and those schools that are interested in pursuing a similar path in the future.

Dedication

I dedicate this study to my loving wife, Wendy, and children, Robert, Rose and Rhonda. Words can never express the gratitude I have for each of you. During the long hours that I spent working on my computer surrounded by books, articles and eventually, interview data, while you were patiently waiting and supporting this endeavor: I truly appreciate your patience. Words cannot describe the love and devotion I have for you. Without your love and support, I would not have had the desire and strength to complete this endeavour.

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Much appreciation is also extended to the members of my school's teaching staff. Their contribution and collective expertise have served as an inspiration throughout my dissertation.

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CHAPTER 1
INTRODUCTION

To understand the process by which teachers come to integrate new technology into their teaching practices, I (the researcher) undertook a yearlong investigation into new technology integration in the curriculum of a Victorian secondary school. The purpose of this research study was to investigate teachers' perceptions and experiences in adopting a new technology known as the "Blackboard" Learning System (Release 6) as a case study in a Catholic secondary school in Victoria.

The introduction of this new program in 2004 was significant, not only for the teachers, but also for their students. The new computer program has meant major changes to how subjects are taught and how students are assessed. The impact of a mandated change process on the teachers within the school, especially the introduction and integration of the new technology on the direct users of that technology, was also investigated.

Technology has become an integral part of our society today and as pressure is exerted upon educational systems to implement new technologies, teachers' abilities to respond to change and innovation become key factors for success. If organisations are to function effectively, it is important the people who work in them are able to adapt to change and deal with the uncertainties of transition periods. The management of change, the human aspects as well as the technical considerations can, therefore, be seen as an important area for both organisation study and practice. By understanding the process of adaptation and adoption, school administrators and others will be better able to assist staff to deal with the change affecting them.

The purpose of this study is to look at the impact of the integration of the "Blackboard" computer program on a group of teachers in one school. To further understanding, this study investigated teachers' perceptions of the new learning technology. The study focused specifically on the teachers directly affected by the change and the factors that affected their integration, or otherwise, of the new program. The study explored the direct users' perceptions and experiences of the program by

interviewing them on three separate occasions prior to, during, and post implementation periods of the program in 2004.

Background to the Study

Historically, the expectation has been that "the human being should and would adapt to the demands of technology" (Mumford, 1979, p. 2). However, understanding how the introduction and integration of new technology affects people should enable systems to be designed and implemented in such a way that the system enhances the work of the user.

According to Taylor (1998), the 1990s was a period of rapid change in the workplace as organisations altered their structures and embraced new management practices and styles. Alongside and closely connected with organisational changes were massive technological developments.

When considering change, it is important to understand what that change means for the people directly affected by it, and what factors assist and/or hinder in adapting effectively to the process of change. Bogdan and Biklen (1992) concur: change is complicated because beliefs, lifestyles, and behaviour come into conflict. Policy makers, for example, who try to change education, be it in a particular classroom or a whole system, seldom understand how people involved in the change process think. Consequently, they are unable to accurately anticipate how the participants will react. Since it is the people in the setting who must live with the change, it is their understanding and experience of the situation that are crucial if change is going to work.

Fullan (1991) elucidates how people react to new experiences by attaching their own construction of reality to them, regardless of the meaning others assign them. Thus, the implementation of educational change is never fully envisioned until the people in the particular situations attempt to spell them out in use:

> In short, one of the basic reasons why planning fails is that planners or decision makers of change are unaware of the situations those potential implementers are facing. They introduce change without providing the means to identify and confront the situational constraints and without attempting to understand the values, ideas, and experiences of those who are essential for implementing any changes. (p. 96)

Hargreaves and Fullan (1992) explain the critical role teachers play in the change process:

> Teachers don't merely deliver the curriculum. They develop, define it and reinterpret it too. It is what teachers think, what teachers believe and what teachers do at the level of the classroom that ultimately shapes the kind of learning that young people get…For example, what goes on inside the classroom is closely related to what goes on outside it. The quality, range and flexibility of teachers' classroom work are closely tied up with their professional growth-with the way that they develop as people and as professionals. (p. ix)

Several researchers emphasised teachers' attitudes towards change are dependent upon how change affects them personally. Hord, Rutherford, Huling-Austin, and Hall (1987) assert that it is critical to understand the point of view of those involved in the change effort. "A central and major premise of the [Concern Based Adoption Model] is that the single most important factor in any change process is the people who will be most affected by the change" (p. 29). This model provides guidance for professional development strategies for all training settings. In the Concern Based Adoption Model (CBAM) of Hord et al., users pass from self-concerns, through task-concern, to impact-concern as they become more experienced with the use of the innovation.

From their studies of change, Hord et al. identified seven developmental stages of concern related to the introduction of innovations in schools. These stages provide insights into teachers' attitudes that contribute to their willingness to engage in the school improvement efforts. The "self" stage of concern, for example, occurs during the early stages of the change effort, when teachers are primarily interested in the personal effects the change will have.

Welch (1989) reports that teachers assess advantages and disadvantages of collaborative consultation primarily in terms of how implementation will impact on them personally rather than how it might impact on student growth. Welch states that "for innovative change in school settings to be meaningful, its effectiveness must be proven in terms of the personal and professional growth of all involved, not just student growth" (p. 538).

Technology is now widely used in a variety of educational and other institutions. New technologies are being introduced before we learn how to make effective use of existing technologies. Rather than leap to conclusions that new technologies require new planning and design processes or radically different learning paradigms, it appears reasonable to consolidate what we know works best. This helps identify known gaps in our knowledge and areas where new technologies simply do not fit well into existing frameworks.

In a world of technological development the challenges for teachers include employing educational technologies in their own working lives and empowering their students to do likewise. New learning technologies provide opportunities for gains in resource efficiency in education and in educational effectiveness. There is, however, no guarantee technological innovations will be for the better.

The adoption of new learning technologies is sometimes driven by no more than faddishness or by doubtful assumptions of increased efficiency. Purchasing and placing computers in a classroom is not true technology integration (Dockstader, 1999). True integration happens when technology is effectively applied to a curriculum and to the students' learning.

Educational researchers have designed many models of integration. These models describe steps or stages in incorporating technology into the curriculum and into student learning. Dockstader wrote that the teacher is an integral part of the integration of technology. Technology has become a key component in our lives. Understanding its implications, utilising its potential and becoming comfortable with its effect is a necessary skill in today's workplace.

One group in particular which faces the challenge of attaining technological literacy is schoolteachers. The role of the classroom teacher is the crucial factor in the full development and use of technology in schools (Trotter, 1999). The transformation of classroom technology from hardware, software, and connection into tools for teaching and learning depends on knowledgeable and enthusiastic teachers who are motivated and prepared to put technology to work on behalf of their students.

Just knowing how to use a computer is not enough. Instead, teachers must become knowledgeable about technology and have sufficient confidence to integrate it effectively

in the classroom. Teachers, in other words, must become "fearless in their use of technology" and empowered by the many opportunities it offers (Guhlin, 1996, p. 213). Guhlin concludes that most teachers want to learn to use educational technology effectively, but they lack the time, access, and support necessary to do so.

Computer technologies are changing the teacher's role from information giver to facilitator, adviser, guide, coach, co-learner, mentor, resource and technology manager, and mediator to the student (Dyril & Kinnaman, 1994; Kurshan, 1991; Perkins, 1991; See, 1994). For schools to improve, teachers must change. For teachers to change, there must be appropriate and promising practices and procedures (innovations) that they develop or adopt and, when necessary, adapt (Hall & Hord, 1984).

Underlying this study was recent research into teacher and student perceptions of their own experiences. Contributions to this research come from a number of different perspectives on teaching and learning, principally relational (Ramsden, 1988), phenomenographic (Marton & Booth, 1997), constitutionalist (Prosser & Trigwell, 1999) and constructivist (Biggs, 1999). While these perceptions differ on precisely how knowledge is formed, common to all is a focus on understanding teachers' and students' perceptions of learning contexts in order to improve teaching and learning.

The research into teachers' and students' perceptions of teaching and learning contexts established a series of systematic associations linking teachers' perceptions and approaches with students' perceptions, learning approaches and outcomes (Marton & Booth, 1997; Biggs, 1999; Prosser & Trigwell, 1999). An explanation of these associations is important in understanding the significance of investigating teachers' perceptions of learning technologies. Prosser and Trigwell (1999) summarised these associations:

> Teachers conceptualise and approach teaching in a limited number of qualitatively different but related ways. Broadly, teachers who perceive learning as the accumulation of information are more likely to view teaching as the transfer of information. Such teachers are more likely to use a teacher centred approach where the teacher imparts information to students and uses assessment techniques, which encourage and test rote learning. In contrast, teachers who view learning as conceptual change are more likely to view teaching as facilitating conceptual change. Such teachers are more likely to use

> a student centred teaching approach where independence in learning is encouraged through discussion, debate and questioning among students and assessment which reveals conceptual change. (pp. 43-44)

The school education system is experiencing significant pressure to change (Beare, 2001). As schools change, the work of teachers and others in schools is also changing. Like most people working in schools, the role and work of schoolteachers have undergone significant change over the last decade (Hallinger, 1992; Gurr, 1996a, 1997; Webb & Vulliamy, 1996; Wylie, 1997; Wee, 1999; Day, Harris, Hadfield, Tolley & Beresford, 2000). In Victoria, Australia, this has occurred at a time of major change to schools and school systems. Gurr (2000) states that over the last decade in Victoria, schools have experienced change in areas including P-12 curriculum, student assessment, school administration, school funding, accountability, principal and teacher career structures, school governance, school transitions, and use of technology.

Information and Communication Technology (ICT) is rapidly becoming a normal feature of school life. Meredyth, Russell, Blackwood, Thomas and Wise (1999) highlighted this fact based on data collected from a survey of student information and technology use in Australian schools. A summary of their findings indicated that:

> In classrooms around the country, some students are exploring the emerging potential of information technology. They are accessing the Internet, World Wide Web and CD-ROM resources and connecting to local and international TAFE and university programs, while making use of distance education resources, both individually tailored and group-based or interactive. On evidence from domestic consumption of computer hardware and software alone, it is clear that many have access to sophisticated technological environments in the home and other sites outside the school. (p. iv)

Gurr (2000) states that the use of learning technology in Victorian schools continues to grow rapidly. The increasing numbers of computers and the associated infrastructure in our schools, coupled with increasing confidence and skills among teachers, are contributing to the growing demand for online teaching and learning materials. Schools and school systems face increasing pressure to utilise current information and computer technology to enhance not only student learning, but also

enhance workplace practice both in terms of teaching practice and the administrative work of teachers and principals (Cusak, 1997, 1998; Gurr, 1997; Schiller, 2000).

In order to investigate these issues a Catholic secondary school in Melbourne's northern suburbs was selected. This school was selected because of its introduction and adoption of a new computer program called "Blackboard" Learning System Release (6). The school is paving the way for the adoption of cutting-edge Information and Communication Technologies (ICT) within Australia's secondary school classrooms. Over the course of 2003/2004, the school invested in networked computing infrastructure and soon thereafter initiated development of a sophisticated student, staff, parent, and library Intranet system. The school recognised the opportunity to create collaborative online learning environments for both academic staff and students. As a result, the school made a strategic decision to adopt the "Blackboard" online learning platform, citing ease-of-use as a key factor in the choice.

The school adopted the "Blackboard" platform to not only deliver a variety of resources to students in many different forms, but also to incorporate web-based discussions, improve communication, and share resources between staff and students. In addition to using "Blackboard" for work lodgment in several subjects, online assessment is used in the process of investigating online reporting to parents. The introduction of "Blackboard" was very much a planned change. Discussions I had with some staff members in the school prior to commencing this research highlighted some of the issues they anticipated might arise from the introduction and integration of "Blackboard" into the school curriculum. The issues tended to be similar to those to be discussed in the literature, and focused on:

- individual teacher and collective philosophies of teaching and learning. Teachers tend to adopt innovations that are in line with their beliefs about how students learn and which teaching methods work best; therefore, teachers who believe new technology can improve learning are most likely to use it on a daily basis; and
- many teachers, especially those who have had success teaching academic subjects using traditional teaching methods (teacher-centred), see no reason to change, while others thrive on change and innovation.

Educational Reform

According to Fullan (1993), the purpose of educational reform is presumably to help schools accomplish their goals more effectively by replacing some programs or practices with better ones. He adds that change for the sake of change will not help. New programs either make no difference, help improve the situation, or make it worse. The failure of some educational reforms may be related just as much to the fact that many innovations were never implemented in practice, as it is a fact that societal, political, and economic forces inhibit change within the educational system.

The current wave of school reform is focused on "improving the quality of teaching through, for example, better teacher preparation and higher quality, more relevant professional development" (Hirsch, Koppich, & Knapp, 1998, p. i). Changes in the views of how students construct knowledge have influenced the understanding of how teachers learn about teaching. The vision of schools as professional learning communities is also important in this context and the social organisation of teaching, collegiality and peer support is now more commonly described as an important element in building new capacities for school improvement.

Much of the research about school improvement places an emphasis on learning-student learning and teacher learning as the focus or lens for decision-making about teaching practice. The view of learning that has been widely accepted by the educational research community in recent years is the constructivist view. According to Thompson and Zeuli (1999), constructivism is a multifaceted theory that suggests knowledge is personally and actively constructed by the individual through experience and language; the learner constructs meaning by making connections between previous experiences and conceptions and the new learning situation. Social interaction is essential for learning to take place as students discuss and test their ideas with other learners.

Thompson and Zeuli stated that students are better able to construct meaning and to develop deep understanding when teachers create opportunities for them to have hands-on experience; to go in depth on important topics; to work with other students in varied groups; and to integrate concepts across subjects. They add that this view of learning is a radical departure from the behaviourist view of learning prevalent when

many of today's teachers were pre-service students. Since a theory of learning essentially drives the development of teaching practice, understanding constructivist ideas requires teachers to engage with new ideas, reflect on their practice, and to deeply rethink teaching, learning, and the teacher's role in the classroom.

In the past, teacher learning has been primarily additive learning that augments the teacher's repertoire with new skills. The kind of teacher learning that reformers are now talking about is quite different. It is "transformative" learning that produces changes in deeply held beliefs, knowledge, and habits of practice. Cohen and Ball (1999) are describing this kind of learning when they said that if we can "enable teachers to change what they see in students' work" (p. 9), then we are likely to see distinctive changes in teaching practice and student learning. They talked about the connection between teacher learning and change in instruction this way:

> Helping teachers hear and see more in student work, helping teachers learn to intervene artfully in student work and to motivate students, all affect what students can learn to do. The most effective teacher learning is likely to focus on instruction as interaction, rather than on isolated elements of instruction. (p. 28)

The new role of the teacher in reform and in classrooms is as a learner. New interventions "have been invented" that focus more clearly on providing meaningful learning experiences for teachers (Cohen & Ball, 1999, p. 1). Many of these interventions stress collegial relationships among teachers where they have opportunities to share ideas, discuss educational issues, and participate in collaborative lesson planning, and problem solving. Some researchers are actively studying the connection between teacher learning and student learning. Preliminary results suggest student performance increases when teachers have greater learning opportunities (Cohen & Hill, 1998). Cohen and Hill stated:

> When educational improvement is focused on learning and teaching academic content, and when curriculum for improving teaching overlaps with curriculum and assessment for students, teaching practice and student performance are likely to improve. (p. 33)

If the reform utilises constructivist-learning theory to formulate student curriculum, for example, then the learning opportunities for teachers must also be designed around constructivist ideas. Further, these learning opportunities should be firmly grounded in developing deeper knowledge of the student curriculum, of the relationship of assessments to curricula, and the relationship of both to pedagogy and student learning (Cohen & Hill, 1998).

According to Killion (1999), schools have begun to engage in reform efforts that focus on teacher learning and some of those that have been most successful in improving student achievement have been recognised nationally. Killion found teachers engage in diverse and extensive learning experiences. She found that teachers identified: time; resources; collaboration; focused goals; support structures; and leadership as key factors in fostering their learning. Killion concluded that all teachers are responsible for contributing to their ongoing professional development and ultimately are accountable for their students' success.

Teachers' Learning Environments

According to Bransford, Brown and Cocking (1999), teachers continue to learn about teaching in many ways:

- Firstly, they learn from their own practice. Whether this learning is described as the monitoring and adjustment of good practice or analysed more completely according to a model of pedagogical reasoning (Wilson, 1999), teachers gain new knowledge and understanding of their students, schools, curriculum, and instructional methods by living the practical experiments that occur as a part of professional practice (Dewey, 1963; Schön, 1983). Teachers also learn from their own practice through different types of teacher research or "action research", such as creating journals, essays, classroom studies, and oral inquiry processes (Cochran-Smith & Lytle, 1999).
- Teachers learn through their interactions with other teachers and collegial support. Some of this occurs during formal and informal mentoring that is similar to apprenticeship learning (Little, 1990; Lave & Wenger, 1991). Formal

mentoring occurs when an experienced teacher takes a new teacher under his/her wing to provide insight and advice (Feiman-Nemser & Parker, 1993). Informal mentoring occurs through conversations in hallways, teachers' rooms, and other school settings. Novices also learn through supervision by department chairs, principals, and other supervisors. To a small but increasing degree, teachers are teaching other teachers through formal in-service education. Administrators are beginning to recognise expertise in their schools and are encouraging teachers to share expertise as in-service presenters to their colleagues. Feiman-Nemser et al. found that some schools recognise the preparation for these in-service programs as a form of professional learning for the presenters and award them with "professional development points" for time spent in preparing to teach, as well as time spent teaching their colleagues. Teachers also teach teachers outside of schools. Meetings of professional associations and teachers' unions include numerous workshops and presentations in which teachers share their knowledge with other teachers.

- Many teachers enrol in post-graduate programs. Most schools tie teachers' salaries to their level of education. Teachers also take post-graduate courses in education rather than in the subject matter of their teaching because of the lack of disciplinary graduate courses offered after school hours or during the school holidays (Renyi, 1996).
- Finally, teachers can also learn about teaching in ways that are separate from their formal professional work. They learn about intellectual and moral development in their roles as parents. They learn about non-didactic forms of instruction through such activities as coaching (Lucido, 1988) and other youth-related work in their communities.

Because of the wide variety of ways in which teachers continue to learn about teaching and learning, it is difficult to generalise about or judge the quality of the teachers' learning experiences. One fact is clear, however: there are relatively few opportunities available when measured in financial terms. Overall, there is minimal public investment in formal opportunities for professional development for teachers.

Most schools spend only 1 to 3 percent of their operating budgets for professional development, even when salaries are in this factoring. This lack of investment in personnel is unheard of, either in leading corporations or in schools in other countries (Kearns, 1998).

Innovation Adoption in Schools

This section explores the studies of some researchers and their analysis of innovation in schools. Everett Rogers, in his seminal work on the *Diffusion of Innovations* (1983) describes a process of adoption and decision-making that seems to apply to schools' and educators' adoption of technology. Rogers explained diffusion as a process by which an innovation is communicated through certain channels over time and among members of a social system. Thus, diffusion of an innovation within Rogers' theory is both an individual and a social activity. Additionally, Rogers found that the diffusion of innovations was not only affected by certain behavioural traits, but by other factors, such as the perceived attitudes of the innovation and the type of decision involved in the adoption process. Other factors, such as size of the organisation and socioeconomic status were also considered to be theoretical reasons why individuals choose to be involved in the innovation diffusion process.

Rogers (1983) stated that each participant matches the characteristics of one of five adopter categories. These are *innovator (venturesome)*, *early adopter (respectable), early majority (deliberate), late majority (skeptical), and laggard (traditional)*. In diffusion research these categories were derived from "ideal types," or what Rogers defined as "conceptualizations based on observations of reality and designed to make comparisons possible" (p. 248). *Innovators* usually have the resources, contacts, or knowledge that the other adopter categories are lacking. The innovator plays an important role in the diffusion process: that of launching the new idea in the social system by importing the innovation from outside the system's boundaries. Thus, the innovator plays a gatekeeping role in the flow of new ideas into a social system (Rogers, 1983).

Early adopters are the next group to adopt the innovation. They do not have all the resources innovators have, but they are more respected by the social system and have

the greatest degree of opinion leadership, the ability to influence others' decisions in the adoption process, among the group. Early adopters have a high level of opinion leadership, which Rogers defines as "the degree to which an individual is able to influence other individuals' attitudes or overt behaviour informally in a desired way with relative frequency" (p. 27). The role of the early adopter is to decrease uncertainty about a new idea by adopting it, and then conveying a subjective evaluation of the innovation to near peers by means of interpersonal networks.

Early majority members "adopt new ideas just before the average member of a social system" (p. 249). These members interact with many of the group but do not move into leadership positions. Their innovation-decision period is relatively longer than that of the innovator and the early adopter.

Late majority members "adopt new ideas just after the average member of a social system" (p. 249). The reasons for adoption may be due to increased pressure from peers in order to motivate adoption. They do not adopt an innovation until most of the other members of a social system have done so.

Rogers referred to the fifth category, *the laggards* as "traditional" (p. 250) because their point of reference is in the past. They are always the last to adopt and unlike the early adopters, they have no opinion leadership. They are often suspicious of the innovation and those who are in support of the change especially change agents. Their traditional orientation slows the innovation-decision process to a crawl, with adoption lagging far behind awareness knowledge of a new idea.

Dalton (1989) stated that it could be difficult from year to year to identify the opinion leaders in a school because of the increased teacher turnover and the teacher shortages. A teacher identified one year, as an opinion leader, may not be at the same school the following year. This will increase uncertainty of the innovation in late majority and laggards.

According to Miles (1964), the focus of innovations in schools should be on the change process in a social system. The value of an innovation is based on its intended outcomes or accomplishments for the system or unit of adoption. However, the main focus in many change efforts is on content and not on the features of the change process.

For example, why do some innovations spread more rapidly than others do, or what are the causes of resistance to change in the educational setting?

Cohen and Bredo (1975) stated that within the literature on educational innovation, the subject is often "handled in a diffuse but concrete manner, with emphasis on adoption rather than implementation. Little attention is paid to the way such innovations affect teaching" (p. 298). Cohen and Bredo identified current instructional and organisational practices as examples of changes in structure and technology of teaching and then examined what current practices mean for teachers in terms of working together and new ways of teaching. The focus for their research was not on the success or failure of adopting an innovation, but on the individuals who were responsible for the success or rejection of that innovation.

Statement of the Problem

The case study school is paving the way for the adaptation of cutting-edge Information and Communication Technologies within Australian secondary school classrooms. In 2003-2004, the school recognised the opportunity to create collaborative online learning environments for academic staff, students, and parents. As a result, the school's leadership team made the strategic decision to adopt the "Blackboard" Learning System (Release 6) online learning platform.

The purpose of this study was to investigate and examine teachers' perceptions and experiences in adopting "Blackboard" into their classroom curricula. Through rich description based on data gathered during interviews, email dialogues, and observations, I sought to discover how those teachers integrated the new technology and ways in which their feelings changed with time and how they felt about the change process.

Significance of the Study

The current status in the evolution of technology in education will precipitate changes in teaching methods. Integrating new technology into a curriculum is a time-

consuming and difficult task for the classroom teacher. Rewards for the extra time spent integrating the new technology into class plans are not always realised immediately.

Information obtained from this study will contribute to the growing body of research in the area of new technology introduction and integration in classrooms. The results of this study will identify teachers' perceptions towards and approaches to using the new technology resources provided for them and the reasons behind these perceptions. Teachers in other schools can use the findings of this study as a baseline in their effort to assess the effectiveness of new technology implementation in their classrooms.

The significance of this study therefore lies in:

a) its contribution to the process of school improvement by gathering data on how teachers perceive and experience "Blackboard" adoption in their classrooms; and

b) its contribution to theory by relating a school's new technology program with the theories of change and innovation in education.

Finally, since many schools in Victoria may not be aware of this technology and its applicability to teaching and learning, this study will provide some insights for those schools interested in pursuing a similar path in the future.

Limitations of the Study

This study focused on seven Catholic secondary school teachers. Therefore, the results may not be generalisable to teachers at other school levels. The teachers were not randomly selected from the population of teachers and thus the results may not be generalisable to all teacher populations. The teachers volunteered to participate in this study.

The question of confidentiality with regard to interviews was another issue. I am a full-time staff member at the case study school, and teachers were informed the personal information provided would be kept strictly confidential in any report deriving from the data they provided.

The attempt to be both a member of the school's teaching team and a researcher can often lead to problems of role conflict. The possibility of a *'Hawthorn Effect'* due to

the extra attention the teachers were receiving as participants of a research study on the adoption of "Blackboard" in their school's curriculum was noted. My professional interest and background are both a strength and a limitation with regard to this study. I also note the potential to influence results of this research, particularly when I have direct contact with my colleagues as participant in this study.

Research Questions

The following research questions were addressed in this study:

Main research question:

How do the teachers perceive and experience the process of adoption of the "Blackboard" computer program in their classrooms and how do they feel about the process of change?

Sub-questions:

1. Do teachers undergo a period of adaptation during the introduction and integration of a new technology and how do they feel about the process of mandated change?
2. Does teacher professional development on "Blackboard" integration combined with classroom application and other factors, such as access and time, foster positive teacher and student experiences toward technology?
3. Do school leaders' attitudes towards technology have any influence on teacher and student perceptions and experiences in adopting the new technology?

Definition of Terms Related to Technology

The following definitions denote the use of terminology, concepts, and constructs associated with this study:

Adoption: A decision to make full use of an innovation as the best course of action available. Rejection is a decision not to adopt an innovation (Rogers, 1995, p. 21).

Adoption Categories: Classifications of members of a social system on the basis of *innovativeness*, the degree to which an individual or other unit of adoption is relatively earlier in adopting new ideas than other members of a system (Rogers, 1983, p. 268).

Barrier: Something either internal or external that keeps a teacher from successfully adopting, then integrating technology into their teaching. Barriers and obstacles in the context of this study are taken to mean the same thing.

Bulletin Board (BB): A place on the Internet where messages may be posted and read by all visitors. Usually anywhere from a few seconds to a full 24-hour delay may intervene before a message is posted.

CD-ROM: A compact disc with read-only memory. Data is "burned" onto the disc, which requires a special drive to access it.

Construct: "a conceptual variable… an idea, a researcher's idea, related to other ideas in a theory of organisational behaviour and belief" (Schwab cited in Stablein, 1996, p. 516).

Constructivism: An approach to teaching that emphasises the value of multiple sensory inputs and individualised learning strategies (Yager, 1991).

Diffusion of Innovation: A theory regarding the adoption of improved or advanced techniques, methods, or machinery by persons within an organisation (Rogers, 1995).

Distance learning: Electronically connecting students with instructors and/or resources that can help them attain knowledge and skills (Hopey & Ginsburg, 1996).

Early Adopter: An individual in an organisation who is among the first wave of adopters of an innovation as it becomes available within the organisation (Rogers, 1995).

Early Majority: Individual in an organisation who adopts an innovation ahead of most peers but at a later time than Innovators or Early adopters (Rogers, 1995).

Email: Electronic mail; messages sent person-to-person via the Internet or a local area network (LAN).

Emotion: A strong feeling about something or someone.

Face-to-Face Teaching: Teaching that is provided through traditional classroom-based channels where the students and teachers meet in person to conduct learning activities.

Hypermedia: A computer-based system providing presentation graphics, video and audio images, and interactive links, to provide a flexible and interactive learning environment (Hanson-Smith, 2000, p. 164).

Information and Communication Technology (ICT): A generic term referring to technologies which are being used for collecting, storing, editing and passing on information in various forms (Cuttance, 2001).

Internet: A global telecommunications network based on satellite and ground relays. Originally conceived as a research tool and means to connect academics in universities, institutes, and government, the Internet is now accessible by any individual through commercial service providers (Tobin & Dawson, 1992).

Integration: Enhancing student learning by incorporating technology into a curriculum area (Dockstader, 1999).

Innovation: An individual perception of a practice, idea, or object that is perceived as new (Rogers, 1995).

Innovator: Individual who adopts an innovation through his/her own resources, without waiting for implementation at the organisational level (Rogers, 1995).

KLAL: Key learning area leaders of departments and faculties in the case study school.

Laggard: Individual who does not adopt an innovation, often due to shortcomings of the organisation (Rogers, 1995).

Late Majority: Individual who adopts an innovation late in the adoption cycle and often due to peer pressure or necessity (Rogers, 1995).

Microcomputer: A small, stand-alone computer designed for use by one person.

New Technology: For this study, encompasses the use of "Blackboard" Learning System (Release 6).

Online Teaching: Teaching that is distributed through telecommunication technologies, such as the World Wide Web.

Personal Computer (PC): A personal computer, a desktop-sized computer designed for use by one individual.

Professional Development: For this study, professional development for new technology should contain essential components that this research has found to be important. These components include: a connection to student learning; hands-on technology use; variety of learning experiences; curriculum-specific applications; new roles for teachers; collegial learning; ongoing process; sufficient funding and time; technical support; adequate resources; and built-in evaluation.

School Reform: A process designed to bring about change throughout the educational system.

Technology in the Classroom: For this study, encompasses the use of computers, the "Blackboard", or other computer-related software.

The Hawthorn Effect: The Hawthorn Effect is where the participants or subjects in research projects, instead of acting naturally, try to please the researcher by giving his/her the results he/she is looking for (It is named after The G E Corporation in Hawthorn, Ohio). It is also known as subject or response bias (Bartol and Martin, 1991).

Typology: Represents system of classification. Researchers create typologies through the grouping of sensory information into categories based on some perceived similarity (Brew, 1986).

Website: An address on the World Wide Web, often referred to as a page or homepage, written in http (HyperText Transport Protocol), so that users may link to media and to other sites.

World Wide Web: A graphical software interface to the Internet, which allows the transmission of sound, picture and video, as well as text, and the linking of media and text with the click of a button. Often seen in Web addresses as "www" (Hanson-Smith, 2000, p. 165).

Organisation of the Study

This case study research is presented in a descriptive and narrative form and chronicles the perceptions and experiences of seven teachers participating in the process of adopting the "Blackboard" Learning System (Release 6) into their classroom teaching. The structure of this thesis is arranged to provide an accurate account of the teachers' perceptions of this process and the issues they identified.

Chapter One provided background to the study, educational reform, teachers' learning environments, innovation adoption in schools, statement of the problem, significance of the study, research questions, limitations of the study and the organisation of the study. Chapter Two provides a review of literature related to educational change, coping with and resistance to change, adoption of technological change, and the impact of technology on teaching and learning. Chapter Three is a summary of the purpose of ICT in education. Chapter Four includes a description of the study methodology, research design, research setting and data collection and analysis methods. Chapter Five provides results of data analysis. Finally, Chapter Six contains a summary of findings, conclusions and recommendations for improved practice and for further study.

CHAPTER 2

A REVIEW OF RELATED LITERATURE

The following review focuses on literature related to educational change, coping with and resistance to change, adoption of technological change, and the impact of technology on teaching and learning. In addition, the literature review focuses on the barriers to technology use by teachers in schools and associated issues including: teacher's skill levels, adult learning, and web-based teaching and learning. Teachers' professional development and the use of new technologies are also reviewed in terms of both content and process. Literature, which may broaden understanding of concepts emanating from the data, is also discussed.

Change and Teachers Coping with Technological Change

The purpose of this first component of the review is to examine the change process and teachers coping with technological change.

A great deal has been written about change, its processes, outcomes and the effectiveness of various approaches to its management. Social, organisational and technological changes are occurring with ever increasing frequency and speed, requiring people to adapt rapidly.

The focus of this study is on the teachers' perceptions and experiences with the integration of new technology in schools. It is important to recognise that technological change has a significant impact on social and organisational structures and processes. Technological changes are often devised and implemented by people who fully understand the technology but who do not always fully understand or manage the social implications. This leads to potential difficulties in the relationships between the various sub-systems within the organisation.

Beare and Millikan (1983) suggest a particular strategy must be devised for each situation, recognising that all change occurs within a system of existing relationships. They argue that technology, structures, tasks and people are the interacting change

variables in complex organisations, and whilst planned change begins as an attack on one of these, it rapidly spreads to all four.

Johnson and Fredian (1986) concentrate on the phases of the change process: pre-announcement phase; transition phase; and consolidation or implementation phase and on the critical success factors which must be attended to. They define these as:

- gaining the support of key people who have influence and authority;
- developing a good project plan; and
- gaining support of the employees who will be affected by the change.

Changes in practice as a result of a new computer program frequently have a negative impact on the direct users of the program because if the change is not managed, and does not take account of people's needs, then resistance to the change is more likely to occur.

We live in an age of discontinuous change. Continuous change and change that evolves is comfortable (Fullan, 1993). The past is a guide to the future. In this technological age, the age of information explosion, change is dramatic, sudden and for many, discomforting. There is a need to understand the change process better. Those who know why change happens waste less effort protecting themselves or in fighting the inevitable. Those who realise where change is heading are able to use this change to their best advantage. Change is another word for growth, a synonym for learning (Hardy, 1989). Change is different in today's world: discontinuous, rapid and not part of any pre-existing pattern. Such discontinuity has happened from time to time throughout history and has been confusing and disturbing. For example, the computer has sparked an information revolution that is quickly dividing the world into the "haves" and "have-nots". Increasingly, computers are becoming an essential component for success in this technological culture (Aviram, 2001).

Technological change, in the main, is imposed. For individuals, it is the little changes that can make the biggest differences to our lives, even if these go unnoticed at the time. It is the change in the way in which our work is organised, how we are educated for work or, indeed, whether we work in paid employment at all, which makes the biggest differences to the way in which we live. Constant technological change demands that

schools, and especially teachers, alter their strategies to incorporate the newest software and hardware in order to maximise their students' exposure to the latest sophisticated tools to assist the delivery of quality teaching.

In theory, the purpose of educational change presumably is to help schools accomplish their goals more effectively by replacing some structures; programs and/or practices with better ones. Fullan (1991) states that educational change depends on what teachers do and think; it's as simple and as complex as that. He adds that no real change will occur in schools without substantial change in teaching practice, particularly in relation to: a) new or revised materials; b) new teaching approaches; and c) the possible alteration of beliefs.

Connell (1993) describes some of the expectations placed on teachers:

> Time spent preparing the lesson; time spent getting the class settled and willing to listen, time spent supervising exercises and correcting them. Beyond this, running a class involves keeping order, dealing with conflicts between kids; having a joke with them from time to time and building up some personal contact; discussing work with them individually; planning sequences of lessons; preparing handouts and physical materials; collecting, using and storing books and audiovisual aids; organising and marking tests and major exams; keeping records; liaison with other teachers in the same subject…That is for conventional classroom work. Beyond it there is a very wide range of jobs to be done to keep a school humming along or even bumping along. Supervising the kids in playgrounds, at the canteen, at sporting events, onto transport, on excursions. Planning, arranging, swimming carnivals, athletic days, football matches, fetes, and so forth inside it. Going to parent/teacher nights, staff meetings, and administering punishments… (pp. 71-2)

The occupation is becoming exhausting both physically and emotionally and the expectations placed on teachers are of tremendous importance. It is the many hours that go into preparations, marking, developing schemes of work, attending parent interviews and the sheer sense of responsibility, that contribute to teacher exhaustion and resisting change, which, invariably, leads to teacher stress.

Brickner (1995) conducted research which concluded that teachers experience many real and perceived obstacles to technology adoption in their classrooms. There are numerous reasons why teachers generally resist change. Sometimes they have a fear of

what change will bring. They may not have all the necessary equipment to implement the change effectively, or they simply may not want to make the change. Brickner suggests that the obstacles teachers experience can be identified as first and second-order barriers to change. First-order barriers to change are typically *extrinsic* in nature; that is they are external to the teacher or require a "technological quick fix" for change to be able to occur. For example, the lack of teacher access to computers and software is considered to be a first-order barrier to computer implementation. These barriers are easy for teachers to identify due to the fact that the barriers exist outside of their control.

First-order barriers to change can include the lack of:

- access to hardware;
- access to software;
- time to plan instruction;
- technical support; and
- administrative support.

Second-order barriers to change are defined as *intrinsic;* that is they are "internal" to the teacher. These barriers to change exist within teachers and they are reluctant to acknowledge their existence. For example, a fear of computers or the insecure feeling someone gets when they are around computers relates to second-order barriers. Many times second-order barriers are hidden within first-order barriers (Brickner, 1995).

Second-order barriers to change can include:

- beliefs about teaching;
- beliefs about technology;
- organisational context;
- lack of instructional models; and
- unwillingness to change.

Ongoing professional development is one way that could alleviate the barriers to the implementation of computer-related technologies. These developments can provide teachers with a non-threatening environment where they can learn to use computer

technology and programs. By doing so, many of the first-order barriers to successful technology implementation may be removed.

Brickner (1995) stated that teachers need time to be able to explore different technologies and experiment with a variety of software and instructional applications. Adequate access to software and the Internet will increase teachers' computer usage. If teachers can find a piece of software to enhance their instructional goals they will be more likely to use the computer as an instructional tool. Second-order barriers are best addressed by providing follow-up support and personalised assistance. This support is imperative to the successful implementation of computer technology. Brickner also stated that when teachers have time to experiment with technology they are less fearful of using it as a teaching tool. Teachers who want to begin using new technology in their teaching should be provided with teaching models and assistance during their first attempts. These efforts ease the transition for many teachers.

Bradshaw (1997b) states that teachers' anxiety levels decrease significantly when they know they have support and are not alone in their technology implementation efforts. Professional development workshops help alleviate second-order barriers to technology implementation by providing the teachers with assistance and training in technology usage both during the workshops and between workshop sessions. This assistance should take the form of teacher modelling (e.g. suggesting specific strategies for technology implementation, providing technical assistance, and encouraging teachers to use technology in their classrooms). As education has changed to reflect the needs of society, teaching strategies have also changed. However, not all educators agree about appropriate strategies that will best achieve educational goals. Roblyer (2003) noted two views that have served as methods for teaching and learning and the technological applications associated with them. The first view was known as direct instruction, which was derived mainly from cognitive learning theories (the information processing branch) and behaviour learning theories. Drill and practice and computer tutorials are examples of direct instruction.

The second view was referred to as constructivist, which was derived from the cognitive learning theories. Web-based learning and multimedia production could be considered as examples of both directed and constructivist learning. Roblyer (2003)

suggested, “proficient technology-oriented teachers must learn to combine directed teaching and constructivist approaches. To implement each of these strategies, teachers must select technology resources and integration methods that are best suited to their specific needs” (p. 56).

Teachers’ work is further complicated when we consider their values. Many researchers have pointed out that ensuring the success and well-being of children is of vital importance to teachers (Fullan, 1991; Huberman, 1993) and a major source of reward (Lieberman & Miller, 1984). This concern with students has been characterised as the moral purpose of teaching. Fullan (1993) stated, “the moral purpose is to make a difference in the lives of students regardless of background, and to help produce citizens who can live and work productively in increasingly dynamically complex societies” (p. 48).

Teachers have a pivotal role in schools and they are essential to the success of any school’s restructuring plan (Cuban, 1986; Barth, 1990; Hargreaves & Fullan, 1992; Cohan & Kottkamp, 1993). McLaughlin (1990) stresses the importance of “teachers’ perspective as informants and guides to policy” (p.15). The processes needed, however, to ensure teacher involvement in and ownership of change are rarely in place. While teachers should be asked, and be asking, the questions that drive educational reform, the process of mandating change is not in their hands (Cohn & Kottkamp, 1993).

Newmann, King and Young’s (2000) recent paper provides an important framework for understanding continuous school improvement, which focuses on student achievement. According to Newmann et al., the following are core components of school improvement:

- knowledge, skills and dispositions of individual staff members;
- a professional learning community in which staff work collaboratively to set clear goals for student learning; and
- the extent to which the school’s programs for student and staff learning are coordinated, focused on clear learning goals and sustained over a period of time.

If teachers are going to implement the changes that new technologies offer to classrooms then, they must feel affirmed by their management and leadership team.

Teachers' Resistance to Technological Change

Early studies (Ross, 1958; Miles, 1964; Mort, 1964; Gross, Giacquinta & Brenstein, 1971) of attempts to implement change in schools focused on teachers as the source of resistance to change as teachers' beliefs shaped their use or otherwise of new technologies in classrooms. Teachers were often painted in a negative light as fearful, lazy, insecure, conservative and irrational. On attempts to implement technical innovations in schools, Hodas (1998) wrote:

> Each battle is essentially the same battle. The technologists' rhetoric is remarkably consistent regardless of the specifics of the machine at issue. So too is their response when the technologies in question meet with only a lukewarm response: to blame the stubborn backwardness of teachers or the inflexibility and insularity of school culture. (p. 21)

Similarly, Gillman (1989) explained that many teachers are reluctant to invest the additional time and energy to incorporate a new technology into their teaching methodology because they have already developed adequate solutions to many of their pedagogical problems within the given organisational structures. Gillman (1989) frames teachers' resistance to change as rational responses to technologies that are incongruent with institutionalised practices and the organisation of schooling.

Technology can potentially make change on both the organisational and practice patterns of schools. That change can subvert or reinforce existing lines of power and information, and this change can be, for the technologists or the school staff, intentional, inadvertent or a combination of the two. Since schools are not monolithic but composed of groups with diverse and generally competing interests on the rational, organisational, and symbolic levels, adoption and implementation of a proposed technology are two very different matters (Honey & Moeller, 1990).

According to Sheingold and Hadley (1990), the introduction of new technology, for example, is hailed in one discourse (directed towards the public and towards policy makers) as a process, which will radically change the nature of what goes on in the classroom, give students entirely new sets of skills, and permanently shift the terrain of learning and schools. In another discourse (directed towards administrators and teachers)

new technologies are sold as straightforward tools to assist them in carrying out pre-existing tasks and fulfilling pre-existing roles. The more innovative the approach the greater its critique, and hence its threat to existing principles and order.

When confronted with this challenge, teachers have two responses from which to choose. They can ignore or subvert implementation of the change or they can coopt or repurpose it to support their existing practices. Much of the question concerning teacher self-definition revolves around the anxiety generated by their unfamiliarity and incompetence with the new technologies. The fear of being embarrassed is a major de-motivating factor in the acquisition of the skills required to use computer technology in the classroom (Kerr, 1991).

At the classroom level we would expect to find tools and processes that both ease the physical labour of the teacher while maintaining his/her traditional role within the classroom. The black/white board, TV and VCR, and the overhead projector come immediately to mind. All enhance the teacher's authoritative position as an information source, and reduce the physical effort required to communicate written information so that more energy can be developed to the non-didactic tasks of supervision, arbitration, and administration. This type of technology seldom poses a threat to any of the teacher's functions, because it is fundamentally supportive of the school values, and reproduces locally the same types of power and information relationships through which the teacher himself/herself engages administrators. Technologies, such as these will seldom meet with implementation resistance from teachers because they support them in the roles through which teachers define themselves, and contain no critique of teachers' practice, skills, or values (Becker, 1981).

These examples of successful technologies confirm the requirement of simplicity if a technology is to become widely dispersed through classrooms. Becker (1981) suggests this is partly to do with the levels of general teacher aptitude, partly with the amount of time available to teachers to learn new tools, and partly with the very real need for teachers to appear competent before their students.

Many teachers are busy with their daily routines and can find any excuse when asked to add something new. " Why change what is working?" Many teachers find that it

is easier to stay with the status quo. Maurer (1995) has categorised this fear of change into three levels of resistance:

Level one: *"Resistance to any use of technology."* Teachers for example:

- do not understand what the administration is trying to accomplish or if the school realises how much technology will cost in time or money;
- have their own ideas about what the school should do;
- like the status quo and believe the timing is wrong;
- do not know what impact the use of technology will have on them; and/or
- may just be afraid of letting others know what they don't know.

Level two: *"Deeper than the use of technology."* Teachers for example:

- believe the administration has made promises it did not keep before;
- fear they will no longer be included as "in";
- are afraid that technology use is really the start of something bigger and deeper; and/or
- may be worn out by taking on so many changes all at once.

Level three: *"Deeply embedded resistance."* Teachers for example:

- may have deeply entrenched distrust over many years; and/or
- fight anything the administration is supporting because values differ from what teachers want and what administration is proposing.

Maurer (1995) argues that staff developers may be spending wasted time on Level Three resistors. Are schools wasting valuable resources on teachers who are never going to change and may even try to sabotage the problem? The problem is deeper than what schools can fix as staff developers. However, one of the best ways to ensure success is to have all the teachers supporting the change and the professional development program before schools begin making the change.

Resistance comes in many forms and can become overwhelming for teachers and staff program developers. Using the three levels can assist in identifying whom the teachers are working with and approach each with what will work for him/her. One teacher may like ongoing hands-on professional development, so provide more professional development for this teacher. Another teacher may need handholding and will need more time.

George, Randall and Pearce (1996) noted that a person's natural response to computer anxiety would be to seek "comfort in isolation" (p. 2), since this anxiety presents a "level of uneasiness over his or her impending use of technology that is disproportionate to the threat the technology presents" (p. 2). One could infer that those teachers who are afraid to use computers might really be afraid of what others (colleagues, students) might think of their computer illiteracy.

According to Fullan (2001), it is impossible to consider educational reform, new technology implementation, or curricular enhancement without paying attention to teachers' perceptions. What happens to the teachers' role in this new environment? Extensive practice, comfortable atmosphere, individualised attention and voluntary participation are all elements that encourage teachers to adopt new technology in their classrooms.

O'Grady (1994) made the following key points for successful change:

- the hardest thing to change is a hardening of attitudes; nothing kills change faster than attitudes that resist it;
- high self-esteem results from making small positive changes in spite of fear. Confidence comes from conquering fear of change; and
- unexpected pain can result from either huge setbacks or successes.

For the purpose of this study, these factors will be considered when focussing on the adoption of "Blackboard" by the seven teachers in their classrooms.

Organisational Learning

O'Rourke (2003) in her recent research on pedagogy and ICT in Victoria, states that a focus on pedagogy provides a way of talking about the relationship between teaching and student learning, so that as aspects of pedagogy are made explicit, it becomes possible to examine and change practice. Just as an emphasis on pedagogy can help to transform individual classrooms, an emphasis on organisational learning can help to transform a school. Argyris (1977) defines organisational learning as the process of "detection and correction of errors" (p. 116). In his view organisations learn through individuals acting as agents for them: "The individuals' learning activities, in turn, are

facilitated or inhibited by an ecological system of factors that may be called an organisational learning system" (p. 117).

Huber (1991) considers four constructs as integrally linked to organisational learning: knowledge acquisition, information distribution, information interpretation, and organisational memory. He indicates that learning need not be conscious or intentional. Further, learning does not always increase the learner's effectiveness, or even potential effectiveness. Moreover, learning need not result in observable changes in behaviour. Senge (1990) advocates that all organisations become "learning organisations". He characterised them as:

> …organisations where people continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are new, where collective aspiration is set free, and where people are continually learning to see the whole together. (p. 3)

The basic rationale for such organisations is that in situations of rapid change only those that are flexible, adaptive and productive will excel. For this to happen, it is argued that organisations need to "discover how to tap people's commitment and capacity to learn at all levels" (p. 4). Senge adds that while all people have the capacity to learn, the structures in which they have to function are often not conductive to reflection and engagement.

Furthermore, people may lack the tools and guiding ideas to make sense of the situations they face. Organisations that are continually expanding their capacity to create their future require a fundamental shift of mind among their members. For Peter Senge, real learning gets to the heart of what it is to be human. We become able to re-create ourselves. This applies to both individuals and organisations. Thus, for a learning organisation it is not enough to survive. Senge argues that the leader's role in the Learning Organisation is that of a designer, teacher, and steward who can build shared vision and challenge prevailing mental models. He/she is responsible for building organisations where people are continually expanding their capabilities to shape their future, that is, leaders are responsible for learning.

Fullan (2001) states schools that only restructure (change the curriculum, add new roles, reorganise) make no difference in teaching and learning. However, schools that reculture (as well as restructure) do make a difference if they: (a) focus on student learning; (b) link knowledge of student learning to change in teaching practices; and (c) work together to assess teachers and school leadership to make improvement.

The Impact of Technology on Teaching

In his review of the effects of information and communication technology (ICT) on teaching and learning, Toomey (2001) observed that recent reports identified ICT as a source of whole school reform. He concluded that, "ICT can be a major force in re-engineering schools. The strategic introduction of ICT into a school can seriously challenge its day-to-day practice" (p. 36).

Results of a study conducted in USA by O'Donnell (1996) on the integration of computers in the classroom indicated that the majority of teachers failed to utilise computers in direct classroom instruction. O'Donnell reported that teachers did not understand how to use computers in the teaching process, how to utilise software, or how to redesign their instruction to incorporate computers in the classroom. Suggestions from the study included the need to know teachers' perceptions of their computer skills and the extent of their desire to receive further training. O'Donnell stressed that professional development programs must address the specific needs of teachers and should be ongoing over an extended period of time.

Researchers (Bradshaw, 1997b; Meltzer & Sherman, 1997) acknowledged that the lack of time for training, for trying out technology in the classroom, and for talking to other teachers about technology was a major barrier. Bradshaw (1997b) and O'Donnell (1996) have reported fear, insufficient access, and lack of support. Cuban (1993) offered the following as an explanation as to why teachers use technologies infrequently and selectively:

1. Limited access to equipment that quickly becomes obsolete.
2. Limited time to use technology due to class schedules.

3. Each teacher's beliefs about instruction and learning, knowledge about new technologies, and prior attitudes toward technology determine whether and how students will get to use computers (Cuban, 1993, p. 192).

For the purpose of this study, these issues will be assessed to investigate teachers' perceptions on the adoption of "Blackboard" in their teaching.

Marsh (1999) asserted that teachers must move beyond excuses, such as "I haven't been trained", "I don't have the time", and "I'm not so good with computers" because much of the learning about technology has to be self-taught. Teachers learn through experimenting, reading, attending computer education meetings, and interacting with other teachers involved with computers. Horsley (1997) suggested that professional development be based on what is known about adult learning and the process of innovation.

Teachers must be involved in planning and implementing professional development activities. Darling-Hammond and McLaughlin (1995) found that teachers were motivated to participate in professional development by career advancement opportunities, pay increases, and personal satisfaction, such as improved teaching and learning. Knowledge, skills, attitudes, and behaviours of teachers were also essential in planning effective professional development.

Recognising the link between professional development and successful educational change, Darling-Hammond, and McLaughlin were among the leading school reformers who called for a new approach to professional development. Lieberman (1995) recognised that while everyone appeared to want a wide array of learning opportunities for students which would engage them in experiencing, creating, and solving real problems, these same opportunities were somehow absent when teachers reversed roles and became learners. She noted the following similarities between the ways students learn and teachers learn:

> People learn best through active involvement and through thinking about and becoming articulate about what they have learned. Processes, practices, and policies built on this view of learning are at the heart of a more expanded view of teacher development that encourages teachers to involve themselves as learners in much the same way they wish their students would. (p. 592)

There is a strong link between effective use of new technology and the theory of constructivism. According to Mann (1994), the use of new technology in an educational setting has caused the theory of learning and constructivism to receive new attention. Students in these settings become empowered by gaining access to real data and work on authentic problems. Often, roles are reversed as teachers and students learn from one another.

Professional development from a constructivist perspective states that, "teachers and administrators will collaborate with peers, researchers, and their own students to make sense of the teaching/learning process in their own contexts" (Sparks, 1994, p. 27). There is no longer a question about whether new technologies will be used in schools. Nearly everyone agrees that students must have access to computers and other technology in the classroom. Many believe these technologies are necessary because competency in their use is an important feature of career preparation; others see equally important outcomes for civic participation.

Most importantly, a growing research base confirms technology's potential for enhancing student achievement. What is less certain is how and when these technologies will change the nature of schooling itself. For example, the technologies are already providing an alternative curriculum for students that are scarcely acknowledged by the formal school curriculum. Nevertheless, they have been mainly employed as additions to the existing curriculum. Teachers employed in schools already know how to use computers, but knowledge of and skills in the use of new technologies have not been practised by all teachers and for different reasons (Brand, 1997). Brand also stated that the introduction of new technologies into schools is occurring at the same time that three decades of research in the cognitive sciences, which has deepened our understanding of how people learn, is prompting a reappraisal of teaching practices. This research indicates that knowledge is not passively received, but actively constructed by learners from a base of prior knowledge, attitudes and values. As new technologies become more readily available and less expensive, they serve as a catalyst for ensuring that new approaches to teaching gain a firm foothold in schools.

Teaching in schools too often consists of helping students acquire information from textbooks and acting as an additional source of expertise. Teachers may be forgiven if they cling to old models of teaching that have served them well in the past. All of their formal instructions and role models were driven by traditional teaching practices (Clark, 2000). Breaking away from traditional approaches to instruction means taking risks and venturing into the unknown. But this is precisely what is needed at the present time. In order for teachers to adapt to take advantage of technology for teaching, they need to understand the deep impact technology is having on society as a whole and how technology has changed the nature of work, of communications, and our understanding of the development of knowledge (Clark, 2000).

Teachers must recognise that information is available from sources that go well beyond textbooks and mass media. Teachers help their students understand and make use of the many ways in which they can gain access to information. Teachers must also employ a wide range of technological tools and software as part of their own instructional repertoire. Teachers should help students pursue their own inquiries, making use of technologies to find, organise and interpret information, and to become reflective and critical about information quality and sources (NCATE, 2003).

The Impact of Technology on Learning

The teaching and learning process has been dramatically altered by the convergence of a variety of technological, instructional, and pedagogical developments in recent times (Bonk & King, 1998; Marina, 2001; Smith, 2002). Garmer and Firestone (1996) concur that technology is challenging the boundaries of the educational structures that have traditionally facilitated and supported learning. Recent advances, especially in the area of computer technology have heralded the development and implementation of new and innovative teaching strategies.

Instructional technology is influencing education in many ways. Although education has brought significant contributions to society, it has remained elusive to many people especially those who live in remote areas. Instructional technology is bridging this accessibility gap by permeating the walls and opening doors for many people to participate in learning (Hanna, 1999). According to Hofmann (2002),

educational opportunities are now accessible to students who in the past lacked opportunities due to such restraints as geography, time, family and money. Additionally, the use of emerging technologies has enhanced distance learning (Bates, 1997; Marina, 2001).

Online learning is now considered the backbone of continuing education and is enabling educators to reach populations that would be otherwise inaccessible (McEwen, 2001). Currently, there are greater opportunities for accessing up-to-date content, as updating information on the web can be done faster and more easily than with textbooks. In addition, educators can make choices as to what technologies to integrate into their classroom situations from the large pool of resources available, such as CD-ROMs, DVD-ROMs, application software, multimedia applications, and communications applications (Shelly, Cashman, Gunter, & Gunter, 1999).

Those who advocate technology integration in the learning process believe it will improve learning and better prepare students to effectively participate in the 21st century workplace (Butzin, 2000; Reiser, 2001; Marina, 2001; Hopson, Simms & Knezek, 2002). Technology has no doubt become an integral part of education enabling students to access information rapidly and visually (Smith, 2002). Coupled with increased usage of instructional technology, web-based instructional resources like electronic textbooks are slowly making their way into the education system (Chen, 1998). These resources, like the web-based texts, give readers a feeling of engaging in real time, face-to-face interaction through use of interactive programs (Ahern & El-Hindi, 2000).

There are many ways that information technology can enhance curriculum, and student learning. According to Gilbert and Green (1995), the major issue "…is the effective use of information technology resources as tools to support teaching and learning outcomes" (p. 17). Rather than asking whether to use technology, today's educators are concerned with how to use technology to enhance and enrich their learning environments (Barker, 2000). Ultimately, an attempt must be made to assist teachers at all levels to develop rich classroom environments that facilitate active learning and higher level thinking skills, e.g., reflection, problem solving, flexible thinking and creativity (Grabinger, 1996; Hopson, Simms & Knezek, 2002).

The New Role of the Teacher

Information and communication technologies (ICT)) have swept through our society at large, especially since the advent of the Internet. Teaching and learning will not escape this evolution. Teaching frequently involves solving problems and critical thinking, which are characterised by a large amount of information, open constraints and the absence of a single correct solution (Voss & Post, 1988).

There is currently great debate about how teachers should adapt their teaching skills and practices to accommodate the introduction of new technologies. These changes are comprehensive: embracing teaching methodology; assessment of learning; student tracking; communication and evaluation. The distributed nature of information and communication technology learning, and the impact it creates on both learners and teachers are crucial issues.

The shared resources, shared working spaces and particularly the notion of collaborative learning may be particularly difficult for some teachers to accept. Most critically, the extent to which teachers relinquish control and let learners drive their own learning may create the greatest barrier to the adoption of new technology in the classroom. In considering the role of teachers, Becker (1998) articulated the characteristics of exemplary technology integrating teachers. He found that teachers integrated technologies into their teaching lessons and created an environment for learning in which the technology use was not only directly related to their curriculum goals, but also incorporated a wide variety of uses for the technology that was relevant to knowledge building across the curriculum.

Many are predicting that new technologies will bring about several benefits to the learner and the teacher. Wheeler (2000) identified these benefits as she included sharing of resources and learning environments as well as the promotion of collaborative learning and a general move towards greater learner autonomy. She briefly discussed each of these benefits inturn, offering some examples:

- Shared learning resources: One of the most striking examples of technology in action in schools is the appropriate use of video systems to transmit television

programs and information throughout an entire school and even between schools in the same area. Students and teachers enjoy the facility to share information wherever they are in the school.

- Shared learning spaces: Networked computing facilities create a distributed environment where learners can share work spaces, communicate with each other and their teachers in text form, and access a wide variety of resources from internal and external databases via web-base systems through the Internet. Using these shared systems, students develop transferable skills, such as literary construction (e.g. using a range of complex search strategies), keyboard techniques and written communication skills, whilst simultaneously acquiring knowledge of other cultures, languages and traditions.
- The promotion of collaborative learning: Reil (2000) argues that much of what we now see, as individual learning, will change to become collaborative in nature. Reasoning and intellectual development is embedded in the familiar social situations of everyday life, so the social context of learning has a great deal of importance. Collaborative learning is therefore taking an increasing profile in the curricula of many schools, with technology playing a central role.
- To move towards autonomous learning: At the same time, computers and the power they bring to the students to access, manipulate, modify, store and retrieve information will promote greater autonomy in learning. Inevitably, the use of new technology in the classroom will change the role of the learner, enabling students to exert more choice over how they approach study, requiring less direction from teachers. Students will be able to direct their own studies to a greater extent, with the teacher acting as a guide or instructor rather than as a director (Forsyth, 1996). This facilitation will take on many facets and will also radically change the nature of the role of the teacher, as we currently understand it.

Decisions made by teachers about the use of computers in their classrooms are likely to be influenced by multiple factors including the accessibility of hardware and relevant software, the nature of the curriculum, personal capabilities and constraints, such as time. However, there is substantial evidence to suggest that teachers' beliefs in their capacity to work effectively with technology are a significant factor in determining

patterns of classroom computer use. Teachers have been polarised in their acceptance of the new technologies. Whilst some have enthusiastically integrated computers and the Internet into the classroom, others have been cautious in their welcome and some have simply rejected the technologies.

There is a level of justifiable cynicism based on previous experience of computer-based applications, such as Computer Assisted Learning (CAL). Ironically, some enthusiasts have inadvertently damaged the reputation of Information and Communication Technology by poor classroom practice, using the technology for the sake of its novelty value, or failing to think through the issues before implementing the technology (Littlejohn, Stefani & Sclater, 1999).

Wheeler (2000) states, with the inevitable proliferation of information and communication technology (ICT) in the classroom, the role of the teacher must change. Wheeler gives four reasons why this must happen:

- the role of the teacher must change because Information Technology (IT) will cause certain teaching resources to become obsolete. For example, the use of overhead projectors and chalkboard may no longer be necessary if learners all have access to the same-networked resources on which the teacher is presenting information. Furthermore, if students are distributed throughout several classrooms, which is becoming more commonplace, then localised resources, such as projectors and chalkboard will become redundant and new electronic forms of distributed communication must be employed;
- Information and Communication Technology may also make some assessment methods redundant. Low level (factual) knowledge for example, has been traditionally tested by the use of multiple-choice questions. In an ICT environment, online tests can easily be used which instantly provide the teacher with a wide range of information associated with the learner's score. Comparisons of previous scores and dates of assessment, for example, will indicate a student's progress, and each can be allocated an individual action plan data base stored in electronic format into which each successive test's results can be entered automatically;
- the role of the teacher must change in the sense that it is no longer sufficient

for teachers merely to impart content knowledge. It will, however, be crucial for teachers to encourage critical thinking skills, promote information literacy, and nurture collaborative working practices to prepare children for a new world in which no job is guaranteed for life, and where people switch careers several times. Teaching strategies and resources can be shared through communication with other educators and may be integrated across the curriculum, and the Internet provides a wealth of information to the extent that it is now impossible to comprehensively track the amount of information available;

- teachers must begin to re-appraise the methods by which they meet students' learning needs and match curricula to the requirements of human thought. The Internet can be an excellent way to adapt information to meet the characteristics of human information processing. Traditional methods of imparting knowledge, such as lectures and books, are characterised by a linear progression of information. Human minds are more adaptable than these using non-linear strategies for problem solving, representation and the storage and retrieval of information.

The overall picture, which emerges from Wheeler's statements, is that the teacher's role must change due to the current changes in Information and Communication Technologies. For the purpose of this study, these statements will be further explored when analyzing the data.

Hypertext software enables teachers to provide their students with non-linear means to match non-linear human thinking processes (Semenov, 2000).

A new role for teachers means:

- adapting schools' organisation and teaching resources (i.e. ICT) and casting new roles for the different actors of education (learners, teachers, parents);
- having teachers acquire new skills;
- ensuring a better understanding of this process by decision makers in the world of education; and
- re-evaluating teachers' role positively and rewarding them adequately.

Collaborative Work Cultures

Developing collaborative work cultures helps reduce the professional isolation of teachers, and allows the sharing of successful practices and provides support. Collaboration raises morale, enthusiasm, and the teachers' sense of efficacy and makes teachers more receptive to new ideas (Simpson, 1990; Smith & Scott, 1990; Fullan, 1991).

Collegiality, which according to Barth (1990) is frequently confused with congeniality, is difficult to establish in schools. Little (1997) describes collegiality as a norm exhibited through four specific behaviours:

1. Adults in schools who have a collegial relationship talk about practice.
2. They also observe each other engaged in the practice of teaching and administration.
3. Colleagues engage together in work on curriculum by planning, designing, researching, and evaluating it.
4. Collegiality is exhibited when adults teach each other what they know about teaching, learning, and leading.

Barth (1990) suggests that a number of outcomes may be associated with collegiality:

> Decisions tend to be better. Implementation of decisions is better. There is a higher level of morale and trust among adults. Adult learning is energised and more likely to be sustained. There is even some evidence that motivation of students and their achievement rises, and evidence that when adults share and cooperate, students tend to do the same…The relationships among adults in schools allow, energise, and sustain all other attempts at school improvement. Unless adults talk with one another, observe one another, and help one another, very little will change. (p. 31)

Collegial relationships facilitate change because change involves learning to do something new and interaction is the primary basis for social learning. New meanings, new behaviours, new skills, and new beliefs depend significantly on whether teachers are working as isolated individuals (Goodlad, 1984; Sarson, 1990) or are exchanging ideas, support, and positive feelings about their work (Fullan, 1991).

The relationships teachers have with each other, their students, and the community affect change. In like manner, the relationships between students and their peers, teachers, and the school as a whole can help or hinder school improvement efforts. Fullan (1991) points out that students are typically seen only as the potential beneficiaries of change rather than as participants in the process of change. This traditional view of students is reflected in the observations of Fine (1991). The principal of the high school in Fine's study seemed to believe that merely telling students what to do, without their involvement, would compel their compliance. Teachers are rarely informed regarding new school plans in spite of the fact that the new plans cannot be carried out successfully when teachers are not committed to cooperate with the plan, and do not know what to do or how to do it (Fullan, 1991).

Teachers and students need to believe they are being treated with decency and fairness by those at other levels when many of their personal and professional needs are satisfactorily met through their work environment.

Teachers and Technology Integration in Classrooms

In labelling technology as the "great siren song of education", Kearsley (1998) argued that "educational technology [has become] primarily, if ironically, a distraction (on a grand scale) from what matters most: effective learning and good teaching" (p. 47). By focusing merely on how to use computers, technology integration has failed and has caused us to miss the forest for the trees by not addressing how to teach students more effectively using a variety of technological tools.

Kearsley further lamented the lack of technology preparation for teachers (too little and too late), stressing the realistic need for extensive and sustained practice over years, not one-day workshops (p. 49). He adds that what teachers need to know most is how to teach content more effectively. Because of our quick-fix mindset in education, we myopically "teach people how to use specific types of technology [rather than] how to solve educational problems using technology when needed and appropriate" (p. 50).

Even though Gardner (1991) has expressed the view that "a well trained and effective teacher is still preferable to the most advanced technology, and that even

excellent hardware and software are to little avail in the absence of appropriate curricula, pedagogy, and assessment" (p. 223), he nevertheless admitted "immersing oneself in a problem using the latest technology…can make a significant contribution to student learning" (p. 223). For him, the most important question is "whether such technological prosthetics actually improve classroom performance and lead to deeper understandings" and become "helpful handmaidens in the [learning] process" (p. 233).

Pierson (2001) defined technology integration as teachers utilising content and technological and pedagogical expertise effectively for the benefit of a student's learning (see Figure 1). Pierson's model was based on a meta-analysis of 120 case studies of technology integration in K-12 environment. All grade levels and curriculum topics were included. He found three important components common to student's construction of knowledge: (a) content knowledge; (b) pedagogical knowledge; and (c) technological knowledge.

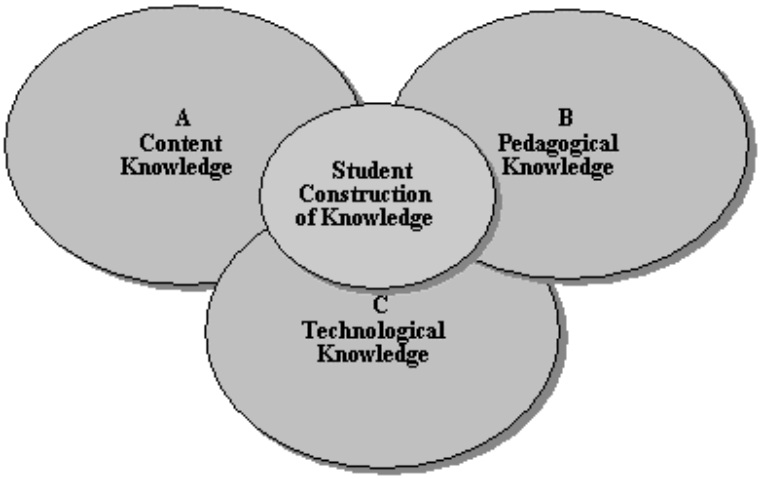


Figure 1: Pierson's model of technology integration (modified by Woodbridge, 2004)

Postman (1993) has warned that technologies alter "the things we think about… the things we think with… and the arena in which thoughts develop" (p. 20). Hence, technology has become a serious arena for academic work (Mollgaard & Sides-Gonzales, 1995). This is the promise and the potential. It is also the challenge. The questions to be addressed are: "Who is in charge? Who is the driving force?" The answer should be the teachers who use the technology well. It cannot be the technology in and of itself.

A review of research compiled in the early years of the past decade (Sivin-Kachala & Bialo, 1995) demonstrated the value of technology in enhancing student achievement, improving students' attitudes about themselves and about learning, and changing the learning environment. However, these authors emphasised that "the decisions made by well trained educators [necessarily] determine the computer's ultimate instructional effectiveness" (p. 17), and that "the most important determinant of student attitudes when using technology is the teacher" (p. 24).

Working in an appropriately designed technology-rich environment has the potential of producing a variety of positive outcomes (Tiene & Luft, 2001): improved patterns of social interactions, changes in teaching styles, more effective teaching, increased student (and perhaps, teacher) motivation, and enhanced student learning. Achieving this potential, however, is the challenge, and it requires the correct vision of technology and its integration.

Definition of both terms (technology and integration) whether broad or limited, drives the problem. Computer technology is merely one possibility in the selection of media and the delivery mode not the end but merely one of several means to the end. Integration does not just mean placement of hardware in classrooms. If computers are merely add-on activities or fancy work sheets, where is the value (Hadley & Sheingold, 1993)? Technologies must be pedagogically sound. They must go beyond information retrieval to problem solving; allow new teaching and learning experiences; promote deep processing of ideas; increase student interaction with subject matter; promote teacher and student enthusiasm for teaching and learning; free up time for quality classroom interaction, in sum; and improve the pedagogy (Byrom & Bingham, 2001).

Integrating technology is not about technology; it is primarily about content and effective instructional process. Technology involves the tools with which teachers deliver content and implement practices in better ways. Its focus must be on curriculum and learning. Integration is defined not by the amount or type of technology used, but by how and why it is used. A study conducted by Schofield, Eurich-Fulcer, and Britt (1994) has shown that effective technology integration is not found in classrooms that are traditional and use didactic teaching methods. Rather, effective integration of ICT occurs in environments where teachers and learners engage in new partnerships for learning. There

are collaborative and problem-solving settings where all participants learn. The relationships between learners are dynamic and ICT complements engagement in collaborative and authentic learning tasks. Schofield et al. (1994) argue that successful technology adoption/integration requires a focus on the mission of improving education for all students. It grows from the mission. As an add-on or fad, it soon withers.

ICT implementation must be seen as an ongoing innovative process designed to meet teaching and learning needs (Robey, 1992). Bernaur (1995) captured a significant insight when he stated, "it is not technology *per se* that has resulted in improved student outcomes, but rather how the technology was used and integrated into instructional processes" (p. 1). While noting increased student proficiency in using technology for learning rather than as technology for its own sake, he also attributed such achievements to teacher planning and expertise, recognising that true success must be measured in terms of improvement in teaching and learning, not merely in the placement of computers in classrooms.

Munoz (1993), who described herself as a technophile, emphasised the prudent, ethical use of technology and warned us to "resist the seductive force of technology to replace rather than enhance" (p. 49). She stressed that human elements, such as intuition, judgment, imagination, and creativity cannot be replaced and that technology may fail if it is viewed as change for the sake of change.

Fullan (2001) in a review of educational reform reminds us that since technology is ubiquitous, the issue is not whether, but *how* we contend with it. He stresses that as technology becomes more powerful, good teachers become more indispensable.

> Technology generates a glut of information, but it has no particular pedagogical wisdom, especially regarding new breakthroughs in cognitive science about how learners must construct their own meaning for deep understanding to occur. This means that teachers must become experts in pedagogical design. It also means teachers must use the powers of technology, both in the classroom and in sharing with other teachers what they are learning. (p. 582)

Aviram (2001) stated that questions about technology integration/adoption often centre on schools and classrooms. Such questions fall short of the target. It is relatively

easy to "place" technology in physical locations. The real question must focus on integration into teaching practices, learning experiences, and the curriculum. Integration (from the Latin *integrare,* to make whole) includes a sense of completeness or wholeness and incorporates the need to overcome artificial separations by bringing together all essential elements in the teaching and learning process, including technology (as *one* of the elements, but not the sole element).

It is important to remember that technology is not a subject (Duffield, 1997). The focus of integration is on pedagogy: effective practices for teaching and learning. Teachers need to be able to make choices about technology integration/adoption without becoming technocentric by placing undue emphasis on the technology for its own sake without connections to learning and the curriculum. For both pre-service preparation and in-service professional development, this means providing experiences, primarily in instructional design, media selection, modelling exemplary technology practices, resource sharing, and extensive and sustained training and practice.

Ertmer (1999) explains "teachers need opportunities to observe *models* of integrated technology use, to *reflect* on and discuss their evolving ideas with mentors and peers, and to *collaborate* with others on meaningful projects as they try out their new ideas about teaching and learning with technology" (p. 54). The curriculum must be the vehicle for technology integration. Just as reading is content free (i.e., incorporates all subject areas), so is technology. We must weave technology into the fabric of learning, or as Cuban (1986) admonished: "Fit the computer to the curriculum, not the curriculum to the computer" (p. 68).

How are we to understand the process of adopting new technologies for teaching and learning? Why do some teachers readily embrace new tools, while others are very slow to change? My purpose in this section is to outline some key ideas and theories underlying the adoption of new technologies in classrooms by teachers, which shape this study. For example, a research study conducted by Evans-Andris (1995) revealed that teachers whose schools had possessed computers for at least five years shaped their interaction with computers through their style of computing. Three styles were shown to include almost all the participating teachers. These were avoidance (60%), integration (28%), and technical specialisation (12%). Russell (1995) presented a set of stages of

technology adoption. According to his research, adults learn new technology by passing through six stages on their way to becoming confident technology users. These learners may begin at any point and progress through at their own rates. The stages include: a) awareness; b) learning the process; c) understanding and application of the process; d) familiarity and confidence; e) adaptation to other contexts; and f) creative application to new contexts.

In a study comparing levels of adoption of technology and personality types, Rude, Parkins, Baugh, and Petroako (1993) defined three levels. At the "high level", teachers were enthusiastic and integrated technology into the classroom. At the "medium level" teachers used some technology for personal use and some with students. The "low level" adopters used technology neither with their students nor for personal use. Based on an international study involving children, teachers, and computers, Collis, Knezek, Lai, Miyashita, Pelgrum, Plomp, and Sakamoto (1996) stated:

> Teachers are the main gatekeepers in allowing educational innovations to diffuse into the classrooms. Therefore, one of the key factors for effecting an integration of computers in the school curriculum is adequate training of teachers in handling and managing these new tools in their daily practices. (p. 31)

They found that the "degree of classroom computers use was closely tied to the extent of training in integration techniques" (Collis et al., 1996, p. 32). Assessing teachers' stages of adoption of technology allows the teacher educator to adapt the instruction to fit the learner's needs.

One of the most revealing studies of technology integration is a ten years study of Apple Computer's Classroom of Tomorrow (ACOT). These were elementary, middle, and high school classes in average or low-income districts that had been infused with technology; each student and teacher had a computer at school and another at home. Teachers received intensive support and training. Over the course of the project, researchers looked at the changes in teachers' beliefs, attitudes, and behaviours and identified stages of development that teachers go through on their way to fully integrating technology into their teaching programs. These stages and concomitant characteristics are summarised in the table below as adapted from Dwyer (1994).

Table 1: Stages of development teachers go through in fully integrating technology into their teaching

Stage	Characteristics
Entry	- As the classrooms begin to change, teachers have doubts about technology integration.
Adaptation	- Teachers use technology to support traditional text-based drill and practice. - Student achievement shows no significant decline or improvement. - Self-esteem and motivation are strong. - Student attendance is up and discipline problems are few.
Appropriation	- Teachers and students personally appropriate technology. Teachers gain a perspective on how profoundly they can alter the learning experience. - Students have highly evolved technology skills and can learn on their own. - Students' work patterns and communication become collaborative rather than competitive.
Invention	- Teachers are prepared to develop entirely new learning environments that utilise technology as a flexible tool. - Teachers view learning as an active, creative, and socially interactive process. - Knowledge is something students construct rather than something that can be transferred.

Over time, technology use changes the way teachers teach. As they grow in their use of technology, they become more willing to experiment, their teaching becomes more student-focused, and they tend to establish collaborative working relationships with other teachers. Teachers were experimenting with new kinds of tasks for students, and they were encouraging far more collaboration among students (Dwyer, 1994). These changes occur only when teachers and administrators have flexibility in changing the classroom environment and rearranging schedules to accommodate different patterns of teaching and learning.

Barriers to Technology Use by Teachers in Schools

Several researchers have noted barriers that prevent teachers from using technology. Hardy (1998) identified several barriers including lack of hardware and software, lack of time for classroom computer activities, uncertainty in how to integrate computers into the curriculum and a lack of adequate training. In terms of training, Hyman (1981) notes that parochial self-interest, lack of trust, different assessments of different information, low tolerance for change, fear of losing face, peer-group pressure, and mistaken first impressions are all resistance factors to training.

Some researchers believed that providing more resources, time and training would solve the problem and encourage teachers to integrate technology (Hoffman, 1997). Hoffman points out that teachers learn new technology skills in numerous ways: self-study, workshops and conferences, in-service training courses, coaching, or guidance and help from colleagues. However, teachers need to commit a certain amount of time to learn technology skills. Not all teachers can find time to spare, and much research has identified lack of time as one of the major factors preventing teachers using technology resources (Renyi, 1996). This is especially the case for those teachers who are already overburdened with large classes, and overloaded syllabi.

In their review of the literature on teachers' attitudes toward computers, Dupagne and Krendl (1992) observed that the literature they reviewed generally demonstrated positive teacher attitudes toward computers. However, several studies in Dupagne and Krendl's review reported that teachers share a number of concerns about integrating computers into their instruction. Although teachers may believe in the instructional effectiveness of computers, they remain unable to make use of the technology because they have their own limitations, such as time or lack of knowledge. The primary recommendation emerging from Dupagne and Krendel's review of the literature was teacher training: referring to the need for schools to invest time and resources in in-service and workshop training for teachers.

The technology itself will not directly change teaching and learning but the way it is incorporated into instruction will certainly be a critical element in its integration (Baylor & Ritchie, 2002). Baylor and Ritchie predict that successful technology

integration depends on two variables: teacher openness to change and the extent to which teachers experience and practice using technology.

Albion (1999) refers to other studies which indicate that innovativeness also contributes to teachers' level of computer use because teachers will have to master a variety of powerful tools and redesign their lesson plans around technology enhanced resources. For individuals who have a low sense of efficacy, innovativeness is not an option. Albion argues, on the other hand, that the research suggests that teachers' beliefs about their self-efficacy in using technology for teaching be directly related to their actual experience and practice with technology.

Belief about the relevance of a particular computer program resource is a key factor in determining whether teachers will utilise that resource or not. Many teachers fail to use new technology not because they are technophobic, but because they cannot understand how technology could be utilised in their teaching practices, or have doubts about the usefulness of technology (Lam, 2000).

Research has also shown that teachers who have more experience with computer technology are more comfortable using and have positive attitudes towards computer technology resources, while those with computer anxiety tend to avoid using them (Akbaba & Kurubacak, 1998). The expansion and success of instructional technology, then, depends greatly on teachers' attitudes towards and ability to use it in their instruction (Clark, 2000). Some researchers found that the provision of opportunities and training to enable teachers to experience computer technology resources and learn how to use them in instruction is crucial for teachers' acceptance and use of them (Clark, 2000).

Mahmood (2000) indicates that literature about end-user satisfaction reveals three major categories of satisfaction: perceived benefits and convenience, user background and involvement, and organisational attitudes and support (see Figure 2). Mahmood proposed an integrative theoretical framework for the instrument development of end-user satisfaction. His results indicated that perceived benefits, user background and organisational support mainly affect end-user satisfaction. Perceived benefits are measured by user expectations, ease of use and perceived usefulness. User experience, user skills and user involvement in the system development process determine user background.

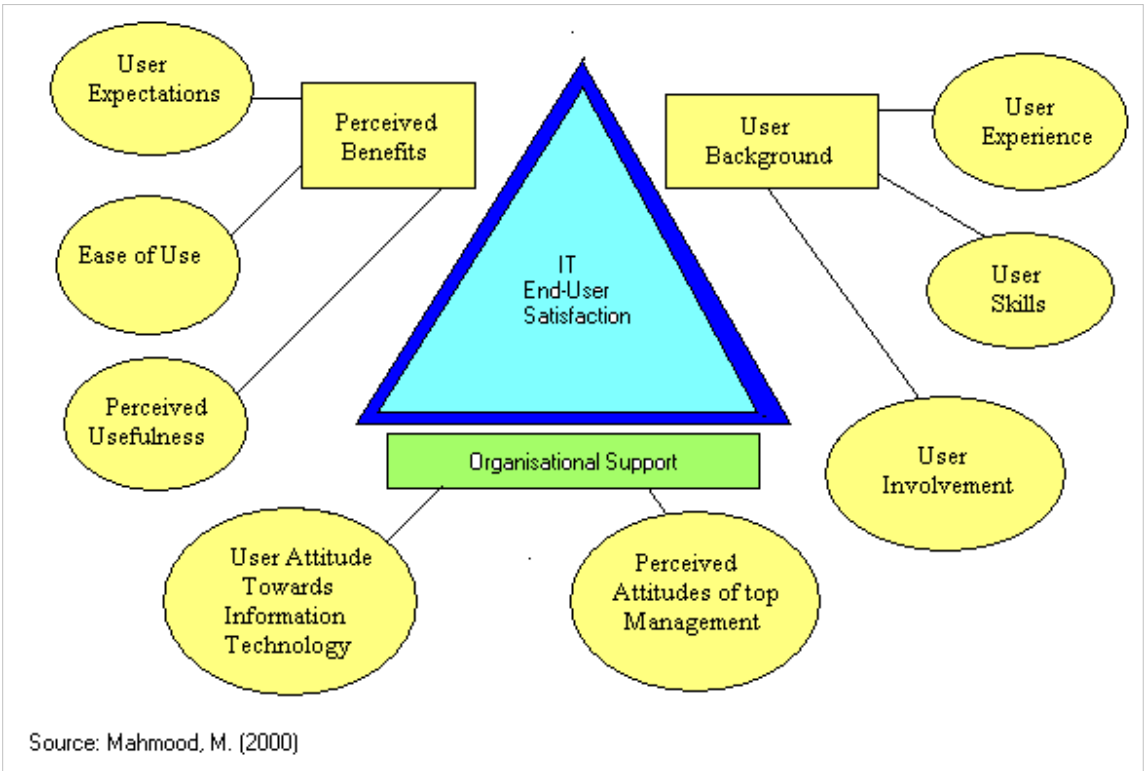


Figure 2: Research model of factors affecting IT end-user satisfaction

Spiege (2001) states that it is critical schools provide support for all of their personnel as well as involve them in various aspects of technology usage. Involvement leads to empowerment and seems to have a great impact on attitudes.

Fullan (2001) suggested that teachers' requirement for organisational, resource and training support must be met in order for them to successfully implement technology as an educational innovation.

In conclusion, it is this research literature that will assist me in understanding the challenges and barriers to new technology integration by teachers in schools.

Teachers' Skills Level and Professional Development

Learning the new roles and ways of teaching that go hand-in-hand with technology integration requires that teachers have opportunities to participate in an extended process of professional development. Teachers need time to acquire technology skills and develop new teaching strategies for integrating technology into the classroom. Except for occasional in-service programs, teachers often have no time built into the school day for their own professional development.

Carlson (1994) identifies teachers' beliefs as the most important influence on what they do in the classroom. He suggests that linking beliefs about students, teaching, and information technology is one of the most critical aspects of professional development in this area. He recommends that professional learning programs:

- assist teachers to uncover their personal beliefs about teaching;
- encourage teachers to describe their experiences with, and the assumptions they have about information technology;
- allow time for reflection;
- probe for deeper understanding;
- encourage teachers to go beyond "fitting into the curriculum" when they design information technology activities; and
- help teachers to identify persistent difficulties within the curriculum, topics with which students consistently have problems (Meredyth, Russell, Blackwood, Thomas & Wise, 1999, p. 284).

Meredyth et al. found that although the majority of teachers possess basic skills and familiarity with computers, there was:

> …little evidence that teachers are extending these basic skills in ways that are likely to fundamentally change the ways they teach, or in ways that will enable the use of computers as other than relatively low-level educational tools. (p. 263)

Because teachers learn at different rates and have individual needs when mastering new technology skills, professional development should be flexible yet cover a comprehensive set of skills. Teacher technology skill acquisition that builds upon each

teachers' background and experiences is clearly not easy to implement, and it requires two things in short supply in most schools: time and money. To adequately meet the learning needs of all students, however, every teacher, not just the computer guru, must be able to go beyond basic computer functions to use technology as a springboard to engage learning in every classroom.

Professional development time is especially important when teachers are learning new technology skills. Renyi (1996) states for example:

> …this time for learning is especially important as schools incorporate information technologies into the classroom. When a school proposes to install these technologies, each teacher must become adept at their use, identify appropriate hardware and software for his/her subject matter and students, and sit down to work on the computer. Learning to use new technologies well is accomplished best when teachers have time available to learn in a variety of ways. Teachers need large blocks of time to gain initial familiarity with new hardware or software, learning and practicing for sustained periods. (p. 12)

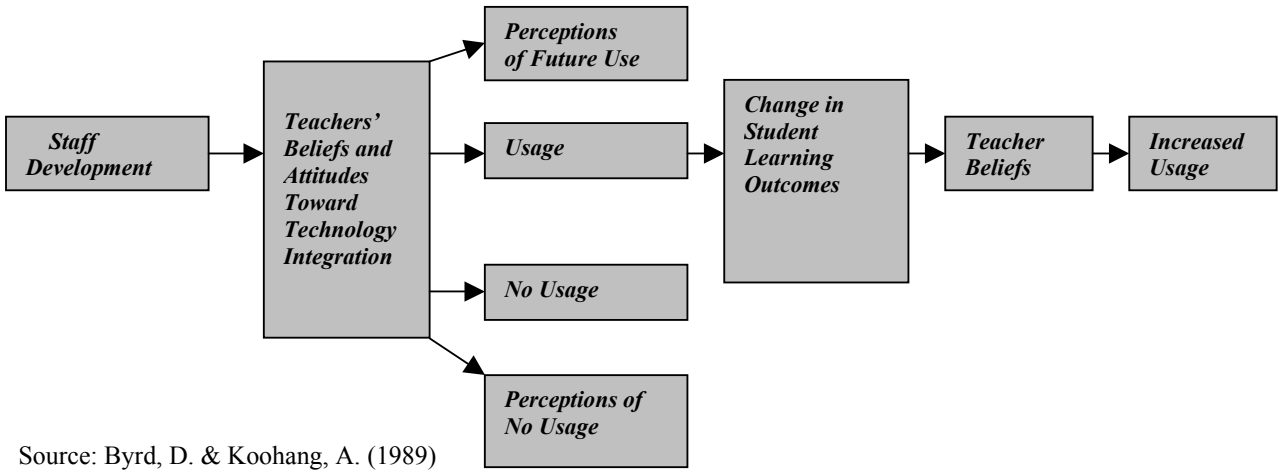
When professional development activities are conducted after school, teachers may not have the energy necessary for engaging in learning. Burgos (1998) stated that the research on professional development tells us that it is least effective when it is done at the end of the school day. Some researchers, such as Hardy (1998) suggest that the ideal time for teachers to participate in professional development activities is during the school holidays, when students are not a consideration and teachers do not have as many demands on their time.

Teachers need good quality training that encompasses all of their potential uses of technology. A simplified model of the professional development process (Byrd & Koohang, 1989) is presented in Figure 3. They recommend, "practical experience be blended into the structure of professional development activities related to computers" (p. 409).

Based on the Byrd et al. (1989) model of the process of staff development, it is quite important here that teachers learn what is relevant to them. The relationship between professional development and teachers' beliefs and attitudes to use technology

relies on a quality professional development program, which supports teachers changing their attitudes towards technology.

Figure 3: Model of the Staff Development Process and the Relationship of Beliefs and Attitudes to Usage and Perception of Future Use



Source: Byrd, D. & Koohang, A. (1989)

An uninformed teacher, or one who simply refuses to consider using technology, ultimately performs a disservice towards his or her students. In addition, state-of-the-art technology is useless if a teacher does not know how to use it. The appropriateness of when and how to use technology must be the decision of the teacher but at the very least, that teacher should be professionally prepared on how to use new technology in his or her classroom.

Another related area of note is the teacher-learning process. As previously noted, quality professional development is an essential part of conquering teacher fears towards technology. Mitchell (1998) states ten recognised principles of adult learning; [People]:

1. learn only what they are ready to learn.
2. learn best what they actually perform.
3. learn from their mistakes.
4. learn easiest what is familiar to them.
5. favour different senses for learning.
6. learn methodically and systematically.
7. cannot learn what they cannot understand.
8. learn through practice.

9. learn better when they can see their own progress.
10. respond best when what they are to learn is presented uniquely for them. Each of us is different (p. 48).

Recognising who the learner is and what his or her individual needs are, is a crucial part of staff development. As Byrd and Koohang (1989) note, it would seem logical that a person's perceptions of what he or she is studying "will be of use to them and lead to positive attitudes towards the content they are to learn" (p. 409).

Web-based Teaching/Learning: Pedagogy for New Technologies

According to Stephenson (2001), e-learning demands new pedagogical skills and fluency with technology, which will be new to many teachers. It also includes developing "technological fearlessness", keeping an eye out for new technological developments and for new ways of using the technology autonomously in solving problems and learning. Stephenson adds that improvements in learning through online approaches, when observed, are generally the product of reflective teachers who have conceptions that encourage them to develop effective teaching interventions regardless of technology rather than features of the particular online pedagogy, such as discussion groups or interactive exercises or hyperlinked resources. Conversely, arguments claiming that pedagogical improvements inherently follow from the use of online technologies are misleading. Phipps and Merisotis (1999) draw a similar conclusion from their study:

> …although the ostensible purpose of much of the research is to ascertain how technology affects student learning and student satisfaction, many of the results seem to indicate that technology is not nearly as important as other factors, such as learning tasks, learner characteristics, student motivation, and the teacher. The irony is that the bulk of the research on technology ends up addressing an activity that is fundamental to the academy, namely pedagogy, the art of teaching. (p. 67)

The current online pedagogy is following up the globally desirable trend of a "shift from teaching to learning" (p. 67). The ICT changes in an increasing degree the roles and relationships of learners and teachers by interfering and changing their interactions. Online pedagogy, as it is understood here, mainly focuses on the activities of

the learners and observes the teachings primarily from the point of view of support (Phipps & Merisotis, 1999).

As we know, technology has radically changed the role of the teacher. Particular attention must be paid to the Internet. Today's World Wide Web has changed the way in which many people communicate and disseminate information. The teacher has become a guide, mentor, and coach. Teachers' fears must also be recognised. Conquering their fears could lead to more technology usage on the part of the teacher (Anderson & Reed, 1998).

Web-based teaching and learning is rapidly becoming one of the major avenues to deliver courses to students (Smith, 1999; Camevale, 2000; Garcia, 2000; Stocks & Freddolino, 2000; O'Riordan & Griffith, 1999). Key reasons for this rapidly increasing system of delivery include the fact that the World Wide Web offers a means to provide excellent teaching and learning and is cost-effective. Another benefit of coursework on the World Wide Web is the ability to communicate and collaborate with other students.

During the last several years, college and university teachers have developed web-based instruction courses (Frederickson, 1999). Many of the teachers had expertise or interests that included developing web pages and web-based activities before beginning the development of web-based courses. Conversely, there were teachers who had no experience with technology, and did not have the time or the desire to develop web-based courses. Web-based training should include a gradual introduction of the technologies that will assist teachers make the transition from traditional pedagogy to a model in which they take a full and active role in their own learning.

Educators today are using web-based learning as a method for delivering courses. There are many software packages specifically designed for electronic learning (e-learning), such as WebCT, "Blackboard" and Prometheus. In recent years, schools and universities have moved to web-based courses to attract students not able to attend traditional classes for various reasons. Teaching styles have to be adapted to this new environment because the Internet is a different medium.

Teachers and students have to adjust to the pedagogy that uses instructional technology as an integral component in teaching. Many teachers who have not used instructional technology to accomplish course objectives in the past now have to be

trained to do so, and they very often include a component in the course that provides information to students about technology itself (Hazari, 1998). Students must also be trained to work with instructional technology in order to be successful with online learning classes. In a technology rich classroom, students might search the web for information, analyse a certain topic, chart the results, and record what they have learned on the computer. In such an environment, acquiring content changes from a static process to one of defining goals the learners wish to pursue. Students are active, rather than passive, producing knowledge and presenting that knowledge in a variety of forms.

The use of the "Blackboard" program as a tool for web-based learning has educators rethinking the way instruction is administered to students. Web-based communication creates a variety of ways to deliver instruction and provide electronic resources for student learning. Some methods, such as web pages that deliver text in much the same way as hardbound texts, are very familiar to some teachers. However, a big advantage is that the Internet also supports the delivery and use of multimedia elements, such as sound, video, and interactive hypermedia (McNeil, Robin & Miller, 2000).

Internet-based learning can overcome some traditional barriers, such as time and place. A student can study independently online or take an instructor-led online class, which combines the benefits of self-study with those of more traditional classroom-based learning (Ryan, 2001).

Classes that use technology and the Internet as an enhancement to what is happening in the face-to-face teaching generally employ materials on CD-ROM. There is the electronic textbook including associated learning activities; "lecture" material or an asynchronous discussion board located on a course site online. They may use chat or synchronous discussions online; or they may even simply use email. This technology may be used in a class that is conducted completely or almost completely online. The difference being that there may be minimal or no scheduled face-to-face sessions associated with the class. Yet another form of online learning is the posting of course material on a static website, meaning that no means of interactivity is built into the course. In this type of class, the student interacts only with the machine and not with other students. His or her contact with the teacher is likely to be via email.

Finally, a review of the ways and means to provide web-based learning is essential. How do we choose the delivery system that will be the most effective for our needs? Cook (2000) suggests that a "one-size-fits-all" system approach to course development and delivery might not be the best choice. Cook identifies and describes effective pedagogical designs that provide guidance in this area. It is important for schools and universities to review the different systems available and choose the one that will best fit the needs of their own organisation.

There are many decisions to consider about the kinds of programs to choose. This study will investigate the advantages of implementing web-based teaching and learning programs, the limitations, how teachers' knowledge and skills will be developed, who the audience is, and the kind of delivery system that will be used to implement the process.

Conclusion

In this age of rapid change and uncertainty, there is one thing of which we can be certain. Teachers will need to adapt to change if they are to survive and keep pace with new methods and technologies. Arguably the area of most rapid change is that of Information and Communication Technologies (ICT). Teachers realise the need for change, but implementation of real change is difficult. Examining how each educator views technology is a very important factor in supporting ICT integration. Senge (1990) emphasised the importance for each member of the team to have a "mental model" that should be aligned with the group's vision.

Teachers and administrators need to have continuous access to professional development that involves hands-on computer training and workshops that are relevant to their curriculum. Pierson (2001) argued that true technology integration involves:
a) students constructing their own learning while using both hardware and software tools; b) teacher's content knowledge; and c) teacher's pedagogical knowledge. He also argued that educational reform efforts should not only focus on acquiring more computers for classrooms but on developing teaching strategies that complement technology use within the curriculum.

One positive implication of technology integration is that it allows the teachers and the learners to be involved in the learning process. Teachers learn more when they are active participants in a project. They need to be engaged in a situation in order to absorb and acquire knowledge. This is so very true for all those who are learning about technology and those who plan on teaching using technology in the classroom to support student learning (Johnson, 2000).

McKenzie (1998) stated that many teachers hunger for the time to translate new ideas and strategies into practical classroom lessons and unit plans. Invention is the time when teachers take ownership. They make the innovation real. Online teaching and learning may also cause problems of social isolation as it "creates a reduced need for teacher contacts with colleagues and students and offers fewer possibilities for such contact (Hennestad, 1983, p. 21). The early stages of integration may increase teacher contact for direct users due to the involvement of curriculum and information technology teams. A better understanding of the process that teachers go through to integrate new technology into their teaching will benefit not only other teachers, but also the students who will be learning in those classrooms.

Research on classrooms that have put constructivist teaching and learning models into practice also indicates that technology can enhance student engagement and productivity (Means & Olson, 1995). More specifically, technology increases the complexity of the tasks that students can perform successfully, raises student motivation, and leads to changes in classroom roles and organisation (Dwyer, Ringstaff & Samholtz, 1990; Baker, Gearhart & Herman, 1994). These role changes with students moving toward more self-reliance and peer coaching, and teachers functioning more as facilitators than as lecturers, will support educational reform goals for all students.

The user's ability to adapt to and learn a new computer program may be affected by his/her prior task knowledge. Waern (1985) studied the "relationship between user's prior knowledge of a particular task as it is performed with the aid of a computer" (p.452). He concluded that when old methods can continue to be used, new methods are learnt more slowly, and "that learning a new procedure will be difficult if new methods have to be learnt to attain old goals, or if new conditions have to be attended to in order to use the same or similar methods" (p. 452).

The literature reviewed in this chapter has focused on research, strategies and suggestions concerning the introduction and integration of new technologies and how teacher adaptation can be fostered and encouraged. It appears that technology lends itself to exploration. But before technology can be used effectively, it must be firstly valued if it is important to both teaching and learning.

Johnson (2000) stated that any technology integration required the following: a) that computers were to be available and accessible to both students and teachers; and b) teachers using the computer should be confident and competent with the range of applications that is available to support their teaching and students' learning. Moreover, he argued that:

> The interaction of computer availability and teacher preparation is critical to understanding the effectiveness of computers in the classroom…It is impossible to assess accurately the effectiveness of any teaching tool if the tool is not used often enough to have some pedagogical effect. Further, if teachers are not able to teach with computers, the effect of the availability of computers alone might generate biased achievement that would be limited in its usefulness. (p. 6)

It is evident from Johnson's statement that the use of computers has to be an integral part of classroom life. Marginal use of computers will obviously not affect outcomes.

This literature review identified a number of issues involved in the introduction and integration of new technology in classrooms by teachers. These included:

- change and teachers coping with technological change;
- teacher resistance to change, and fears of new technologies;
- impact of technology on teaching and learning;
- the new role of the teacher;
- integrating technology in classrooms;
- barriers to technology use by teachers;
- teachers, skills levels and professional development; and
- web-based teaching/learning: pedagogies for new technologies.

CHAPTER 3
ICT in EDUCATION

Introduction

Information technology (IT) is the term most commonly used to describe the use of computers and their educational applications. More recently, the broader term Information and Communication Technology (ICT) has been coined to refer to the vast array of technologies and forms of communication computer facilitate. ICT encompasses electronic hardware, software and network connectivity (Moran, Thompson & Arthur, 1999; Toomy, 2001), of which IT forms a smaller part. Examples of electronic hardware, the physical parts of the computer, include computers, scanners, printers and compact disc read-only memory (CD-ROM) burners. Software refers to the programs that operate computers. These include computer programs, such as the widely used Microsoft Word or Excel, and CD-ROMs and videos.

Network connectivity refers to the linking or networking of computers so those users can communicate with one another and share resources, such as printers and documents. This form of connectivity is perhaps best illustrated in the use of the Internet, a vast global network that facilitates the use of electronic mail (email), and of the World Wide Web ("the web"), which is a part of the Internet that consists of millions of pages of text and images published by anyone with access to computers and the appropriate software. Technologies, such as computer and video-conferencing also depend on network connectivity for their success.

The broader term "ICT" encompasses terms, such as "electronic technologies", "online technologies" and "computer technologies". As the name suggests, ICT has three key functions, which pertain to:

- *information*: its access, storage, retrieval and manipulation;
- *communication*: between and among users;
- *knowledge creation and adaptation, skills, learning products and information sources* (Moran et al., 1999, p. 5).

ICT has the potential to facilitate innovative ways of using and manipulating

information. It promotes new ways of communicating, teaching, learning, knowing and understanding. Therefore, this chapter will address issues related to computers in education, the purpose of ICT in education, how teachers use ICT in their classrooms, strengths and limitations of using ICT in the classroom, and ICT standards for teachers.

Computers in Education

Computers have become an integral part of education today. For example, Pasupathy (1992) defines education as the development in knowledge, skill, ability or character by teaching, training, study or experience. Computers and other technologies address these components by increasing knowledge, using skills, and providing experience and training that will help them throughout their life. According to Pasupathy, some benefits of using computers and technology are: they increase the variety of classroom instructions; they are great sources of communication; sources of information and resources; and productive and motivational.

Technology increases the variety in the classroom by allowing the teacher to break away from the more traditional lecturing approach and use IT tools, such as a multimedia software application to interest and engage students. Computers provide a source of communication in enabling teachers to collaborate with other teachers and students by email or electronic bulletin board.

Electronic bulletin boards provide a forum for discussion and dialogues between teachers and students. They also serve as a way to post assignments. (The Internet in particular is a great source of information and resources. Teachers can research any topic on the web to gather information for a lesson). Electronic bulletin boards serve as a great way for students to exchange information ranging from text, graphics, or audio clips. Bulletin boards also can allow the students to communicate with their teacher after school hours. The Internet provides students with access to investigate worldwide problems and issues.

Technology can be used to enhance teaching and learning. One example is having students break into groups and do web searches for information on a particular subject,

then report to the class. Computers and technology also allow remote students to be in contact with their teachers and colleagues.

Computers also help teachers with organisation and according to Layfield and Scanlon (1998), have been proven to improve their general attitude towards teaching. Another benefit to teachers is that the Internet's information is available at all times, 24 hours a day. Students also benefit from computers and technology. These benefits include group collaboration; a place to exchange information; paced learning; access to world resources; and computer skills.

According to McLoughlin and Oliver (1998), group collaboration while using computers encourages students to share ideas in ways that support cognitive and thinking processes, such as the ability to access information and the capacity to work collaboratively. McLoughlin and Oliver (1998) also found that group work with computers increases problem-solving capabilities and higher order thinking.

Computers and the Internet provide a student with an unlimited resource that is available at all times for curricula and classroom activities. When using technology, teachers can teach their students the most common applications, such as word processing, spreadsheets, and basic computer skills that "are important for all educated members of society to acquire" (Robertson, Calder, Fung, Jones, & O'Shea, 1997, p. 233).

Students learn by doing and using the Internet or computers to complete a class assignment is teaching them not only the class assignment but also computer skills that will be important for them in their daily lives.

The Purpose of ICT in Education

Bottino and Chiappini (1995), and Claeys (1997) argue that there are two main purposes that are served by introducing information technology into schooling. Firstly, it can change learning environments and therefore learning outcomes. Information technologies will help to motivate students, supplement the tutoring available to them and change the student-teacher relationship. In an information and communication technology rich learning environment, that relationship will focus on mentoring students rather than on instructing them. Secondly, and more profoundly, information technology has the

potential to transform and reform the culture and organisation of schooling. This broader challenge is seen as essential to achieving outcomes consistent with the capacity and disposition for lifelong learning. Darling-Hammond and McLaughlin (1995) argue:

> It is now clear that most schools and teachers cannot produce the kind of learning demanded by the new reforms, not because they do not want to, but because they do not know how, and the systems they work in do not support their efforts to do so. (p. 194)

Most innovations are a result of the work of lone rangers, the early adopters of new technologies (Taylor, 2000). However, this individualised approach will not achieve systemic change (Alexander & McKenzie, 1998). On the one hand, the approach fosters innovations that are consistent with existing cultural expectations, meaning that in school, teachers control the process of innovation. On the other hand, because approaches of this type work within the existing system, they tend to leave it unchanged. Teachers also tend to exacerbate existing inequities in access to information technologies: the information rich become richer (Schofield & Davidson, 1997).

Reform can be achieved more effectively through the development and strengthening of relationships between all the stakeholders necessarily involved in that achievement (Bottino & Forcheri, 1998). Thus, it is unlikely to be achieved through a "grassroots" approach, or by "top-down" policy announcements enacted in isolation from those who have to implement those policies. The tidy demarcation of policy from practice is unhelpful. What is needed is an approach that incorporates collaborative and concurrent development of both policy and practice (Bottino et al., 1998, p. 165). As Darling-Hammond and McLaughlin imply, teachers need support at the level of practice, as well as conditions that support new practices.

How Teachers Use ICT in the Classroom

Attitudes towards ICT in education depend most of the time on the personal history of each teacher and his/her personal experience of ICT training in school and industry.

Cuttance (2001) claimed that the effective use of Information and Communication Technology in schools has the potential to produce the following teaching and learning outcomes:

- motivation and stimulation of learners and reduction in the risk of failure;
- development of analytical and divergent thinking;
- promotion of greater understanding, assimilation and creation of new knowledge through the presentation of information in fresh and relevant ways;
- adaptation to students with different learning styles or special needs;
- enhanced communication and collaboration with others; and
- improved monitoring, guidance and assessment of individual students' progress (p. 39).

These claims on the pedagogical potential of information and communication technology are supported in the research conducted with technology using teachers. In a study reported by the United States Office of Technology Assessment (US OTA, 1995), it was found that while some teachers use technology in "traditional teacher-centred" ways, such as drill and practice for mastery of basic skills, or to supplement teacher-controlled activities, there is a group of teachers whose teaching has been fundamentally changed by new technologies (OTA, 1995). These "accomplished" technology-using teachers reported that as a consequence of their use of Information and Communication Technology in the classroom they:

- expected more of students;
- felt more comfortable with students working independently;
- presented more complex material;
- tailored instruction more to individual needs; and
- spent less time lecturing and more time overseeing small groups or working one-on-one with students (OTA, 1995, p. 12).

It is worth noting that while computer skills are important, the most critical skill for teachers is to know how, when and why to use ICT to optimise learning experiences. Computers have the potential to facilitate student-centred learning and to

structure learning environments in innovative ways. A key issue to success is how the technologies are used in classrooms. Healy (1998) expressed several concerns regarding the use of technology by some teachers. Her concerns included the discomfort among classroom teachers that technology has been shoved upon them without adequate training and technical support within the individual schools. Teachers have not had the opportunity to learn how new technology can be used as part of the classroom curriculum. Healy suggested that there is no objective evidence that computers produce long-term positive results for student learning. Healy also suggested that the push for technology for young children is not grounded in formative and summative research, and that many technology-related purchases are made by educational leaders in order to indicate to parents that the school system is keeping up with other school systems.

Tapscott (1998) proposed that the influx of technology into the classroom is responsible for a shift from pedagogy to the creation of a learning partnership. With the addition of technology, in many instances, the classroom is now a place to learn and not necessarily just a place for teachers to teach. "This is not to say that learning environments or even curricula should not be designed. They can, however, be designed in partnership with the learners or by the learners themselves" (p. 143).

This shift from teacher-centred to student-centred education does not diminish the importance of the teacher in the classroom, but rather emphasises the value of the teacher in the whole learning experience. The teacher, through the effective use of technology in the classroom, creates the learning experience for the learners. With student-centred learning, the learners themselves design the learning environment and curricula. This approach to learning is considered by many to be consistent with the constructivist view of teaching and learning (Tapscott, 1998).

Strengths and Limitations of Using ICT in the Classroom

What is immediately evident is that the use of ICT in schools is not a simple panacea for solving problems of under-achievement, nor is it a straightforward way of raising standards of student performance. The investment of ICT resources in schools, and the development of accompanying teacher and student skills, should enhance the

overall effectiveness of a school and should also improve levels of academic performance. There, however, can be no guarantees that these things will happen.

The mere presence of a computer in a classroom does not automatically guarantee improved learning and teaching. Researchers (Means & Olson, 1995; Steketee, Herrington & Oliver, 2001) indicate that the use of computer-based instruction when compared with conventional instruction has a moderate to positive effect on student outcomes and on their attitudes to computers and learning. However, these results should be interpreted with caution, as the quality of computer-based instructional materials varies widely, as do the skills with which teachers are able to integrate ICTs into their teaching.

Strengths of using ICT in the classroom

There are many ways in which ICT has contributed to school and classroom improvement. This has occurred particularly through the use of ICT as an aid to independent learning, as a motivator of students of all abilities, and as a set of innovative mechanisms for assessment and monitoring.

The use of computers has been found to enhance students' motivation and self-esteem. The integration of ICT can enhance student learning because it promotes student motivation by:

- engaging learners (Jonassen, Carr & Yueh, 1998);
- encouraging self-regulation and control over learning (Arnone & Grabowski, 1992);
- improving attendance and enhancing students' attitudes toward learning (Charp, 1998);
- linking learners to information sources through hyperlinks and hypertext systems (Kozma, 1994);
- catering for different cognitive styles; for example, helping visual learners see problems and solutions through interactive visual media (Kozma, 1994);
- tracking learner progress (for self and reporting to others) (Kozma, 1994);

- linking learners to learning tools because ICT can cover long distance, support instruction and enhance learning (Hauser & Malouf, 1996);
- increasing physical involvement and engagement with learning, in that computer users engage by using the mouse to control movements and actions, and by selecting courses of action or search strategies for themselves (Hauser & Malouf, 1996);
- facilitating cooperative learning in small groups or with others in virtual communities; for example, with hypermedia products and Logo programs, and research projects using online and off-line databases (Hauser & Malouf, 1996);
- enabling distributed learning and cognition, which may broaden students' experiences and perspectives (Hauser & Malouf, 1996);
- facilitating student-centred learning, which allows students a degree of autonomy and self-management, and which offers some choice and flexibility in content and delivery (Saye, 1997);
- encouraging independent learning among students, particularly those who are not high achievers in traditional book-based learning (Saye, 1997);
- developing learners' metacognitive skills in a computer environment (Clements, 1999); and
- offering a wider range of options through using online and digital delivery methods and establishing links with external experts in certain fields (this is particularly relevant for smaller schools with limited curriculum offerings, or for students in remote areas) (Clements, 1999).

Therefore, ICT can enhance student motivation and engagement and ultimately lead to improve learning outcomes. Interestingly, this contradicts Healy's (1998) suggestion that there is no objective evidence that computers produce long-term positive results for student learning.

Limitations of using ICT in the classroom

Computers and other technology tools are being used in schools to support a broad range of administrative and educational tasks. With this increased ICT integration in schools come both opportunities and problems.

There are some negative implications in using ICT in schools. ICT has the potential to reinforce differences between economically advantaged and disadvantaged schools and students and to entrench existing inequities. It costs a great deal to maintain adequate computer equipment and software in schools. There are often disparities between students in terms of the types of ICT resources they have, and have access to at home. Inequitable access to ICTs may compromise the quality of learning experiences for students, both at school and later in life.

Computers can be used as an effective classroom management tool to encourage students to collaborate on computer-related tasks, with a focus on student-centred activities using computers (Knutson & Coukos, 1999). However, for many teachers, particularly those new to teaching, integrating computers into the curriculum may present several practical classroom management challenges. For instance, there are often insufficient computers for individualised use, which means students may need to be grouped around computers. Problems can arise if groups are not effectively arranged or if students are not used to working collaboratively.

If students are working online, there may be technical difficulties, such as computer crashing or network failure that could mean the planned task couldn't be accomplished. Such classroom management issues can be addressed, but they can also cause frustration and stress for both teachers and learners.

Heavy Internet users may become alienated from their regular social connections as they become increasingly involved in online cyber-relationships (Amichai-Hamburger & Ben-Artzi, 2002). Shyness and anxiety levels may contribute to individuals using electronic forms of communication and entertainment to avoid making face-to-face contact with others (Scealy, Phillips & Stevenson, 2002).

Despite the apparently widespread use of computers, anxieties and phobias about

their use remain among some teachers (Bradley & Russell, 1997) and learners, particularly those classified as non-users (Murero, 2002). One researcher referred to computer-related anxiety as 'technostress' (Genco, 2000). Technostress is related to perceived technical competence and continues to have an impact on ways in which ICT is integrated into teaching and learning experiences.

An Australian study, "Real Time" by Meredyth, Russell, Blackwood, Thomas, and Wise (1999), identified serious problems with the teacher knowledge and proficiency around the use of ICT. They found that although the majority of teachers possess basic skills and familiarity with computers, there was:

> …little evidence that teachers are extending these basic skills in ways that are likely to fundamentally change the ways they teach, or in ways that will enable the use of computers as other than relatively low-level educational tools. (p. 263)

Meredyth et al. also argued that effective use of ICT could achieve "fundamental reform in everyday classroom practice". For example, ICT was associated more with the development of "competent citizens in this information age" than with skill development (p. 266). They argue strongly that technological competence must be seen as:

> … not only technical skills, but also understanding of the social and cultural relevance of learning activities, the ability to transfer knowledge and skills to new tasks and situations, and the capacity to think broadly and critically about the impacts of human activities on each other and the environment. (p.270)

Meredyth et al. recommended ICT skills be developed in the context of teaching other useful knowledge or integrated across the curriculum and be accompanied by the development of students' awareness of "when and why they would use the skills, together with a readiness (even a desire) to use those skills" (p. 264). Such levels of awareness would contribute to the flexibility and the ability to be autonomous and adept to technology change. Schools develop and implement ICT products and models of ICT-based education, but due to the basic lack of rational discourse and rational culture development, there are no clear threads of ongoing improvement on existing models. As

it is, everybody is reinventing the wheel time and time again. The different implementation policies stemming from the different views have an enormous impact on the future of the educational system and society at large. Meredyth et al. argued that it is vital that we look below the surface of the process of ICT introduction to education, expose the fundamentals of the different views that have guided this process until now, and encourage an ongoing rational and critical discussion amongst them.

ICT Standards for Teachers

The increasing prominence of computer and communication technology in classrooms and in educational policy has led to a range of approaches aimed at defining and implementing core competencies or skills for teachers in the use of these technologies in their professional duties.

The ICT standards need to facilitate teachers and school leaders to reflect critically on their practice. Teachers need to continually seek improvement in their practice, to adopt and adapt new technologies and to take a pro-active role in leading and shaping change that may result from the application of new technologies in teaching and learning.

According to the Department of Education, Training and Youth Affairs (DETYA, 2000), all classroom teachers should be prepared to meet the following standards and performance indicators.

Technology Operations and Concepts:

- *teachers demonstrate a sound understanding of technology operations and concepts;*
- *teachers demonstrate introductory knowledge, skills, and understanding of concepts related to technology;*
- *teachers demonstrate continued growth in technology knowledge and skills to stay abreast of current and emerging technologies;*

Planning and Designing Learning Environments and Experiences:

- *teachers plan and design effective learning environments and experiences supported by technology;*

- *teachers apply current research on teaching and learning with technology when planning learning environments and experiences;*
- *teachers identify and locate technology resources and evaluate them for accuracy and suitability;*
- *teachers plan strategies to manage student learning in a technology- enhanced environment;*

Teaching, Learning and the Curriculum:

- *teachers implement curriculum plans that include methods and strategies for applying technology to maximise student learning;*
- *teachers facilitate technology-enhanced experiences that address content standards and student technology standards;*
- *teachers use technology to support learner-centred strategies that address the diverse needs of students;*
- *teachers apply technology to develop students' higher order skills and creativity;*
- *teachers manage student- learning activities in a technology-enhanced environment;*

Assessment and Evaluation:

- *teachers apply technology to facilitate a variety of effective assessment and evaluation strategies;*
- *teachers apply technology in assessing student learning of subject matter using a variety of assessment techniques;*
- *teachers use technology resources to collect and analyse data, interpret results, and communicate findings to improve instructional practice and maximise student learning;*
- *teachers apply multiple methods of evaluation to determine students' appropriate use of technology resources for learning, communication, and productivity;*

Productivity and Professional Practice:

- *teachers use technology to enhance their productivity and professional practice;*
- *teachers use technology resources to engage in ongoing professional development and lifelong learning;*

- *teachers continually evaluate and reflect on professional practice to make informed decisions regarding the use of technology in support of student learning;*
- *teachers apply technology to increase productivity;*
- *teachers use technology to communicate and collaborate with peers, parents, and the larger community in order to nurture student learning;*

Social, Ethical, Legal and Human Issues:

- *teachers understand the social, ethical, legal and human issues surrounding the use of technology in K-12 schools and apply that understanding in practice;*
- *teachers model and teach legal and ethical practice related to technology use;*
- *teachers apply technology resources to enable and empower learners with diverse backgrounds, characteristics and abilities;*
- *teachers identify and use technology resources that affirm diversity;*
- *teachers promote safe and healthy use of technology resources;*
- *teachers facilitate equitable access to technology resources for all students (pp. 108-110).*

It is essential that schools consider the implications of adopting these standards/performance indicators for teachers prior to wading into this large technology pond. It is also hoped that education systems, employer groups and individual schools will consider these standards in forming policy and implementing programs to develop competency. While it is evident that technology has a lot to offer education, it is important that it is not taken at face value, and that adequate thought and preparation is given to the introduction of new technology into the school curriculum.

Conclusion

Across all Australian government and non-government school systems, there is a shared vision of improving student outcomes through the effective use of information and communication technologies (ICT) in teaching and learning. Also, supporting the progressive transformation of schools and their culture, and ensuring that substantial and continuing investments in infrastructure, professional development and curriculum products are well founded and fruitful.

Without a good grounding in ICT, teachers and students will be disadvantaged in their ability to take part fully in the rest of the school curriculum and the wider world of work. It is clear that our society is rapidly transforming into one which is based on information, requiring its citizens to be familiar with, and at ease, with information-based resources and their manipulation. To take full advantage of such resources, all teachers and their students need opportunities to develop competency and confidence in the use of computers and their peripherals in a range of contexts.

This chapter highlighted the importance of realising the intrinsic relationship between the strengths and potential limitations of ICT usage in classrooms. ICT can help the teacher to present a lot of information within a short period of time. This is a strength. Nevertheless, it can also be easily turned into a major weakness if the teacher uses it to dump information onto students without considering the time and process for them to digest it. If schools want to survive, they have no option but to adapt themselves to the era in which they function and which they have to serve.

In order to make well-founded ICT implementation decisions in the field, we must initiate a rational discourse between the different theories, and form a model for ICT introduction that would reflect the state-of-the-art in the field.

Meredyth et al. (1999), identified the following recommendations for ICT integration:

- having ICT supporting good teaching and learning in an environment where teachers are expected to implement it through ICT implementation plans, teaching charters and the like; and

- requiring the teachers to gradually acquire competence with ICT, sometimes with the assistance of students and regularly with the help of colleagues. It is also essential for the technology to be absolutely reliable and effective.

In summary, Meredyth's recommendations suggest that technology integration is very important for teachers and their ongoing professional development and also for their students. It is from these issues and available data relative to these issues that the investigation begins to form.

CHAPTER 4
METHODOLOGY AND PROCEDURES

In this methodology chapter is information regarding the characteristics of a qualitative research study, the research setting and participants for this study, the rationale for the use of the case study approach and the unit of analysis and the data collection methods. The issue of trustworthiness is also discussed.

This research used a case study methodology to investigate the process of adoption of new technology for a group of seven teachers in a Victorian Catholic secondary school. The research focused specifically on the factors that affect the teachers' support, or otherwise, of the introduction and integration of the new computer program known as the "Blackboard" Learning System (Release 6). The study explored the needs, beliefs and perceptions of the users of the program, in relation to their own participation in the adoption of "Blackboard" program, and their perceptions of a planned change process.

Characteristics of Qualitative Research Study

The characteristics of qualitative research define the nature of the research process I used to learn more about how teachers perceive and experience the process of implementing new technology into their classroom, and the teaching strategies they use in this process. A qualitative research design assumes a worldview in which "there are multiple realities, that the world is not an objective thing out there but a function of personal interaction and perception" (Merriam, 1988, p. 17).

These realities are dynamic and change over time. This view is important to research in that it attempts to bring understanding to a process or event as perceived by the participants in that event. In the education field, classrooms are of a dynamic nature, unique and constantly in flux. A qualitative design is an effective research design to use in this educational setting.

According to Bogdan and Biklen (1992), qualitative research has five major characteristics. The design provides the researcher with an avenue to step inside of the

context of what is being researched. Qualitative research has the natural setting as the direct source of data and the researcher is the key instrument (Bogdan & Biklen, 1992). The nature of the research is descriptive and I am concerned with process rather than simply with outcomes or products. The description of a process or event is valuable when quantitative research designs do not provide the insights necessary to understand the participants' role in the process, and their perceptions of the experience. Qualitative researchers analyse their data inductively. The research is like a funnel in which all the possible information is collected and then organised into themes and patterns revealing the meanings from the participants' perceptions.

I am involved in and not removed from the research process in a qualitative design. I brought my biases as a technology studies teacher to the research study. I developed my theories through trial and error and evaluation of student participation and achievement in using the new technology. As a full-time technology (design and production) teacher, I do not understand why some teachers are often reluctant to learn and implement teaching strategies that integrate new technology into their classrooms. One of the key aims of this study is to support administrators and teachers to understand how teachers perceive and experience the process of adopting new technology into their school curriculum.

The data collection for this study was conducted in a field setting. Interviews, observations, email correspondence, and documents were all used in the data collection process (Creswell, 1994). The information from the study is presented as a description of the process the seven teachers experienced in integrating "Blackboard" computer program into their classrooms.

The study was inductive in that it attempted to identify patterns or trends in the process of integrating new technology in the classroom. The research questions for this study are outlined in the form of a main question followed by sub-questions (Miles & Huberman, 1994).

The following four constructs of qualitative research, proposed by Lincoln and Guba (1985), were used to judge the soundness, usefulness, and bias of the data collected during the study: a) credibility; b) transferability; c) dependability; and d) confirmability (These are further discussed later in this chapter).

Rationale for the Case Study Methodology

The case study is an examination of a specific phenomenon. In this case, it is a specific process those teachers are experiencing. The case study seeks holistic description and explanation (Merriam, 1988). The case study design is particularly well suited to situations where it is impossible to separate the phenomenon's variables from their context (Yin, 1989). It is the goal of this case study design to accurately describe and give voice to the informants being studied. The emphasis is on filtering meaning from a variety of data collection methods.

A case study methodology was the preferred method for this research because the study intended to investigate individual responses, and a case study approach provided the opportunity to look in detail at the impact of a planned process of change on those directly affected.

A descriptive case study is the best method of providing the rich and complex details of this issue. Yin (1994a) defines a case study as "an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are clearly evident" (p. 13). I, therefore, chose case study research in order to gather information of a greater depth than would be possible using another methodology, such as survey data.

This study was descriptive as it focused on the perceptions of the direct users of a new computer program about which no previous data was available. Additionally, a study of the literature revealed that little research had followed the changes in the perceptions and feelings of one direct user over time, hence, this study was investigating a potentially new area in ICT integration. Grinnell (1985) comments that the case study "is well suited to observation and description of complex inter-relationships among constituent parts of a social system. The objective…is to understand the system as a whole or the pattern that exists among all the constituent elements" (p. 302).

According to Bell (1987), the case study methodology has also been described as an umbrella term for a group of research methods that have in common the decision to focus an inquiry around a specific instance or event. The philosophy behind the case

study is that sometimes just by looking carefully at a practical, real-life instance, a full picture can be obtained of the actual interaction of variables or events.

The case study allows the investigator to concentrate on specific instances in an attempt to identify interactive processes that may be crucial but that are transparent to a large-scale survey. Thus, the aim of the case study is to provide a three-dimensional picture of the situation. It should illustrate relationships, corporate-political issues and patterns of influence within a particular context.

Generalisation from Case Studies

A common criticism of case studies is that they provide a description of a particular instance but that they do not provide the means by which generalisation can be made. Inherent in this criticism is the assumption that a generalisation is a general rule from which predictions about particular instances can be deduced. Hamilton (1982) argues that "the customary usage of the term generalisation is derived from the physical sciences and rests on three assumptions: first, that nature is uniform in time and space; second, that closed population can be unambiguously defined; and third, that the defining attributes of a population are shared by all its members" (p. 106). Hamilton suggests that the kinds of research problems posed in education do not warrant these assumptions. Thus, this point of view appears to Hamilton to undervalue the process of case study research.

Stake (1995) argues that general rules of another kind are of value in circumstances where the object is to use those rules to guide action. From a case study, he says, it is possible to make "naturalistic generalizations" in which "the similarities of objects and issues in and out of context" and "natural convariations of happenings" can be recognised. He writes:

> They derive from the tacit knowledge of how things are, why they are, how people feel about them, and how these things are likely to be later or in other places with which this person is familiar. They seldom take the form of predictions but lead regularly to expectation. They guide action; in fact they are inseparable from action. (p. 74)

In other words, it is Stake's view that the kinds of generalisations emanating from case studies belong in the world of everyday rather than academic knowledge: in the world of action rather than general theory building. Hamilton (1982) sees the process of interpretation of case study data as being one of theory building:

> To group sense data into categories is to identify logical relationships (e.g., school/not school) and generate concepts; to group concepts into schemata is to codify information and generate theory; and to generate theory is to 'make' sense through the rendering of an account; and to render an account is to communicate by symbolic means (e.g., words) about events that are (or may be) remote in time and space. (p. 108)

In order to analyse our data, we must be able to identify bits of data. One way to do that is by grouping the data (Hamilton, 1982, also calls it *creating categories*). Here we put the bits of data, which seem similar or related into separate piles, and then compare the bits within each pile. We also can divide up the items in a pile into separate sub-piles if the data merits further differentiation.

It is a process in which the generalisation always remains provisional and subject to what Kemmis (1983) describes as a dialectical process of interpretation and seeking contradiction. He points out that naturalistic generalisations develop within a person as a result of experience, may become verbalised, and may pass from tacit to propositional knowledge. Naturalistic generalisations have not yet passed the empirical and logical tests that characterise formal scientific generalisations. Kemmis (1983) asserts that the true value of non-experimental research lies in its connection to the real world, its ability to describe actions in their social and historic contexts, and its ability to rationally critique these descriptions (p. 150).

The Research Setting and Participants

The School

The research setting for this study is a Catholic secondary school in Melbourne's northern suburbs. The population of this school during the investigation included 1,300 students, one principal and two assistant principals. The average class size was 28

students. Two computer resource labs held 30 IBM computers each, purchased in 2004, in the first round of the "Blackboard" program introduction.

The school has three campuses junior, middle, and senior with 1,300 students enrolled in years 7-12. They are involved in nine study areas including Arts, Business Studies, English, Human Development, Mathematics, Science, Technology Studies including Information and Communication Technologies, Studies of Society and Environments (SOSE) and Languages Other Than English (LOTE). There is also a range of Vocational Education and Training (VET) courses offered to students. There is a staff of 95 full-time classroom teachers and 40 support staff.

The school is paving the way for the adaptation of new Information and Communication Technologies (ICT) within Australian secondary classrooms. During the past three years, the technology has changed from a Macintosh to IBM format and from stand-alone to networked computers. Late in 2003 a proposal written by the Information and Communication Technology Coordinator was presented to the School Council and then published for distribution to parents and the school community. This proposal outlined many of the benefits of the "Blackboard" program. It described how the school could provide students with the best of all possible computer programs and a web-based course delivery environment, using both IBM and Macintosh-based platforms.

This proposal stated that:

> *Offering a multi-platform approach to computing also allows students and teachers with home computers the opportunity of working at home and at school on projects regardless of whether their home computer is an IBM or Macintosh.*
>
> *(ICT Coordinator, 2003, p.2)*

After outlining the benefits of "Blackboard" in the proposal, the coordinator explained why the school should introduce the "Blackboard" program into the curriculum.

> *It is my belief that the new technology "Blackboard" Learning System (Release 6) assists students to focus on high-order learning tasks and enables teachers to guide students in tasks that would be beyond the normal classroom. The benefit*

of the new technology is not to educate students in technology but to use technology to educate students. (p. 4)

This proposal was presented and accepted by School Council during the last term of 2003, when the school felt that the introduction of the "Blackboard" program would be in the best interests of its students and teachers alike.

As a result, the school's leadership team made the strategic decision to adopt the "Blackboard" online learning platform. "Blackboard" was designed to serve the needs of years 7-12 teachers who were eager to extend their face-to-face classrooms in an online environment. Teachers in the school were subsequently introduced to a number of the following features of "Blackboard" that would extend the classroom community beyond school walls:

- posting course materials and handouts on the web;
- providing online forums for class discussions;
- collecting and annotating Internet-based curricular resources;
- using online assessments to help students prepare for standardised tests;
- communicating more easily and effectively with parents via chat tools; and
- differentiating instruction for exceptional populations (gifted and talented, special education, advanced placement) using group communications.

Since 2001, the school has been pursuing an agenda for whole school change. The key goal of the whole school reform effort has been to provide a safe, caring environment which promotes a positive attitude to learning and excellence, and to improve the quality of teaching and learning at the school. The incorporation of the widespread, effective use of ICT, a reconsideration of approaches to teaching and learning and an organisational restructure were all, in combination, intended to contribute to that key goal. ICT was the catalyst for the reform effort. Its introduction was to play a major role in the transformation of teaching and learning and the reorganisation of leadership and administration arrangements. ICT has played an important role in the whole school change process. The role of ICT in education has been fully explored in the previous chapter.

The original school ICT plan contained the following goals:

1. To provide a quality learning environment

2. To promote excellence in all aspects of student learning
3. To deliver quality teaching and professional development in all learning area, and
4. To streamline administrative communication, record keeping, reporting and student attendance by using computer technology (School's Policy Handbook, 2004).

In 2003, the school's first "Blackboard" plan was developed and endorsed as a priority by the leadership team. The school's leadership team considered that whole school change is a process and not an event. They spoke about the innovation being ongoing, a continuing practice and having no finish line.

Over the past four years, the school has:

- revised its overall organisational structure;
- reorganised its decision-making processes and procedures;
- expanded and revised its curriculum arrangements;
- developed extensive in-house professional development programs;
- established a formal annual review and appraisal process for all staff;
- redesigned much of the classroom space so as to accommodate better student centred-teacher guided learning; and
- firmly located itself as a leading school in the integration of ICT into a wholly changed school setting.

The school provided its teachers with continued occasions to not only collaborate to teach students, but to work in an environment built on mutual dependence, sharing and helping. The teacher collaboration at the school is not merely surface congenial acts towards one another, but true-shared work that had an impact on the culture and on each other.

From my observations having worked at the school for seven years, the school is enthused through its own growth efforts. The leadership is aware that paying attention to both individuals and the school culture as a whole is important in nurturing a healthy environment. The personal and professional care taken by all members of the school reflects the strong welfare culture prevalent in the school. They purposely embedded their values and beliefs into their actions and daily events. They tended to each other. By being

aware of both the explicit and implicit cultural elements, the members of the school could seek to continue their development in more specific and concentrated efforts.

There is an air of collegiality about the school. Teachers plan and work in groups. There are numerous working groups, some developing new practices and others monitoring current practices. There is a sense of harmony and purpose within the energetic school community.

In looking at school renewal, the teachers and administrators can put into place action that is directly related to their cultural elements. Fullan (1991) correlated the culture of a school with the leadership of the building administrator(s). Hargreaves and Fullan (1992) use the concept of "culture" to refer to the guiding beliefs and expectations evident in the way a school operates, particularly in reference to how people relate (or fail to relate) to each other.

The principal is directly responsible for a style of leadership that invited others in the school to become leaders. He is highly visible yet not authoritarian. His role is crucial in sustaining the culture's growth and proactivity. The principal believed in delegating his responsibilities to others, making decisions via consensus and tending to the members' personal as well as professional needs. Cunningham and Gresso (1993) talk about the process of delegation that an administrator can establish. It is a style of leadership that encourages employees to take risks, be unique, and make a difference, thus enabling schools to be true centres of learning. They add that an administrator must help employees to see greatness in themselves, others, and in their school. "All should be asked to celebrate their fullest potential. If an administrator can learn the methods to delegate to those closest to the problem or issue, they will feel empowered to develop the appropriate response or program to meet the needs of their constituency" (p. 191).

The Participants

The participants included seven teachers (four females and three males), and me, the researcher. The teachers volunteered because they have multiple curriculum and teaching responsibilities with technology. The seven teachers from different Key Learning Areas were interviewed during the course of the study. They represented a

broad cross-section of the teaching staff (in terms of gender, total teaching experience, and curriculum responsibilities) at the school.

The teaching responsibilities for each of the positions within the school are outlined in Table (2) below. The criterion used to categorise teachers' computer usage and the "Blackboard" program was based on interview data and the number of bookings they made for the computer lab for teaching purposes. Computer laboratory records were also analysed to derive a pattern of teacher computer use and "Blackboard" integration. The pattern of overall computer use in the school was derived from the computer equipment booking sheets that all teachers, regardless of whether they used the computer for teaching with "Blackboard" or some other purpose, completed. Of the seven teachers interviewed and according to computer labs' bookings and observation periods, one teacher was classified as a low-user in that she had booked a computer lab less than five times a week for teaching with or without "Blackboard" (but she had experience of them in other contexts). Two were medium users as they booked a computer lab six to twenty times a week and four high or frequent users of the computers and "Blackboard" in teaching as they booked a computer lab for more than twenty one times a week. The school has not given all the teachers' laptop computers but just those whose role requires them and who are in a leading position, such as key learning area leaders.

Table 2: Background information on the teachers (names are pseudonyms)

Teacher	Subject taught	Teaching experience	Computer usage	Blackboard integration	Laptop provision
Rhonda	English	13 years	Low	Sometimes	No
Phillip	LOTE	13 years	Medium	Occasionally	No
Edward	KLAL/PE	15 years	High	Frequently	Yes
Lisa	KLAL/SOSE	14 years	High	Frequently	Yes
Anne	English	12 years	Medium	Sometimes	No
John	Curriculum Coordinator/RE	16 years	High	Frequently	Yes
Trish	ICT Coordinator	18 years	High	Frequently	Yes

Data Sources and Collection Procedures

Data for this study were collected by means of one-on-one interviews with each teacher. The data collection period was during the 2004 school academic year. Audiotaped and semi-structured interviews were conducted with the seven teachers on three occasions. The initial interview was during Term 2 of 2004, and teachers were asked to describe their experiences in acquiring new technology skills, their frustration with technology, knowledge about "Blackboard", anticipated impacts of "Blackboard" Learning System (Release 6), and changes that "Blackboard" was making in their teaching (see Appendix E). A second interview during Term 3 of 2004, and final interview during Term 4, explored issues, such as professional development, access, time, how they saw their "Blackboard" use evolving, their thoughts, experiences, and feelings in integrating "Blackboard" in their lessons (see Appendix B). The participants of the study were involved in interviews that occurred during or after school. Before an interview began, I informed the interviewee about the recording process and guaranteed confidentiality.

Each interview was approximately half an hour in length and focused on a set of semi-structured open-ended interview questions (see Appendix B). At the conclusion of each interview, member checking was used. In their book, *Naturalistic Inquiry,* Lincoln and Guba (1985) state, "using member checking is a crucial technique for establishing credibility" (p. 314). This technique allowed the respondent an opportunity to assess intentions, correct errors, and volunteer additional information.

Participants were given the option to remain anonymous and each chose to retain anonymity. As a result, names, place names and other potential identifying factors have been changed to respect the participants' wishes. Patton (1990) explains that the purpose of interviewing is to access things that the researcher cannot observe, issues, such as feelings, thoughts and intentions and behaviours that took place at some previous point in time. These otherwise unobtainable issues can be used to illuminate culture and the significance of behaviours. I, therefore, chose both participant observation and interview to investigate what happens when "Blackboard" is integrated into classroom settings. I kept a journal used to record observations.

The seven teachers were encouraged to keep an email dialogue with me throughout the school year in order to follow up on interviews (see Appendix F). This correspondence served as a journal of the teachers' feelings, questions and perceptions as they worked through the school year using the "Blackboard" program. In the course of each interview, new questions emerged, requesting either elaboration or further exploration of events, feelings, or perceptions. Non-formal interviews were requested upon review of the interview transcripts as needed for further elaboration or information confirmation. Telephone calls were made occasionally to follow up on email that wasn't answered, to schedule observations and conduct interviews, and to keep in contact with the seven teachers during the school year.

Each participant was invited to share personal experiences of using the "Blackboard" program in everyday teaching and encouraged to relate instances where difficulties had been experienced, as well as where the new technology was felt to be of great value. As these areas were explored, recurring issues were explored further and there was some sharing of experiences in using the "Blackboard" program. Participants were also contacted to gain permission to observe them teaching a lesson using "Blackboard" in their classroom and during their planning periods. Observations of the planning periods allowed the teachers to talk through the implementation process of how they would actually teach with the new technology. Field notes were taken and one class period was devoted to observation, focusing on the teachers' teaching methods and activities during that period. Observations of the participants teaching lessons using the "Blackboard" program were valuable for several reasons. The data illustrated the teaching strategies and classroom management methods used to integrate the new technology into their lessons. The data also illustrated the settings in which the teachers were working. Field notes were recorded in a research journal as soon as possible after classes, interviews and meetings with teachers. Lee (1997) describes the keeping of a research diary as having three potential uses: as a repository for descriptive data, as a site for data analysis, and as a test bed for theories. The observations recorded in the research journal were necessarily selective, and were filtered by the focus and perceptive powers of the researcher. They were filtered further because they were recorded after the event, relying on the researcher's memory. Observational evidence was often useful in

providing additional information about teachers' experiences in integrating "Blackboard" in their classrooms. Ball (1984) points out that "the distinction between data collection and data analysis in participant observation research is necessarily artificial" (p. 96). Perception and interpretation form part of an active dialogue that constitutes the observation.

Finally, collecting the lesson plans and students' projects that the participating teachers developed was helpful in seeing how teachers and students envisioned classroom lessons working out. These lessons and projects provided clues on the design process and how the teacher planned to use the "Blackboard" program in his/her teaching. The lesson plans identified the teaching strategies and methods the teacher intended to use when teaching a lesson with the "Blackboard" Learning System (Release 6) component.

Sources of Evidence

Data collection for this study began on May 2004 after ethics approval and continued through to the administration of students' exams in December. Two categories of data sources were gathered in this research: primary and secondary. Primary data sources included interviews, observations, teachers' journals, and field notes. Secondary data sources included a variety of documents (i.e. students' projects, school policies, and newsletters).

Interviews

Interviewing was the primary means of data collection in this study. Interviews are essential source of case study evidence because most case studies are about human affairs. These human affairs should be reported and interpreted through the eyes of specific interviewees (Yin, 1994, p. 20). Interviewing is a productive way of gaining information about events outside an observer's range (in time and space) and about the interviewee's point of view. The key problem is determining whether the interviewer is being told the truth.

Denscombe (1983) points out that interviews used without the support of other techniques of data collection "can lend themselves to misrepresentation because the respondents can adopt particular stances toward the interviewer, or the questions, which effectively prevent the interviewer from discovering the truth" (p. 113).

The interviewee is an active agent in the encounter with an interest in controlling the amount and type of information revealed. Descombe observes that the information given is negotiated between the researcher and respondent on the basis of rapport and trust. The other two major issues are whether or not the respondent is able to tell the truth, that is whether they have in the first place the knowledge, and in the second place the recall of events, motives, and points of view. The answer is to incorporate checks into the overall strategy.

Descombe suggests the following checks on interview data.

1. When reporting interview material, look for elements shared by more than one account and construct a version in which the significance of the elements can be assessed.
2. The significance of accounts and elements of them can be assessed for:

(i) their plausibility

(ii) the informant's reliability

Crosschecking between accounts can give a good indication as to misleading or missing information. One procedure suggested is that of triangulation in which role partners compare and discuss their accounts. Using triangulation accounts can be checked for:

(i) falsification: where relevant and necessary actions to support an account are missing;

(ii) inconsistency: where role partners express different views about what the other claims to have been doing, and;

(iii) discrepancy: where role partners identify discrepancies between the others' professed values and actual behaviour (Descombe, 1983, p. 117).

3. Spending time on site creates a familiarity with the school and its nuances that not only gives a background to judgement but a familiar person with whom respondents are more likely to talk.

4. Where possible precede interviews with observation.

Descombe's four points relate primarily to the analysis of interviews for sources of evidence. The difference between evidence and data was discussed in some detail above, and as an aid to the reader Stenhouse's distinction is repeated here:

> When we interview for data, we attempt to gather information whose reliability and status is defined by the process of data gathering. When we interview for evidence our aim is to gather information whose reliability and status is left problematic and has to be established by critical comparison and scrutiny. (Stenhouse, 1983a, p. 50)

Interview material treated as evidence included observations of other teachers, decisions or events and throw-away lines which, when combined with other evidence, were strongly suggestive of particular events and relationships. Whatever possible evidence I gained from the interviews was crosschecked with other informants, documentary sources or observations. Where interview and observation evidence contradicted each other, observation evidence was considered to be more accurate.

At the beginning of each interview the recording device was tested and interviewer and interviewee were agreeably comfortable. A broad opening statement concerning the nature of the study preceded each interview and at this point the issue of confidentiality was raised. Confidentiality was assured with no real names being used. Participants were identified by pseudonyms. Transcripts and tapes were filed under the pseudonyms during the study and no identifiable data was used in the project report.

After the interview recordings were transcribed, I sent interview transcriptions to the participants through email or in person. When necessary the participants made the appropriate changes to the interview transcripts and initialled the documents to verify their accuracy.

Observations

The purpose of the observations was to follow up on the interviews in the classrooms. Participant observation afforded me two roles: one was to engage in the activities of the setting, and the second was to observe, report and describe the aspects of

the setting. My observations concentrated on recording the words and actions of the teachers as they used the "Blackboard" program in order to analyse them in greater detail later (Bogdan & Biklen, 1998).

On entry to the periods of observation, I presented myself as a researcher seeking to observe events and where appropriate, to interact with participants during the course of their teaching with the "Blackboard" program. Initially, my presence in the classrooms was cause for formal introductions and polite but welcoming conversation, but by the end of the first semester little notice was taken. It appeared that sufficient teachers came and went from the classrooms, (including emergency teachers and student-teacher supervisors) that the intermittent appearance of familiar faces was an acceptable part of school life.

For classroom and computer lab observations, permission was sought from participants and freely offered. Usually teachers would introduce me to the class at the first observation session as a teacher undertaking a research study in the school, but on other occasions the role became blurred when teachers invited me to participate in classes as an observer. These situations offered an opportunity to interact with students as a researcher. Students appeared to pay little or no attention to my presence except during some lunchtime computer lab sessions. On these occasions some boys appeared more interested to work on the "Blackboard" program. In addition, observations of the teachers' daily interactions and conversations with other members of their faculty were recorded. The objective was to build a descriptive picture of teachers when adopting and integrating "Blackboard" into their lessons.

Johnson (1975) argues that such observational records are a social product and cannot be considered to reflect an objective reality. When he compared field notes with tape recordings of particular encounters he observed that they differed due to:

(i) the natural limitations of an observer's memory;

(ii) the selectivity of the observer's perception and attention; and

(iii) the unexpressed nature of many understandings (p. 58).

Johnson's principle conclusion is that observation is better focused on the process or <u>how</u> things are done rather than the content or <u>what</u> is done. However, it also follows that observation needs to be combined with other methods of data collection, such as

interview, document collection, the objective being to cross-check accounts. Because these observation records were to be treated as evidence, notes were kept on both the how and what of the occasions, what happened in computer labs being the material upon which the interpretation of process was based.

Inclusion of both the events and their interpretation in the account permits the reader a measure of judgement as to the validity of that interpretation not withstanding the selective nature of the observation and recording process. Because of my role as an *active participant* (Wolcott, 1988, p. 194), fieldnotes were not taken during classtime. Instead, they were recorded in a research journal as soon as possible after classes and meetings with teachers.

Lee (1997) describes the keeping of a research diary as having three potential uses as a repository for descriptive data, as a site for data analysis and as a test-bed for theories. My journal formed part of my data: it was a site for recording events. They were filtered by the focus and perceptive powers of one person. The data collected from observations was filtered further because it was recorded after the event, relying on my memory. Ball (1984) points out that "the distinction between data collection and data analysis in participant observation research is necessarily artificial" (p. 96). Perception and interpretation form part of an active dialogue that constitutes the observation. This is a weakness of ethnographic methods, but it is also a strength. Wolcott (1988) claims, "the ethnographer is the research instrument":

> That instrument… the ethnographer in person…has been faulted time and time again for being biased, inattentive, ethnocentric, partial, forgetful, overly subject to infection and disease, incapable of attending to everything at once, easily distracted, simultaneously too involved and too detached…the list goes on and on. Be that as it may, what better instrument could we ever devise for observing and understanding human behaviour? (p. 190)

The purpose of collecting field notes was to maintain a written account of the observations in as much detail as possible. Bogdan and Biklen (1998) defined field notes as "descriptions of people, objects, places, events, activities, and conversations. In addition, as part of such notes, the researcher record(s) ideas, strategies, reflections and hunches, as well as note-patterns that emerge" (p. 107).

The amount of notes taken during the observation varied depending upon the extent of my participation in any given setting and time. Notes were jotted down whenever possible during the session to remind me of important issues during the session. Immediately following each session, I would elaborate on my notes usually in a chronological order of observed events.

The field notes contained descriptive and reflective materials (Bogdan & Biklen, 1998). The descriptive part included the greatest amount of information. The field notes were very specific to the daily interactions of the teachers as they moved throughout their day when integrating "Blackboard" in their subject areas.

In writing the research report, these observational records were used in conjunction with other sources of evidence to construct an account of the study. On occasions they alerted me to issues that were explored through interviews and documentary sources. They also provided evidence on matters brought to light in the interviews and documents.

Documents

Most of the material used in constructing the account of the development of school computing policy and of the introduction of "Blackboard" Learning System (Release 6) at the case study school was derived from documentary sources including policy statements, newsletters, and minutes of meetings. Gottschalk (1983a) outlines an interrogative procedure that I used for documentary analysis:

1. What is the question(s) that the document is to assist answering?
2. Who is the author? Was the author an eyewitness? If not, what were the sources of information? How much time elapsed between the events and the recording? What was the purpose of the record? Who was the audience and why? Each of these questions is directed at answering the major question: was the author able to tell the truth of the events and willing to do so?
3. How close was the author to events?
4. Does the document contain hearsay or secondary evidence? If so, on whose

evidence does the secondary witness base the statement? Is the primary source reported as a whole? If not what details are accurately reported? (p. 44).

The collected documentation of material, such as school policies, newsletters, course syllabi and samples of students' works were reviewed in order to glean any references made to the technology and "Blackboard" integration and helped to create assertions that guided the study.

This process continued through each day's notes and interview transcriptions. Doing this allowed me (the researcher) to see what was happening in the setting and gave me a chance to ask important questions right away.

Data Management

It is important to have a plan for data management at the outset of a research study. According to Patton (1990):

> The data generated by qualitative methods are voluminous. I have found no way of preparing students for the sheer massive volumes of information with which they will find themselves confronted when data collection has ended. Sitting down to make sense out of pages of interviews and whole files or field notes can be over whelming. (p. 297)

With this statement in mind, I utilised several strategies to manage the data. Interviews were tape-recorded and transcribed and notes were taken during observations in the classrooms and then recorded as soon as possible.

All transcriptions were stored in Word files on the computer and on backup disks. Memoing was used throughout the process by placing any notes, thoughts or ideas into margins in order to support familiarisation with data and identify the main themes. Key information was placed on index cards so I could rearrange the data within constructs and their typologies. Each card was cross-referenced with each transcript in order to identify what each teacher said about a certain topic.

Files for data were also organised and maintained in a standard file cabinet to identify issues, concerns and perceptions. Each file was colour-coded by theme for easy access. I grouped together statements that were similar or related. For example, Anne stated:

Availability of computers is for me the utmost. I need to have a laptop at hand. It needs to be easily accessible...

(Interview 2, Anne, June 2004)

Phillip stated:

> *Having a laptop computer is a big factor in determining whether I will use the "Blackboard" in my classrooms or not in the future...*
>
> *(Interview 2, Phillip, June 2004)*

These two quotes were written on one index card, along with several similar ones located throughout the transcripts. I recorded a heading on the top of the card, "Access to computers". This theme describes teachers' experience with having access to computers at school and home. I discovered that the majority of teachers had made a related statement and based on the contents, in which the statement was made, I assessed that teachers felt strongly about it. I therefore defined this statement as a major construct about "Access".

I found the data management component of this study to be one of the most challenging. The amount of data from observations, interviews, journal entries, and document analysis was a major challenge. Data management also proved to be one of the most time-consuming aspects of the entire process. Bogdan and Biklen (1998) offered suggestions for novice researchers to consider when dealing with the data. Their suggestions included having an appreciation that these processes are time-consuming and setting aside adequate time to deal with the data is essential.

Each construct had its own folder for information storage and the participant folders had additional sub-folders for observations, interviews and journals. Additional folders and sub-folders were created for documents as they arose from the data.

Analytic Procedures

Data analysis involved systematic, descriptive coding to identify constructs and typologies that emerged from the data collected. "Data analysis is the process of systematically searching and arranging the interview transcripts, field notes, and other materials accumulated to increase understanding of them to enable the presentation of what was discovered" (Bogdan & Biklen, 1998, p. 157).

According to Marshall and Rossman (1995), analytic procedures fall into five modes: organising the data; generating constructs, themes and patterns; testing the emergent hypothesis against the data; searching for alternative explanations of the data; and writing the report. Each phase of data analysis entails data reduction as the reams of collected data are brought into manageable chunks. Through analysis and interpretation, I brought meaning and insight to the words and acts of the participants in the study.

The process of data analysis in the qualitative design involves taking the data apart and then reconstructing it to identify what is to be learned and to identify the patterns that might reside within the data. In case study research, Yin (1989) regards the primary modes of data analysis as:

> (a) the search for "patterns" by comparing results predicted from theory or the literature;
> (b) "explanation building", in which the researcher looks for casual links and/or explores plausible or rival explanations and attempts to build an explanation about the case; and
> (c) time-series analysis in which the researcher traces changes in a pattern over time. (Creswell, 1994, pp. 156-157)

I followed the advice of Merriam (1998) and analysed data during the collection procedure. After each observation and transcription to field notes, the notes were read and re-read noting areas of interest, concern, questions or general assertions. The second set of transcribed notes was read and re-read following the previous set of guidelines.

The analysis of data was completed over a number of iterations and contained different elements from the collected sources. The data collected was analysed for patterns or categories of information on teacher's perceptions and experiences in adopting "Blackboard" in their classrooms. The analysis of the data is a concurrent process with the collection (Tesch, 1990). Data collection and analysis inform or drive each other and the results of the analysis suggest some type of higher-level synthesis of the information (Tesch, 1990). Beginning codes were generated from the research questions and evaluated for fit as the data were analysed.

Interviews were audio recorded and transcribed by me and returned to the participants within one week to allow the participant to make any changes or adjustments that he or she wished to make to the original statements. They were then converted into

text documents for use with a computer-coding program, which was used to identify and cross themes, and provide analysis to assist in the interpretation and reporting of the data obtained.

I used a system of content analysis that involved identifying, coding and categorising the main themes in the data. I used a word-processing package to cut and paste comments and to compare and look for similarities/differences and conclusions.

I identified seven broad constructs to support the analysis and description of the data. Creating constructs triggered the formation of a conceptual scheme that suited the data. This scheme helped me to ask questions, to compare across data, to change and to make a hierarchical order of them. Using a content analysis approach in terms of categorising the data, I employed Patton's (1990) sensitising concepts to refer to my seven constructs.

In contrast to indigenous concepts that emerge from the data, these sensitising concepts are ones that I brought to the data, thus providing me with "a general sense of reference" or "directions along which to look" (Blumer, cited in Patton, 1990, p. 151). I simply read the text and noted words or synonyms that teachers used a lot. For example, while conducting interviews with Phillip, a LOTE teacher, I found that Phillip repeatedly referred to ideas associated with change, resistance, adoption and frustration. These repetitions indicated to me that these ideas were important recurring themes in Phillip's professional life.

For some of the constructs, indigenous typologies emerged from the data that captured the essence of the construct. For example, within the skill development construct, terms such as "collegial support", "professional development" and "learn by doing" were frequently used by participants.

I combed through this recorded material and notes looking for verbatim statements made by teachers about this topic. On analysing the statements, I identified a set of typologies within each construct that arose from the data. My experience of establishing these typologies is best summarised by Ely, Anzul, Friedman, Garner and McCormack Steinmetz (1991) when they wrote "making categories means reading, thinking, trying out tentative categories, changing them when others do a better job, checking them until the very last piece of meaningful information is categorised and,

even at that point, being open to revising the categories" (p. 145). Then I grouped together statements that were similar or related.

Coding

Qualitative research coding is a systematic way of developing and refining interpretations of the data. The coding process involves bringing together and analysing all the data bearing on the themes, ideas, concepts and interpretations. What were initially vague ideas and hunches are refined, expanded, discarded or fully developed during this stage of analysis (Taylor & Bogdan, 1984). Based on the suggestions of Taylor and Bogdan, coding constructs and typologies were established and used during the analysis process. To organise the data into meaningful chunks, I used descriptive codes. These allowed me to translate text by attributing a class or theme to segments based on their content.

The data coding was organised to define patterns or themes in the transcriptions of the interviews, observations and email dialogues. This process involved reading transcriptions to get a sense of the whole, identifying descriptions or codes, clustering or grouping categories of data together according to the codes, and recording data if necessary.

Specifically, I looked for descriptions of the teachers' perceptions about the process they experienced while integrating the "Blackboard" program into their classrooms. The results of the interviews have been synthesised into seven main constructs that emerged from the data collected. Key phrases and thoughts were written in margins to assist me with developing typologies and relationships in the data. These procedures allowed me to become more familiar with the data. All transcripts were coded to facilitate the identification of typologies and management of the data.

The coded data were incorporated into a visual representation in the form of a matrix. Patton (1990) cautions the researcher not to allow these matrices to lead the analysis but instead to generate sensitising concepts to guide further explorations: "It is easy for a matrix to begin to manipulate the data as the analyst is tempted to force the data into categories created by the cross-classification to fill out the matrix and make it work" (p. 412). Several different techniques were employed as verification strategies for

this qualitative case study. Internal validity and reliability issues were addressed in the research study design and process.

In analysing all the collected data, I made general assertions about the study after reviewing and re-reading the field notes from observations, transcribed interviews, and additional artifacts and documentation collected during the study. An important part of the process was to find the confirming and disconfirming evidence, maintaining an open mind to reframe the assertions with each round of analysis.

It was important to identify the evidence to support the assertions and that this evidence was triangulated from varied sources (both by participants and through different data collection means). Strength of assertions was based on the amount and quality of supporting information as well as verification of those assertions across sources. Observation, journal entries, and interviews supported a strong assertion. Weaker assertions that were not supported were maintained separately in case the assertion appeared again later and were eventually detached if no other evidence presented itself.

The data obtained from some observation periods conducted by me when the teachers were observed at their work areas are presented together, as this was observation of the individuals at their work rather than of a team. Data collection and analysis are an ongoing simultaneous process (Merriam, 1988). Continual analysis during data collection allowed me to consider emerging ideas, reframe some interview questions within the emerging context and construct an understanding of teacher perceptions.

Particular descriptions included constructs of the everyday professional lives of the teachers written clearly and with enough detail that the reader could have a sense of "being there". These constructs established what teachers were doing during different parts of the study. Supported with evidence from observations and interviews, these constructs set the stage for the reader. Direct quotes were the main tool used in the write-up to express the teachers' points of view.

Trustworthiness

The literature on qualitative research stresses the importance of ensuring rigour.

The basic question regarding trustworthiness in naturalistic inquiry is: "How can an inquirer persuade his or her audience that the findings of an inquiry are worth paying attention to, worth taking account of?" (Lincoln & Guba, 1985, p. 301). Criteria for trustworthiness include credibility, transferability, dependability and confirmability (Lincoln & Guba, 1985). These techniques are discussed below in detail and related to the present study.

To increase validity, multiple data sources were used to cross-reference the findings. Observations provided insight into the actual usage of "Blackboard" within classrooms. Interviews provided understanding about teachers' perceptions with respect to practice. Document review provided insight into organisational intent underlying the actual practices that were observed. The triangulation of data in this manner reduced the possibility of drawing false or misleading interpretations of the data.

External validity or the ability to generalise is more problematic in qualitative research. The findings and conclusions are based on the analysis of the case studies and not on a population. Member checks (Stake, 1995) provide verification for the accuracy of the information transcribed and interpreted in the research study. Member checking attempts to control for researcher bias. Informants were given the opportunity to review and edit the information representing their perceptions to verify accuracy (Stake, 1995). In addition to the interviews, documents generated for the study included email conversations between participants and researcher for the purpose of providing further data and for providing clarifications for member checking (see sample of email communications, Appendix F).

Credibility

Lincoln and Guba (1985) recommend a variety of strategies for improving the likelihood that findings and interpretations produced through naturalistic inquiry method will be credible. Two of these strategies are peer debriefing and member checking. They define peer debriefing as "a process of exposing oneself to a disinterested peer in a manner paralleling an analytic session and for the purpose of exploring aspects of the inquiry that might otherwise remain only implicit within the inquirer's mind." The peer debriefer for this study was a Doctor of Philosophy candidate in the School of Education

at Victoria University of Technology. We talked frequently throughout the course of the study, discussing the methodology, the data, and the framing of the study.

I took every opportunity to have the participants proof all my drafts to ensure their voices were the ones coming through the experiences. Each participant received via electronic mail, a copy of our interview transcripts for review, clarification and suggestions. Suggested changes were made, and transcripts re-sent for verification. All data have been verified through this process (see Appendix F).

Transferability

Naturalistic inquiry depends on a presentation of "solid descriptive data" or "thick description" (Patton, 1990) to improve an analysis' transferability. In order to enable others wanting to apply the findings of this study to their own research to make an informed decision about whether to do so, thick description of the experiences and identity development of the participants as well as some definitive exposition of me (the researcher) are provided.

Dependability and Confirmability

According to Lincoln and Guba (1985), both dependability and confirmability can be determined through one "properly managed" audit (p. 315). To establish dependability, the auditor examines the process by which the various stages of the study, including analytic techniques, were conducted. The auditor determines whether this process was applicable to the research undertaken and whether it was applied consistently (Lincoln & Guba, 1985).

To illustrate confirmability, a record of the inquiry process, as well as copies of all taped interviews and discussions, notes from interviews, discussions, and hard copies of all transcripts have been maintained. These records are available upon request from me (the researcher). A doctoral candidate in the School of Education at Victoria University served as the auditor for this study. As such, she reviewed the data, methodology and analysis processes for consistency and applicability, and reported suggestions. Suggested reconsiderations were negotiated until we agreed to the consistency and applicability of the processes.

Ethical Considerations

I secured all necessary Faculty Human Research Ethics Committee approval for this research study. Participants volunteered to participate and had the right to withdraw from the study at any time.

The identity of the seven participants was protected and pseudonyms were used in this report to protect confidentiality. Teachers signed an appropriate informed consent form to participate in the study (see Appendix C). The school's principal also provided permission and a letter to me (the researcher) to interview teachers and to have access to observations in various school settings.

At the conclusion of the study, each participant received a copy of the final summary of the research findings. A substantial part of the data from the school was in the form of teacher interviews in which the teachers' perceptions on a number of issues were identified and explored. Teachers were assured that no one else would hear the tape or see the transcripts and that if they felt uncomfortable about the recording of particular parts of the interview, the recorder would be switched off. All teachers agreed on these conditions. Notes were taken either during the interview or immediately after the unrecorded sections.

Conclusion

Data analysis, according to Merriam (1988), is making sense of the data by consolidating, reducing, and interpreting what people have said and done. The purpose of the data analysis was to work with the data, arranging and rearranging the collected information into manageable units, searching for patterns, and sharing results and interpretations with others.

In conducting this research study, a considerable amount of time and attention was devoted to the issue of methodology because I see this as the foundation on which the credibility of this research stands.

I believe that as many different approaches to the research problem should be applied as possible. This belief is reinforced by the lack of universally accepted methodology in research into teachers' perceptions in adopting a specific computer program in their classrooms. The methods that are used in this research rely on qualitative information. The case study method was primarily used because it allowed the "Blackboard" program to be investigated in a holistic manner within a real-life situation. Furthermore, the case study research strategy accommodates the belief in multiple methods of data gathering and data analysis. The focus group could be used to obtain access to a number of teachers and thus to widen the range of views collected.

The variety of data collection sources provides triangulation in the data (Merriam, 1988; Miles & Huberman, 1994). I obtained data through a variety of methods that each offered a different avenue for the teachers to express their perceptions and experiences of integrating the "Blackboard" program into their classrooms. The teachers' perceptions were gathered through interviews, debriefings and teacher lesson planning processes were observed and taped for transcription purposes. Email dialogues with the informants were also collected and coded.

According to Maxwell (1996), semi-structured, open-ended interview questions would help reduce the amount of reaction in an interview setting where what the informants say is always a function of the interviewer and the interview situation. Follow-up questions or probes were occasionally emailed to the informants following an interview to clarify meaning or explore a new question as a result of the transcription process.

As I interviewed all seven teachers, I attempted to understand the uniqueness of each of the participants and respect the sincerity of their approaches to the phenomena being studied. I used content analysis in the study of phenomenon, which refers to the examination of data for the purpose of identifying themes or patterns (Gall et al., 1996).

CHAPTER 5

RESULTS OF DATA ANALYSIS

In this chapter, I present the analysis of the seven teachers' perceptions and experiences in relation to new technology integration and more specifically the "Blackboard" program. Initially, data were collected in broad categories based on the scope of the study. As the study continued, the data collection and analysis became more focused and refined. This was based on the emerging categories of study including the participants' characteristics and how these influenced their decision to adopt or integrate the "Blackboard" program in their classrooms.

I collected and analysed the data, made assertions about the direction of the study, and identified new data to be collected. I modified and narrowed the study to a more directed collection of data and analysis (Bogdan & Biklen, 1998). The analysis of data was done in many steps and contained different elements from the collected sources.

Interviews, Observations and School Documents

During the collection and analysis of the data, seven major constructs and related typologies were identified (see Table 3). The seven constructs reflect teachers' perceptions and experiences regarding issues of change; student management; access and use of computers; skill development; enhancing student learning; online pedagogy; time management and teachers' workload.

The constructs began with the smallest, most literal descriptions of the unfolding words and events. Creating constructs and their typologies triggered the formation of a conceptual framework that suited the data. This framework helped me (the researcher) to ask questions, to compare across data, to change and to make a hierarchical order of them.

Table 3: Developing constructs and their typologies

Construct	Typologies
Change	coping with change, acceptance and resistance, frustration, adoption, school reform, willingness, feeling pressured.
Teachers' workload/Time management	amount of work, overworked, excessive work, time to practise, time consumer and time saver.
Student management	organising groups, classroom orientation, behaviour, collaboration, whole class, grouping in pairs.
Enhancing student learning	motivation, interesting, improve learning, self-centred, problem solving, critical thinking, collaborative learning.
Skill development	ongoing professional development, collegial support, hands-on, cooperative learning, learn by doing, leaders support, new skills.
Access	home access, school access, computer lab, laptop computers.
Online pedagogy	communication tool, online, teaching method, teaching tool, web-based teaching, facilitator, student-centred.

An analysis of each construct and its typologies is discussed as follows:

Change

Integrating and implementing new technology into teaching is a complex process for individuals responsible for implementing change. Fullan (1993) suggests that any

change can be examined in regard to the degrees of difficulty experienced by individuals or teams in altering their beliefs, feelings, teaching strategies and use of materials.

In an attempt to understand the seven teachers' perceptions of adopting the "Blackboard" program into their teaching and the process of change, I asked them to describe their roles in the classroom when they started teaching with "Blackboard" and the various types of changes they experienced. At the first interview, the teachers identified the rate at which they would integrate "Blackboard" into their teaching and their feelings and perceptions about the process of change. There was a number of issues that the teachers explained that all seemed to relate to change.

Edward, with 15 years of teaching experience, explained that he felt before he could integrate "Blackboard" into his teaching lessons he had to be ready to make a change and willing to cope with it.

> *I don't know if one internal workshop can make a teacher prepared for adopting new technology in his/her classroom. I really think it's got to be something that the teacher is willing to do. I think there are plenty of opportunities. I just think that teachers have to be ready to cope with change and use the new technology in their classrooms. If they are not ready, it's not going to happen immediately.*
>
> *(Interview 1, Edward, June 2004)*

Phillip also felt preparedness or willingness was a key factor in making change and trying new teaching methods and with new technology.

> *We are not perfect and a lot of people think teachers especially are perfectionists. There are so many new technologies out there and it's always changing. I see that as being a problem, so you're always taking a risk when willing to change.*
>
> *(Interview 1, Phillip, June 2004)*

Fullan (2001) discusses the frustration felt by many teachers when a school such as the one in this study, is involved in a large number of "improvement programs". Phillip, for example, stated:

I'm more frustrated and incapable than ever, as I'm new to all this and need more time in the day to be able to practise all I have been shown and taught in the workshop. I think over time it will become easier.

(Interview 1, Phillip, June 2004)

Phillip was then asked during member checking to elaborate on his feeling of frustration:

I don't resist change. I simply realise that the costs of adopting new technologies are very high and I don't like it. Many teachers want to use the new technology but others don't because the people who made the decisions for them don't understand their needs and wills.

(Email, Phillip, November 2004)

Despite all the hurdles and emotions encountered when using new technology in their classrooms, Phillip and Edward felt it was important to learn and use "Blackboard" in their teaching. Teachers provided several explanations as to why it was important for them to participate in the change and integrate this new technology.

Rhonda felt that the integration of "Blackboard" was important for her teaching:

I've to accept that I can find so many good things on the "Blackboard", and it is so much faster to access than going to the textbooks…and time is important to us as teachers. I also think because of this new technology and all the knowledge out there, I'm not doing so much of the memorising facts, and it's more skill oriented. It has changed a lot because I know ten years ago when I was teaching (first years of my teaching) it was more memorising and paper work.

(Interview 1, Rhonda, May 2004)

Edward also recognised his need to make the change. He viewed "Blackboard" as a tool to support creative approaches to teaching and learning.

I chose to adopt "Blackboard" because I think it's a new technology, first of all. Yes it does create a whole new range of issues that teaching out of the textbook won't have to deal with, but on the other hand, it is a creative way to teach and

learn. I feel it's a way that really helps incorporate higher learning and critical thinking skills. You know there's so much creativity that a teacher can get out of his students and all of a sudden, if you put something else in front of them, it just seems like opening up a whole other door to them.

(Interview 2, Edward, September 2004)

Edward felt that his students are using cognitive skills, such as problem solving, and decision making when using the "Blackboard". Halpern (1996) stated that critical thinking is a process, which stresses an attitude of judgment, logical inquiry and problem solving, and leads to an evaluation in decision or action.

John felt that the new technology helped him to accommodate a range of learning styles in his classes.

I adopted the "Blackboard" because the boys like it. I try to focus on different ways of teaching to bring in all of the tools to help the boys learn. They learn by different modes and they seem to be so much more excited about sitting down at a computer than maybe sitting down with a paper and pen to learn something new.

(Interview 1, John, June 2004)

In discussing change and change to the new technology tools, Trish the ICT coordinator stated:

My experience with the "Blackboard" is very well established as I use it more often in my classrooms; I see it as being a huge communication and information system. "Blackboard" program is more like a store of information, an online teaching and learning tool, which will reform our school's ICT capabilities.

(Interview 1, Trish, June 2004)

Anne, commenting on her decision to integrate "Blackboard" into her teaching, illustrated a set of mixed emotions about the whole process:

I think my time could have been used in better ways because they, the class, could have learned the same things if I had just told them, or just maybe taught it

without the new technology. There are other times when I feel "Blackboard" is the best tool to use in my classroom.

(Interview 1, Anne, June 2004)

Lisa highlighted an additional factor inherent in change that related to the pressure she felt in adopting the "Blackboard" program.

The process by which the "Blackboard" was introduced was not thought out very well. There does not seem to be any logic to the introduction process. The "Blackboard" was introduced at the last minute without much warning and next to no preparation. I feel pressured to use the "Blackboard" and I have little time to prepare classes as it is, and now I am expected to learn about the new technology as well as learn to use it. I am really worried about the new technology.

(Interview 1, Lisa, May 2004)

Each teacher in this study experienced a range of emotions including frustration, and pressure while engaged in the adoption of the "Blackboard" program. Despite this, all the teachers valued the potential of "Blackboard" to support the teaching and learning in their school.

In an attempt to understand the teachers' commitment to integrating "Blackboard" into their teaching and learning practices, I asked them to describe the rate at which they integrated "Blackboard" into their classroom. Each teacher provided a description (in percentage terms) of his or her use of "Blackboard" tools in new lesson planning. Trish, for example, started integrating the new technology in March 2004, and estimated that approximately 70% of her new lessons involved using the following tools: discussion board, student assessment and tracking data base, assignments, online documentation and links to websites. Edward, Lisa and John, who all started integrating the new technology in April 2004, reported incorporating "Blackboard" into approximately 30 to 40% of their new lessons. They used the program mainly for online documentation, as a communication tool and for student assessment and tracking purposes. Phillip, who integrated the new technology in May 2004, reported incorporating "Blackboard" into

about 20 to 30% of the new lessons. He used the program for online documentation and student assessment and tracking. Anne and Rhonda, who integrated the new technology also in May 2004, reported that approximately 10 to 20% of their new lessons were supported by "Blackboard". Their use of "Blackboard" (at the time of this June interview) was limited to online documentation only. This set of data illustrates that there was a varied rate of adoption as highlighted by Rogers (1983) in his research concerning the theory of Diffusion of Innovation (for more details refer to Chapter 6). Factors that have contributed to this variation include: prior experience with technology; personal confidence in innovation and familiarity with the "Blackboard" tools. At this mixed level of use, it would take some time before all teachers would be using the various elements and capabilities of "Blackboard" with confidence and success.

Teachers' Workload/Time Management

The teachers interviewed identified a range of stress-related issues in this construct concerning teacher workload and time management.

The amount of work and time involved in the preparation of teaching material, programs and assessment using the "Blackboard" program was raised in all the interviews, email dialogues and classroom observations. For example, Phillip felt the integration of "Blackboard" had increased his workload and stress level:

> *I found that the amount of work involved has been increased with new subjects' outlines being written and transferred to the "Blackboard" for the foreign languages taught in our school.*
>
> *(Interview 1, Phillip, June 2004)*

The impact of work needed to prepare for the new technology was frequently seen in teachers' references to time pressure. Anne included her feelings about the workload increases when she said:

> *The new technology puts an extra stress on the time and just my life. I am very occupied and overworked with some other things, and not just the "Blackboard".*
>
> *(Interview 2, Anne, September 2004)*

Rhonda spoke of spending many hours finding information and preparing resources for online delivery in her classes. She also expressed great concern at the time she had to commit to the preparation of assessment tasks and tests.

> *The amount of work for me has increased incredibly. To do what is required effectively, to print out the papers and then reflect back onto my assessment tasks, the assessment sheets, marking guidelines and providing the feedback to my students. I am very concerned about not having enough time to learn about all these changes in technology.*
>
> *(Interview 2, Rhonda, August 2004)*

The processes of recording assessment results and communication of results to students were generally seen to be more complicated than previously thought. John felt, for example, that using the "Blackboard" was taking more time away from his other responsibilities as a coordinator.

> *The amount of work is just dreadful and it is almost impossible to get through it to the depth required in the time available.*
>
> *(Interview 2, John, August 2004)*

All teachers referred to the need to develop additional time management skills in order to cope with the increased workload related to the implementation of "Blackboard".

Teachers commented that the time needed to do the preparation and development on "Blackboard" with colleagues and students was creating a problem of balance between their professional and personal lives.

This was most evident in Edward's comment:

> *There is no way I can say tonight that I'm not doing any preparation. There's no way you can do that. You have to go out and pick up your children, or do what you do, and then you do the work. It's not an 8.30 am to 3.30pm job. I'm not complaining about that, but I'm saying this is too much work to be done during the day.*
>
> *(Interview 2, Edward, September 2004)*

Anne highlighted the additional work online teaching required.

> *This is a neat use of the web-based teaching in principle, but this is what added the most extra work and pressure for us. There are very specific skills that teachers need in order to be able to use "Blackboard" ... You've got to be taught how to use that and how it actually works.*
>
> *(Interview 2, Anne, September 2004)*

The teachers interviewed identified a range of issues related to time management and the integration of the new technology into their classrooms. They were now spending more time in learning and implementing various elements of "Blackboard" in their teaching. For example, John as a curriculum coordinator and religious education teacher felt the need for more time to prepare new lessons:

> *Using the "Blackboard" has taken so much time away from other teaching/professional tasks, but as I become more skilled this hopefully will lessen. Teachers need the time to learn how to do things differently in their teaching with the program.*
>
> *(Interview 1, John, June 2004)*

Anne felt that since she had invested so much time in developing a "Blackboard" project for her year 12 classrooms, she planned to use it for her next year's classes as well.

> *Heaps of time can be spent or consumed, preparing a project in "Blackboard" to use for sharing information with a class. When that is made, I will use it next year with my new classes in order to save me time in the future.*
>
> *(Interview 3, Anne, October 2004)*

Teachers who were developing their own lessons using "Blackboard" looked for timesaving features when creating new teaching materials. Anne, for example, planned to build a template of a project during the initial planning stage knowing that it would save her time later on.

Anne would actually like to have on "Blackboard", diagrams and projects made, so that she doesn't always have to recreate these diagrams and she can just get them ready, download ready. In that case, she will save time.

(Researcher observation, November 2004)

In conclusion, all teachers acknowledged an increased workload due to the integration of "Blackboard" in their teaching and learning. A range of time management issues and concerns about professional work and personal life balance was identified.

Student Management

Teachers identified a range of issues related to the integration of "Blackboard" that impinged on both classroom and student management. The main issue which preoccupied teachers on a day-to-day basis was how best to manage large and diverse groups of students. While teachers were looking for innovative ways to develop their teaching using "Blackboard", the student management issue was perceived as a major challenge.

It was noted during interviews and observational periods that the priority for some teachers was finding ways of organising the resources and students with different computer skills in their classrooms, so that teaching and learning could proceed in an efficient manner. For example, Anne acknowledged the importance of knowing her students' skills levels in technology:

…the boys who are in year 12…are quite good because they have got them [computers] at home and they have basic skills. So you can send them to the computer lab in groups and leave them unsupervised, as they are more computer literate than younger students are.

(Interview 3, Anne, October 2004)

In the middle school classes, the issue of behavior management was a major consideration in the planning and use of "Blackboard" and other ICT activity. For example, Edward also highlighted the need to know his students:

Classroom orientation is important. You need to be aware of group dynamics when students are using ICT and "Blackboard".

(Interview 2, Edward, September 2004)

For most teachers, the use of "Blackboard" was synonymous with group activities. Most teachers preferred to work with students in small groups. Lisa in contrast raised an alternative view of teaching and student management:

I think the way that education is going we are coming back now to whole class lessons with students assigned in groups. Well, why not a whole class lesson on computers, i.e., this is a hard drive and this is a CD-ROM, rather than working with two or three students at a time.

(Interview 2, Lisa, September 2004)

Small groups and pairs were often seen as the solution to coping with students with mixed abilities. Rhonda explained:

What I tend to do is organise my "young technicians" in pairs, that are confident enough on the computer… I show them a few things to do, and they can go and explore as much as they are able to do, rather than them always coming up to me. They are designated technicians for the problems we have with computers in my classrooms.

(Interview 3, Rhonda, October 2004)

Phillip had another strategy in managing his class when using "Blackboard" in teaching.

Phillip puts them initially with partners, so he puts a confident student with a less confident student. Phillip has a mixed age group in his class. So, he puts one year 10 with another one from year 11. The outcome of this peer tutoring strategy seemed to encourage cooperative interactions and learning between the students.

(Researcher observation, November 2004)

Trish explained that grouping her students in different levels and abilities also resulted in better learning outcomes.

A bright student can take it that stage further and think it through. You have this peer group business, whereby the brighter student supports one or two others through the course.

(Interview 3, Trish, November 2004)

John also recognised that his students had various technology skills that could be utilised in the class:

Luckily there are students who have computers at home and they are quite confident, so I tend to pair them in groups, and they actually come and help me when I'm stuck. I admit to the students that I am a learner too.

(Interview 3, John, November 2004)

These comments clearly indicated that grouping students with different computer skills would help their peers and also help some teachers in learning about the new technology.

Enhancing Student Learning

For most teachers in schools, enhancing student learning is a priority. Further, teachers' core beliefs are directly related to their tendency to use new and innovative teaching methods. Means and Olson (1995) note that technology can engage students in challenging and authentic learning:

> Teachers can draw on technology applications to simulate real-world environments and create actual environments for experimentation, so that students can carry out authentic tasks as real workers, explore new terrains, meet people of different cultures, and use a variety of tools to gather information and solve problems. (p. 43)

When teachers were asked why they chose to integrate the new "Blackboard" technology, they reported that their motivation came from their intent to positively impact upon their students' learning. Anne, the English teacher, for example, described how "Blackboard" had enhanced her students' learning:

"Blackboard" has a unique potential to extend, improve and enhance students' learning in English. If used appropriately and imaginatively, it provides possibilities, insights and efficiencies that are difficult to achieve in other ways. For example, students can communicate via email with authors or intellectuals.

(Interview 3, Anne, October 2004)

Anne's comment clearly indicated that the new technology was a powerful resource that it could for example, enable her students to conduct searches on any topic and to interact with topic experts through email.

Lisa felt that her students were more motivated when they were actively involved in using the "Blackboard" program with their student projects

Most of the time I use student projects. That's why they're excited about it. For me, that's what works. Having the boys working and solving problems, and not just have it as a presentation tool for me.

(Interview 3, Lisa, November 2004)

Phillip and Rhonda designed lessons which required the students to find information on their own laptop computers at home, work together to complete assignments, and submit them using the "Blackboard" program. Phillip explained why he felt the lesson design was effective for his students:

I have seen a noticeable improvement in students' learning. I saw that they have produced work that was worthwhile and that impacted on their self-esteem and their position on the home front and their position in school. Yes, it works very well with the boys in the low end. I think the ability to be able to word process means the boys are able to produce stuff that they have never been able to produce of such high quality before. They are able to produce it, change it, and move it around. So, I think they are achieving more than ever. Some years ago you would write an essay of say 300 words, now they might really get going and write an essay of 1,000 words and have images in there that they never would

have and email it to me using the "Blackboard". I think it does enhance, it does benefit everybody a whole lot better.

(Interview 3, Phillip, October 2004)

Both Phillip and Rhonda were able to design and plan their lessons with the new technology effectively because they spent a lot of time thinking and working through all the options.

I observed one of Edward's lessons that incorporated traditional materials and "Blackboard" program resources together for his students.

Edward grouped his students in pairs to complete a task using "Blackboard" applications. He posted a set of questions on "Blackboard" that required the students to conduct an investigation. The students were required to conduct some research using the class text. They were also encouraged to find some World Wide Websites that were relevant. Each pair of students critically analysed the information and answered the set questions. Edward's students completed a task that incorporated investigation, research, analysis, problem-solving, presentation and submission.

(Researcher observation, October 2004)

Edward acknowledged that his role as a teacher was changing with the integration of "Blackboard". He was experimenting with new lesson planning, in which his students were working both independently and in pairs. Edward posted his assignments and homework on "Blackboard" and students submitted their work online from home via their laptops.

The teachers saw changes in students' learning in the classroom when they planned lessons using "Blackboard" where students were actively managing information. Anne described her students' increased interest levels when integrating "Blackboard".

What I see happening now with the new technology is the interest level is so much higher and my students are willing to do more research and seek out new information. So yes, it's changed on my part and my students are very interested too in doing their tests and submitting their work online.

(Interview 3, Anne, October 2004)

Trish as the ICT teacher saw great opportunities with "Blackboard" to enhance her students' learning:

> *The "Blackboard" program enabled me to communicate with both students and teachers alike. It gave me access to an enormous amount of approaches to teaching, whether it be software or databases that I never had before and that forced me to evaluate what worked [what did not work]…I'll go back and try something else. I didn't have that before, I only had one or two sets of textbooks. You know, you can get into the program now and you can see a new way in which people teach it and use that within one period, and that forces you, like, that's the beauty of it, you are not sitting there saying, that's fantastic, I'm going to use that. I can even assess my students' work online and submit my feedback to them and they are gaining confidence and motivation from that.*
>
> *(Interview 2, Trish, August 2004)*

Phillip described his role when planning a lesson using "Blackboard" in much the same way:

> *The first day I integrated the program I was more in the [traditional] teacher role, because I needed to show the boys exactly what they're going to be doing, because it was something brand new to them and me. From then on, I became more of a facilitator, problem solver, someone there in case they need me.*
>
> *(Interview 3, Phillip, October 2004)*

Rhonda also described how her role as a teacher in the classroom has changed as a result of using the "Blackboard" program in her teaching and how that enhanced student learning.

> *The more I experiment with the computer the more chances I take working with the "Blackboard" with my students. I have got used to the fact that I am not always the teacher in the classroom; many times my students have taught me things I didn't know and sometimes I teach them and even sometimes we discover*

something together. I am a teacher and a learner at the same time. My students are benefiting a lot from that and motivated too.

(Interview 3, Rhonda, October 2004)

John also described the importance of successful integration of the "Blackboard" program for students when he said:

When I walk into my classroom and I see that the "Blackboard" is being used in the way that I want to see it being used. I find that first of all the students are perfectly comfortable and interested with the new technology and they do not get up in the class and announce in a kind of nervous voice, "this is boring". But, instead, I see that there is a focus on a learning objective and lots of things are going on to meet that learning objective.

(Interview 1, John, June 2004)

All teachers saw a variety of changes in their teaching role in the classroom when they used "Blackboard" integrated lessons with their students. The teachers noted the levels of student interest, engagement and motivation. A number of comments made by the seven teachers reflected on the way students were engaging in learning with the "Blackboard" program.

Skill Development

Trotter (1999) argues that the transformation of classroom technology from hardware, software, and connections into tools for teaching and learning depends on knowledgeable, skilled and enthusiastic teachers who are motivated and prepared to put technology to work on behalf of their students.

The teachers interviewed identified a range of strategies and methods to support their acquisition of "Blackboard" knowledge and skills. These included: personal learning using "Blackboard" manuals and practice; collaboration with colleagues; participating in externally provided ICT workshops; participating in professional development provided by the school and via informal conversations. All the teachers participated in one introductory one-day professional development workshop on "Blackboard" facilitated by Trish (ICT coordinator) in Term 1, 2004.

For some teachers developing new skills in "Blackboard" and ICT in general was achieved through personal learning and trial and error. Phillip, for example, believed that given sufficient time he was able to develop his "Blackboard" knowledge and skills.

> *I learn best by doing. I just need a little uninterrupted time, a couple of hours a day to really absorb everything. I also learn by having other people show me how things work. I am a quick learner, especially when I work with colleagues.*
>
> *(Interview 2, Phillip, August 2004)*

Anne used the documents and tutorial materials provided to learn the features of the new technology, and then experimented with the program.

> *Anne's process of learning new skills involved reading the "Blackboard" tutorials and experimenting via a process of trial and error.*
>
> *(Researcher observation, August 2004)*

Rhonda recognised the need to devote personal time to learning the "Blackboard" program in order to develop confidence with it. Through this process of trial and error, she could develop a clearer understanding about the "Blackboard" tools and their capabilities.

> *My learning process with the new technology is just dig in and try. I am definitely a hands-on type of teacher. My free time at school is limited, but if I have about an hour a day, I can get fairly comfortable with the new technology.*
>
> *(Interview 2, Rhonda, August 2004)*

Trish felt that experience with computers in general has given her more confidence and control when using new technology in her classroom.

> *The more I practise with different programs and the more chances I take working with "Blackboard" with my students, the more skills I get at using the program and solving problems. My role is to assist them after they've got started and also to give them the tools they need to start in the first place.*

(Email, Trish, July 2004)

Collegial support amongst teachers was another key factor in supporting the development of "Blackboard" skills. Anne indicated a preference for having a colleague show her how to use the new technology and then have some free time to experiment with it.

> *I like to practise on computers with a colleague to show me the basics, and then I just need the time to play with the new technology and to try things out. I learn a lot through others.*
>
> *(Interview 2, Anne, September 2004)*

Rhonda felt that working with a colleague helped her, given the amount of time that she had, to integrate "Blackboard" into her teaching.

> *There is just too much to know in "Blackboard" and not enough time for a typical classroom teacher to learn it. Having a peer to share in learning the process, or to share in all the preparation, makes it possible to use the new technology. I also lack a lot of technology knowledge and skills so I need that colleague to help back me up and to lead the way.*
>
> *(Interview 3, Rhonda, October 2004)*

Anne confirmed Rhonda's perspective on working with a colleague. Anne and Rhonda felt that they have been able to make more progress, because they had someone with whom to work.

> *Rhonda and I learned cooperatively and created what we have done so far together. It was a process of teaching each other what we know along with trial and error.*
>
> *(Interview 3, Anne, October 2004)*

Edward also felt a colleague is valuable to review or assess the effectiveness of planning a lesson with the new technology.

Having a colleague helps me tremendously because I have someone to share ideas with and to say, "Let's do it this way". It's helpful to have someone to do the planning with and review, "Did this work? Is this something we feel really met the curriculum needs as well as technology needs?" It's wonderful having someone to bounce ideas off and to get feedback from.

(Interview 2, Edward, September 2004)

Teacher collaboration was critical in the implementation of "Blackboard".

I think what makes it [using the "Blackboard"] successful in teaching, is having a good teacher-to-teacher relationship. I mean, ideally it would be a supportive KLA leader. It's just having a person who lives for it and loves it, whose enthusiasm is contagious and can easily, in a very simple matter, teach another colleague how to use something easier and quicker.

(Interview 3, Trish, November 2004)

Some teachers during informal interviews and conversations indicated the importance of having school culture that supports teacher collaboration. Rhonda expressed some concerns about the lack of support she was receiving from her KLA leader:

I am open to any initiatives when "Blackboard" is involved, but in this school, unfortunately, I don't find a lot of support. I wish I would receive more support from my KLA leader, and also from the school.

(Interview 1, Rhonda, May 2004)

Rhonda recognised the importance of leaders in creating the kind of school culture, which was both forward, looking and dynamic, but also sympathetic to the stages when teachers were at their own "Blackboard" skills and knowledge development.

For teachers such as Edward and Lisa, the participation in external courses and workshops on ICT facilitated the acquisition of their new "Blackboard" and ICT skills. Both teachers had participated in external courses and in-services offered by the local TAFE College.

Some TAFE Colleges and institutions offer hands-on workshops on specific software for teachers … and with those kinds of opportunities, I don't know how a teacher could not take advantage of something like that.

(Interview 2, Lisa, September 2004)

John felt that prior experience with computers in general was an important factor in acquiring the necessary skills and knowledge to use "Blackboard" effectively in the classroom.

The more experience and technology skills the teacher has, the more control he/she will gain over the variables that a new technology introduces in the school curriculum.

(Interview 2, John, August 2004)

Trish felt that experience with computers in general has given her more confidence and control when using new technology in her classroom.

The more I practise with different programs and the more chances I take working with "Blackboard" with my students, the more skilled I get at using the program and solving problems. My role is to assist them after they've got started and also to give them the tools they need to start in the first place.

(Email, Trish, July 2004)

One of the factors that hindered the acquisition of "Blackboard" knowledge and skills was the limited amount of time available for teachers to practise with the new technology. All the teachers reported having to learn the new technology skills and knowledge in short blocks of time. This is typical of a teacher's day, in that it is scheduled into small blocks of time for classes, yard duties and meetings.

Phillip and Rhonda, for example, reported finding some time during their team planning time. However, there were often frequent interruptions during these periods, and therefore, the only long extended periods of time to work on "Blackboard" were after school.

We are fortunate to have our team time [to discuss "Blackboard" applications], so in theory we have short blocks of time. At school it has to be that way because

there are so many interruptions. The only time we have collegial support over long extended periods of time is in the evenings.

(Interview 2, Phillip and Rhonda, August 2004)

Lisa and Anne echoed Phillip and Rhonda's views with regard to the lack of time to work collaboratively in developing understandings and skills about "Blackboard".

Our school time is very limited. We use a lot of after-school time so Anne and I can help each other out if we get into a bind. The school has been providing two full days of professional development over the past two years. We like to use short blocks over several weeks so we can practise in between and absorb the new technologies provided.

(Interview 2, Lisa and Anne, Sep 2004)

Teachers in this study felt that because of time constraints, they tended to learn only what they needed, or were able to use on a regular basis. In many instances, the teachers learnt a new technology skill when they were actually ready to use it with their students.

Trish, ICT coordinator, was responsible for conducting the professional development workshop on "Blackboard" in March 2004. The aim of the workshop was to provide the teachers with some basic knowledge and skills that would enable them to integrate the new technology in their classrooms. The professional development program involved theory and practical activities on "Blackboard" features including course outlines; student assessment and tracking; library; chat; email; assignment submission; and teacher notes.

Anne described the need for ongoing professional development as one of the most important factors in having teachers successfully integrate "Blackboard" in their classrooms.

I think the most beneficial thing would be ongoing professional development provided by someone who really knows how to…If you sit down and show me

something on the computer and show me a benefit from it, then I'm more apt to use it in my teaching.

(Interview 1, Anne, June 2004)

The provision of ongoing professional development (as described by Anne) was not made available due to time constraints. (Further discussion of the implications of this issue is discussed in Chapter 6).

Lisa put forward her view on successful integration:

First of all, the teacher uses the "Blackboard" program for professional reasons. I use it as information and communication resources and I understand what that information means. The "Blackboard" is integrated into our professional lives. So we are innovators, online teachers, and email users. We also understand the importance of acquiring new skills in information and communication technologies in teaching today.

(Interview 2, Lisa, September 2004)

The teachers recognised the complexity of integrating new technology into their teaching and classrooms. They acknowledged that using new technology in teaching is something that takes time, and requires practice and collegial support. They also indicated the importance of teacher collaboration, professionalism, prior experience and collegial support in enhancing their skill development.

Access

Teachers raised a set of access issues that were influencing the integration of "Blackboard". These included the availability of the computer labs and the provision of laptop computers both at school and at home.

Some teachers reported that time spent in the professional development session was of limited value to them until they had reliable access to computers at school. Rhonda commented:

I think one-hour access to the computer lab was not enough to really use the new technology in classroom, or to give the boys enough time to learn about the "Blackboard" program.

(Interview 2, Rhonda, August 2004)

Rhonda also expressed frustration at having to take extra time to try and work out the computer lab scheduling just to get access to the computers.

Scheduling the computer labs has been a problem in the past. Sometimes it felt like it wasn't worth the time spent trying to use the computers with the students.

(Interview 1, Rhonda, May 2004)

Anne also expressed concern about the access to computer labs and the booking process:

If the computers I need are readily accessible to me then I will use them. If I have to go to the IT department and check it out, I'm not really sure if I could do that.

(Email, Anne, September 2004)

The computer lab booking process was coordinated by the IT Department. Due to the high demand by the teachers (across the entire school) during the initial period of "Blackboard" integration, the limited access to the labs frustrated the participating teachers in this study.

The other teachers echoed similar views about having computers easily accessible at school. I asked all the teachers to identify the most important factor or factors, which would determine whether they would continue to plan for and use "Blackboard" in their teaching in the future. Anne identified an additional access issue concerning the availability of a laptop computer for her professional use. (Anne was not provided with a laptop computer by the school as she was not a KLA Leader)

Availability of computers is for me the utmost. I need to have a laptop at hand. It needs to be easily accessible.

(Interview 2, Anne, September 2004)

Edward, a KLA Leader, emphasised the importance of having a laptop available to him:

> *As long as I have a laptop given to me by the school, that's probably the biggest factor in using the new technology in my classroom, as I will have enough time to plan my lessons at home.*
>
> *(Interview 2, Edward, September 2004)*

Phillip also identified access to a laptop computer as an important factor in his application of the new technology. (He was not provided with a laptop as he is not in a leadership role).

> *Having a laptop computer is a big factor in determining whether I will use the new technology in my classrooms or not in the future.*
>
> *(Interview 2, Phillip, August 2004)*

In addition, Phillip pointed out in an email message, the importance of teachers having computers at home as a motivational factor.

> *If they [the school administration] cannot afford to give their teachers laptop computers to work with at home, why should the teachers make that commitment [to learn to use new technology]? I think that was the one piece that would make the teacher feel really professional. It would make every teacher feel, " I am valued and I will buy into this ...I can practise with it all weekend".*
>
> *(Email, Phillip, August 2004)*

Lisa stated the importance of access to computers for both her and her students:

> *If everybody can't sit at his or her own computer and I can't provide that access to everybody in my classroom, I won't use the new technology as much and I would just go back to my textbooks.*
>
> *(Interview 2, Lisa, September 2004)*

Reliable computer lab access was a major factor in determining whether teachers would plan and use the "Blackboard" in their teaching. Working out schedules in shared

situations across the entire school was particularly frustrating for them. Ironically, sometimes the labs sat empty and then on the following day or week, two or three teachers expressed interest in using the labs with their students.

An underlying premise of home access is that the teacher would save time not having to return to school (after hours or during holidays) to use computer facilities to plan his/her lessons. Trish, the ICT teacher and coordinator, highlighted the fact that she could use her laptop at home to prepare lessons and professional development.

> *I rarely have time at school to just sit down and work on my students' projects. At home I do my lesson planning with the new technology. I also do a lot of research, and problem solving on my laptop at home. I don't think that I would even be close to where I am now in the area of technology if I hadn't had my laptop.*
>
> *(Interview 1, Trish, June, 2004)*

John also uses his laptop computer at home for email communications, personal reports and reviewing VCE materials.

> *I have used my laptop computer to conduct research on the Internet, Google, and Yahoo to help me learn more about a subject. I also used it to create projects using "Blackboard" program, and to communicate with the Board of Studies.*
>
> *(Interview 1, John, June 2004)*

The teachers have highlighted the importance of having access to a computer at home. Home access creates more opportunities for them to work on the "Blackboard" program and new technology projects, learn new skills, or complete students' reports at their convenience. At this stage, the school has provided laptop computers only to teachers in leading positions, such as key learning area leaders. Based on this research, the rate of access to and availability of the computers in the school usually influenced the integration of the new technology.

Online Pedagogy

Bates (1997) states that technology does provide an opportunity to teach differently, in a way that can meet the fundamental needs of a new and rapidly changing society. This, however, requires new approaches to teaching and learning that exploit the unique features of different technologies in order to meet the diverse learning needs of students. The teachers interviewed have experimented with different teaching methods to determine which are the most effective for their students in their classrooms.

The teachers identified a range of "Blackboard" features that has enhanced their teaching and student learning. John commented:

> *"Blackboard" program has really made things easier this year. Things like access to Internet articles and journals as well as presentations and communications technology made teaching easier and more organised. My attitude toward integrating "Blackboard" in my teaching has greatly changed. I get excited about downloading lessons, projects, and available resources. My attitude was already positive about it. My students are generally more "on task" and express more positive feelings when they use "Blackboard" than when they are given other tasks to do.*
>
> *(Interview 3, John, November 2004)*

Using "Blackboard" to support online communication was frequently cited as an important teaching tool. Trish suggested:

> *I think the educational merits [of "Blackboard"] are fantastic. We look more into visual displays and web-based teaching which is what the boys tend to be liking these days, you know, CDROM, websites, movies, which makes it more relevant for the students, so that side of it is actually quite good. The boys respond to that more positively than the teacher-centred approach, which I found really good.*
>
> *(Interview 3, Trish, November 2004)*

Edward identified additional features of the "Blackboard" program that support online teaching and learning capabilities:

"Blackboard" is a valuable communication tool. Teachers communicate electronically with their students from different locations and also students communicate with their peers to discuss different topics in a dynamic learning environment, so it's a good teaching tool too. I believe that now is the time to use this technology extensively in my classrooms and students should learn how to use "Blackboard" for the purpose of class work, and learn many other skills on ICT necessary to succeed in real life.

(Interview 3, Edward, November 2004)

Rhonda stated one area that needs delicate handling and careful management is the "Blackboard" discussions (or bulletins) tool. This tool provides opportunities for collaborative teaching and learning, student-to-student and student-to-teacher discussion. It is similar to many public discussion/bulletin boards available on the "Blackboard".

"Blackboard" as a web-based teaching platform should not be used to replace classes or teachers, but only to supplement them as online communication tool. Valuable face-to-face discussions cannot be held on the web and more specifically "Blackboard". It's only one way of teaching; it's not to take over completely. You can't forget that there are other ICT skills. I always encourage my students to give me some sort of feedback on the activities they do in my classes.

(Interview 3, Rhonda, October 2004)

Rhonda's comments reflect a fear among some teachers that online teaching may be used to reduce teacher-to-student face-to-face contact time. Phillip recognised the need for discussions on "Blackboard" to be carefully planned:

I found the online discussions to be good only when they are clearly planned and organised.

(Interview 3, Phillip, October 2004)

Trish stated the importance of ICT in general and the "Blackboard" program for her students.

"Blackboard" program proved to be a very valuable source of information and communication technology, as it enabled me to cover the units I teach in a way that would not have really been possible had I used traditional handouts, and chalk and talk methods of teaching. So the boys learn more, and enjoy learning more when they are actively involved, rather than passive listeners.

(Interview 3, Trish, November 2004)

Anne also felt she had a higher workload, but there didn't appear to be any evidence that she thought having online teaching materials caused this. In fact, the contrary view was expressed.

An incredible length of time! But the "Blackboard" program has made it much easier, in terms of organisation. I see myself one year from now more eager to take on more challenges of learning how to continue to integrate new technologies and online teaching and learning in my classroom. I see myself one year from now much more computer literate and continuing to explore with it, and teaching in a student-centred classroom. The new technology should not be used to replace classes or teachers, but to supplement them.

(Interview 3, Anne, October 2004)

ESL teachers are faced with pressure from students, parents and administrators to incorporate computer technology into their classes (Dusick, 1998). Rhonda, as an ESL teacher, was particularly concerned for students who were low achievers, such as students with learning disabilities, or those who were at risk of academic failure:

I feel that the new teaching tool is designed to suit the upper and middle level ability students and still disadvantage a number of ESL and low-achieving students. I have got to do the best for this particular group of students.

(Interview 2, Rhonda, August 2004)

Rhonda's comment indicated that the new technology has the potential to reinforce differences between advantaged and disadvantaged students, and to entrench existing inequities. Inequitable access to computers may compromise the quality of learning experiences for students from disadvantaged groups.

Trish, in conclusion, during the planning of her lessons with "Blackboard" program stated:

> *I think that the ideal would be to have our subjects taught online using "Blackboard" program. It is much more compact and pushes you to keep under control all your materials for now, and for the future. I see myself more confidently providing curriculum integrating technology and continuing to explore and update myself on new technologies that will benefit my students. My role has definitely changed from a teacher in full control to a facilitator.*
>
> *(Interview 2, Trish, August 2004)*

Conclusion

Teachers reported there had been insufficient time made available to properly implement the new technology in their classrooms due mainly to workloads and other work commitments. The perception that the introduction and implementation of the "Blackboard" had been rushed was strongly expressed in most of the teachers' responses. Teachers were not unwilling to integrate the new technology but expressed the belief that implementation would have been smoother and less stressful if there had been more time for them to prepare resources and lessons.

The amount of time spent planning and teaching using "Blackboard" varied between the teachers. Obviously the amount of time actually spent on planning lessons using "Blackboard" would affect the process of adoption, and it is therefore important to have some sense of each teacher's contact with the program when analysing his or her responses. Trish, for example, was in an ICT teaching position and consequently her greater contact with "Blackboard" occurred with training and assisting staff members and students.

Many teachers suggested that with ongoing professional development and access at school and home, the implementation would be much smoother, resulting in fewer problems. Generally teachers thought the situation would improve in the future as they gained greater mastery of the change.

Guhlin (1996) argues, "most teachers want to learn new technology but lack time, access, and continuous support" (p.13). Some teachers expressed the opinion that there had not been sufficient and continuous in-service training to learn about the new technology. It was often acknowledged that "Blackboard" was a valuable source of communication, although time and access issues were challenging for many teachers. Some teachers expressed the view that they lacked certain technology skills. Some teachers also criticised the professional development they had received and found it insufficient to meet their needs. They said the most useful outcomes of the professional development to date had been to help them get started, to introduce them to the program, and to build their confidence. According to Killion (1999), teachers particularly value professional development, which is:

- appropriate to classroom use;
- hands-on and practical;
- ongoing (internal or external); and
- supportive of teachers in working and sharing with each other.

Teachers also expressed strong views on the workload associated with the new technology change. Preparation of new lessons and online assessment was often cited as factors that increased both workloads and time management problems. The teachers reported having little interest in learning about and teaching new technology and planning lessons until they actually had a computer in their classroom or home. However, in terms of the implementation, there was an overwhelming opinion expressed that there was insufficient time in their busy schedules to properly implement the new technology.

Some teachers reported the new technology was difficult for some students. In particular, it was commonly expressed that ESL students and those with weak literacy skills were disadvantaged.

To understand the process by which the seven teachers came to integrate "Blackboard" into their teaching, and according to the interviews and observation periods, Rogers' (1983) theory of innovation, which was discussed in Chapter One, was used to categorise them. Trish, as an ICT coordinator who had done the greatest amount of work in getting funding and a grant to introduce the "Blackboard" program within the case study school, is categorised as *innovator* as she played a key role in that process.

Edward, Lisa and John could be categorised as *early adopters* as they relied on their initial experiences during the integration of "Blackboard" into their teaching and due to their leadership roles. Phillip was categorised by me as *early majority* due to the fact that he tended to observe other teachers' choices and decisions and formed his own when the time was right. He also was not afraid to venture around the program to find some useful pieces of work that would help him in his classrooms. Anne and Rhonda were categorised as *late majority* as they did not adopt "Blackboard" until most of the teachers had done so. They worked hard to integrate "Blackboard" into their classroom lessons, but the new technology was not as important when other factors disrupted their classroom environment. None of the seven teachers was considered in the *laggard's* category due to their ongoing commitment during the research period (Rogers, 1983, pp. 248-250).

CHAPTER 6

FINDINGS, CONCLUSIONS AND RECOMMENDATIONS TO IMPROVE PRACTICE AND FOR FURTHER RESEARCH

Summary of Findings

Patton (1990) states that the purpose of qualitative inquiry is to produce findings, and the process of data collection is not an end in itself. The culminating activities of qualitative inquiry are analysis, interpretation and presentation of findings.

Qualitative methods were used in this research and according to Stake (1995) provided for more concrete, contextual and constructed knowledge of each teacher's experience. Their levels of use, experience in integration, and practices in the classroom provided a vivid picture and better understanding that, in turn, provided the necessary data to answer the research questions. Analysis of the data across all teachers revealed that there was a number of common themes, as predicted by the research literature. Themes are identified by "bringing together components or fragments of ideas or experiences, which often are meaningless when viewed alone" (Leininger, 1985, p. 60).

Similar themes that emerged from the informants' perceptions and experiences were pieced together by referring back to my seven constructs and their typologies to form a comprehensive picture of their collective experience. The "coherence of ideas rests with the analyst who has rigorously studied how different ideas or components fit together in a meaningful way when linked together" (Leininger, 1985, p. 60). As a result of this analysis, it was possible to identify the most common issues raised across the study.

By referring back to the literature and research questions, I gained information that allowed me to make inferences from the interview transcripts, journals and field notes. In addition, I sought to discover how the teachers' feelings and perceptions influenced the integration of the new technology over the period of the study.

Findings Related to Research Questions

The study results are reported here according to the main research question and sub-questions.

Main research question: *How do the teachers perceive and experience the process of adoption of the "Blackboard" computer program in their classroom?*

In response to this research question, most teachers perceived the "Blackboard" program as a tool that has potential for enhancing student learning or simplifying tasks. For example, Trish said, *"Blackboard program is more like a store of information, an online teaching and learning tool, which will reform our school's ICT capabilities" (Interview 1, Trish, June 2004).* Anne also felt it could provide a supportive role in the classroom but definitely did not replace the teacher, when she said, *"The "Blackboard" as a web-based teaching platform should not be used to replace classes or teachers, but only to supplement them."(Interview 3, Anne, October 2004).*

All teachers did undergo a period of adaptation due to the introduction and integration of the "Blackboard" program. Between making lesson plans, marking papers, meetings, and yard duties, very little, if any time was left to learn a new computer program. In addition to classroom activities, teachers planned and evaluated lessons, sometimes in collaboration with teachers of related subjects. They also prepared reports, oversaw study halls and homerooms, supervised extracurricular activities, and met with parents and school staff to discuss a student's academic progress or personal problems. Some teachers felt comfortable moving away from traditional teaching methods (teacher-centred) or chalk and talk, to a more integrated approach. For example, Trish said, *"The boys respond to that ['Blackboard'] more positively than the teacher-centred approach, which I found really good". (Interview 3, Trish, November 2004).* Teachers recognised that "Blackboard" enabled them to achieve educational goals that focused on learning, not technology. A few teachers took this a step further to emphasise not specific content goals but students' attainment of independent learning skills. Although some teachers mentioned they enjoyed using "Blackboard", the majority of them suggested that the primary reason for using "Blackboard" related to how student learning was enhanced.

Rhonda, however, was particularly concerned for her lower achieving students with learning disabilities and ESL students: *"I feel that the new technology is designed to suit the upper and middle-level ability students and still disadvantages a number of ESL and low-achieving students." (Interview 2, Rhonda, August 2004).* She also believed that the use of "Blackboard" made classroom teaching/learning more dynamic and relevant, motivating students to actively engage in the learning process. As Trish noted, *"...So, the boys learn more, and enjoy learning more when they are actively involved, rather than passive listeners." (Interview 3, Trish, November 2004).*

All teachers described "Blackboard" as a tool that placed students in self-directive roles and themselves in facilitative and supportive roles. The teachers were no longer the centre of attention, but rather played the role of facilitator, setting projects and providing guidelines and resources, moving from student to student, providing suggestions and support for students' activities. Their students became active rather than passive recipients of information transmitted by their teachers or textbooks. Moreover, when "Blackboard" was used as a tool to support students in performing authentic tasks, the students were in the position of defining their goals, making decisions and evaluating their progress. The computer labs tended to be flexibly organised and managed with students moving easily among activities and groups. A great deal of students' work occurred in cooperative groups and revolved around the completion of project-based assignments.

All teachers interviewed described their classrooms as being student-centred; that is, they provided opportunities for their students to set their own goals, make choices about learning methods and activities, and self-evaluate progress. As Phillip said, *"I hope to be more of a facilitator, problem solver, someone there in case I am needed, and my students are more self-learners." (Interview 3, Phillip, October 2004)*

There was agreement amongst the teachers that the classroom management issue and technical difficulties had a major impact on how well "Blackboard" was used in the classroom. The teachers also considered the unreliability of the school computer system as another major impediment to technology integration.

This study has shown that teachers used "Blackboard" for a variety of reasons including enhancing students' learning, motivating them, providing additional sources of

information and adding variety to their teaching. Furthermore, key skills, such as collaboration; critical thinking, receiving feedback; planning and organisation of their work were also highlighted for both students and teachers.

Data analysis showed access at school and home to be very important to the teachers as part of the process of integrating "Blackboard" program into their teaching. It allowed them to learn new skills, design lessons, complete assessment and other teaching tasks online. Home access to a computer was also important because the teachers did not usually have time during the school day to work on new projects and plan lessons. Lisa, for example, suggested that laptop availability for her was the most important factor in supporting her application of the new technology in her classrooms. The teachers also stated that having someone to work with helped them in the process of learning and integrating the "Blackboard" program in teaching. All teachers identified a "colleague" with whom they worked to learn new skills, problem solving, or planning technology lessons using "Blackboard". Becker (1998) found that exemplary computer-using teachers were more likely to be found where there was collegiality among the teachers using computers.

Data from this study yielded the following benefits for me (the researcher) and the participating teachers of this study:

1. development of positive attitudes toward the integration of "Blackboard" in classrooms;
2. increased knowledge related to online pedagogy;
3. recognition of the value of technology integration in the teaching and learning process;
4. knowledge about content-specific uses of new technology; and
5. identification of classroom management issues.

The teachers identified "Blackboard" as a powerful tool to complement understanding of ICT concepts and supplement traditional teaching approaches. It was also seen as a way of opening up the classroom to the outside world and allowed students to communicate with other students about similar learning experiences.

Sub-question: *Do teachers undergo a period of adaptation during the introduction and integration of a new technology and how do they feel about the process of mandated change?*

In response to this research question, most teachers felt it was important to learn and use "Blackboard" in their computer lab in order to enhance their students' technology, problem solving and critical thinking skills.

Teachers' attitudes towards ICT were mixed, and varied between Key Learning Areas. Trish, for example, stated the importance of ICT in general and the "Blackboard" program for her students when she said, *"... the "Blackboard" program proved to be a very valuable source of information and communication technology." (Interview 3, Trish, November 2004)*. Anne also said, *"If "Blackboard" is used imaginatively, it provides possibilities, insights and efficiencies that are difficult to achieve in other ways." (Interview 3, Anne, October 2004).* Overall, teachers' attitudes toward the "Blackboard" program were positive. The majority of teachers wanted to develop their ICT skills and knowledge to supplement their traditional teaching methods. In other words, teachers needed to top up and extend their level of competence, to give them the confidence to use ICT and "Blackboard" with their students. They also needed and wanted to learn more about how to apply ICT effectively within a teaching and learning context.

During my first round of observations in Term 2, 2004, a lack of confidence and competence in using the new technology was observed in Rhonda and Anne's classes. Observations in Term 4, 2004 suggested that their levels of competence and confidence had increased (mainly due to greater familiarisation and practice with "Blackboard").

By the end of 2004, all seven teachers were demonstrating personal confidence in the change process. They were also demonstrating a commitment to the integration of "Blackboard" to enhance their students' learning.

Generally, the participating teachers valued the "Blackboard" program from both an educational and practical perspective. While Phillip felt "Blackboard" would transform his teaching, John, Lisa, Anne and Trish felt it was a very useful tool for supplementing their current teaching practices. Teachers believed an important benefit of "Blackboard" was its ability to provide abstract reinforcement for many of the concrete, experiential activities that took place in class.

At the first interview, Phillip was not confident in his ability to use "Blackboard" consistently and successfully. He stated, *"There are so many new technologies out there, and it is always changing. I see that as being a problem." (Interview 1, Phillip, June 2004).* He recognised it would take some time to become comfortable with the technical aspects of using "Blackboard". Rhonda also described instances in which she turned to her students for help with technical problems, when she said, *"…they are designated technicians for the problems we have with computers in my classroom." (Interview 3, Rhonda, October 2004).*

Teachers did not express embarrassment over having used students for technical support. In fact, they felt this was an important element of the school's learning philosophy that teachers and students both assume the role of learner within the classroom. Anne felt learning to use the "Blackboard" program was a worthwhile endeavor and would benefit students, when she said, *"Blackboard has a unique potential to extend and enhance students' learning in English." (Interview 3, Anne, October 2004).*

Cuban (1993) suggested teaching based on traditional practices would be more resistant to computers due to the discomfort with the child-centred potential in computer-based learning. It would stand to reason, therefore, that teachers in this case study, whose practice is based on student-centred learning, would be less resistant to the "Blackboard" program and more creative in its use. This was indeed the case for the teachers in this study. Teachers actively attempted to link "Blackboard" activities with hands-on experiential work taking place within the classroom. Trish described her use of the "Blackboard" as promoting communication and social interaction among students and between students and teachers: "… *the "Blackboard" has enabled me to communicate with both students and teachers alike, and it gave me access to an enormous amount of approaches to teaching." (Interview 2, Trish, August 2004).*

Sub-question: *Does teacher professional development on "Blackboard" integration combined with classroom application and other factors, such as access and time, foster positive teacher and student experiences toward technology?*

The findings for this research question included the results that influenced a teacher's decision to integrate the "Blackboard" program in his/her teaching. Not surprisingly, an availability of effective and ongoing professional development programs related to integrating "Blackboard" in the classroom was an important factor. As Rhonda stated, *"I wish I would receive more support from my KLA leader and also from the school: for example, through ongoing professional development programs on pedagogical uses of ICT." (Interview 1, Rhonda, May 2004).* According to Valli and Hawley (1998), professional development should be continuous and ongoing, involving follow-up and support for further learning, including support from sources external to the school that can provide necessary resources and an outside perspective. They also stated professional development should provide learning opportunities that relate to individual needs but are, for the most part, organised around collaborative and individualised problem solving.

Teachers mentioned time (e.g., not having enough time to search for appropriate technology-related materials) as being an influential factor in their integration of the new technology. John as a curriculum coordinator said, *"Using the "Blackboard" has taken so much time away from other professional tasks." (Interview 1, John, June 2004).* The issue of time in the process of integrating the "Blackboard" program into teaching is very complex. There was a number of issues the teachers identified that related to time. Even though they identified time as a constraint or limitation, they had all found some time somewhere to get started using the new technology in their classrooms. They would all have liked more time to work on developing new lessons using the "Blackboard" program. The complexity of finding time had not stopped them from progressing in the process.

The time constraint for teachers using a new computer program is a consistent theme in existing literature (Cuban, 1993). Gallo and Horton (1994) identified the necessity for uninterrupted time for teachers to become comfortable with using

computers. Knupfer (1993) asserts meaningful implementation of computer technology requires more time; time that is additional beyond the normal teaching day. Collaboration and good relationships among colleagues were also relevant and had an impact on how teachers effectively integrated "Blackboard" in their teaching. In other words, productive relationships among teachers engaged in sharing of ideas and practices enhanced teachers' confidence in and attitude towards the "Blackboard" program. Anne for example, stated, *"I like to practise on computers with a colleague to show me the basics and then I just need the time…" (Interview 2, Anne, September 2004).*

Most of the teachers in this study put in time after school, on weekends, and during the school holidays to acquire, practise and develop their new technology skills. John, as a curriculum coordinator, felt he needed the extra time to learn how to do things differently in his teaching with the program.

Two factors were identified that affected teachers' use of the new technology. The first had to do with the individual teacher and collective philosophies of teaching and learning. Teachers tended to adopt the "Blackboard" program, which was in line with their beliefs about how their students learn and which teaching methods worked best. Teachers, therefore, who believed the new technology improved learning, were most likely to use it on a daily basis. Some teachers who were less knowledgeable of computers perceived they needed more time, skills and adequate knowledge to implement "Blackboard" in their classrooms. They also felt that having basic knowledge of computers is insufficient to teach with "Blackboard" in their classrooms. They felt uncomfortable and under-prepared to teach with the new technology. For example, Anne, said, *"Heaps of time can be spent or consumed preparing a project in "Blackboard" to use for sharing information with a class." (Interview 3, Anne, October 2004),*

A second important factor was the individual teacher's attitudes to change in general and a proclivity to adopt or avoid the new technology in particular. Edward, for example, expressed his concern when he said, "*…I think that a teacher has to be ready to make a change and use the new technology in his/her classrooms." (Interview 1, Edward, June 2004).*

Rogers (1983) explains there are many factors that influence the rate at which educators adopt innovation: these include their relative advantage, compatibility with

current practice, complexity, "trialability", and observability of results. Extrapolating from Rogers' work, we can anticipate technology adoption will "take off" when ten to twenty five percent of a given group of educators are using technology in their ongoing teaching; that is the point at which interpersonal networks become activated. Staff development specialists say teachers need time and opportunities to work together and share ideas (Carlson, 1994).

Sub-question: *Do school leaders' attitudes towards technology have any influence on teacher and student perceptions and experiences in adopting the new technology?*

One of the most influential factors in the successful integration and implementation of the "Blackboard" program has been the personal motivation of individual teachers and the support from their Key Learning Area Leaders. As Edward stated,*"...I just think that teachers have to be ready to cope with change and use the new technology in their classrooms" (Interview 1, Edward, June 2004).*

While acknowledging not all teachers had such a strong personal motivation towards the new technology, it appeared the school culture was being influenced, to a degree, by the need for teachers, particularly Key Learning Area Leaders, to meet the present and future challenges of technology and school reform.

Attitudes of those in positions of leadership also played a role. Perhaps the most surprising finding of this study was the importance of the role of the Key Learning Area Leader and his/her support and ultimate impact on the other teachers in the school concerning successful practice and the integration of the "Blackboard" into the daily classroom routine and curriculum. Trish stated, *"I think what makes it (using the 'Blackboard') successful in teaching, is having good teacher-to-teacher relationships. I mean, ideally it would be a KLA Leader, I guess…" (Interview 3, Trish, November 2004).* Rhonda expressed some concern about the lack of support she was receiving from her Key Learning Area Leader when she said, "…*I wish I would receive more support from my KLA leader and also from the school" (Interview 1, Rhonda, May 2004).*

During my observations, I found that there was great diversity within the teachers in terms of how they teach and how they view things. Some were very random and fluid

and others were very strict and regimented in their attitudes to technology integration. Some were academic while others used a more vocational base and so there were many differences in teaching styles. This diversity in teaching styles and attitudes to technology did put additional strain on the administration and the leadership teams and on occasions it slowed down progress and the change process. But despite these differences, the key to the school reform was the willingness by all to respect the diversity and maintain a common vision about the teaching role. Trish commented: *"We always go back to those essential issues…why are we here? What is our purpose? What is our mission? And everyone agrees with that." (Interview 1, Trish, June 2004).*

Support by administration of teachers' initiatives to use "Blackboard" was cited as having a positive effect on the use of the new technology as was an availability of computer lab resources**.** It is important to note, however, that not all teachers interviewed in this study felt supported by their school administration and Key Learning Area Leaders. By providing technical support, as well as an opportunity to undertake an introductory workshop on "Blackboard" integration, the administrators demonstrated some commitment to "Blackboard" integration, in general, and to these teachers, in particular.

McIntire and Fessenden (1994) suggested administrators encourage active participation by the stakeholders when implementing new ideas and concepts into a school. Administrators can also encourage the stakeholders (classroom teachers) to be risk takers in integrating new technology in their classrooms. They stated that an administrator should encourage risk taking and should continually reinforce the idea that risks are viewed as learning experiences, and not necessarily as failures. This sense of encouragement was prevalent in this school.

Support for the Literature

The literature indicated that there is generally some adjustment period for the users following the introduction and integration of new technology (Beare & Millikan, 1983). Fear of change was raised as in issue in the literature (Davidson & Walley, 1984; Bloom, 1985) and was certainly evident in this study. Phillip commented, "…*There are*

so many new technologies out there and it's always changing." (Interview 1, Phillip, June 2004).

Barh (1990) sees change and the concepts of school improvements as an endless list of characteristics that attempts to make an "effective principal", "effective teacher" and an "effective school". He believes true school improvement occurs when children and adults are put in situations to learn simultaneously, think critically, solve problems important to them, and becomes a true community of learners where learning is endemic and mutually visible. Change or improvement must be sought and achieved collectively.

Lisa expressed her concern at feeling pressured to use "Blackboard". She had little time to prepare classes and was expected to learn about the new technology and to integrate it as well. Anne felt that since she had invested so much time in developing the "Blackboard" project for her senior students, she planned to use it for her next year's classes as well when she said, *"... I will use it next year with my new classes in order to save me time" (Interview 3, Anne, October 2004).*

Hargreaves and Fullan (1992) stated:

> Experienced teachers who have been teaching for some years will have developed ways of doing things, which they have found to work for them in their situations. Consequently they may be reluctant to abandon tried and tested methods for new ones, which they may be afraid will fail. With regard to technological changes some people may be 'afraid' of using new equipment, therefore they may doubt their ability to learn how to use it. (p. 47)

By the third interview and observations the negative perceptions and concerns of most teachers had dissipated. These concerns did not appear to undermine the teachers' overall willingness to learn the new technology, which may indicate there were sufficient positive factors including the perception that school leaders had a positive attitude, to balance the fears and concerns. A climate that supported change was evident within the school at the time.

Teachers expressed many concerns related to the use of "Blackboard". Some of the concerns were related to time, access, and professional development. These findings are consistent with the findings in the reviewed literature. According to Sheingold and Hadley (1990), teachers are the primary users of computers with students, and these

teachers expressed many concerns about the use of computers that can enhance their teaching and students' learning. Among the concerns reported were the lack of access, lack of time and lack of training on the use of computers.

The participants in this study did not exhibit any significant resistance to the change process. No teacher commented that he/she wished or hoped that the "Blackboard" program would not be introduced. Following its introduction and integration there was no evidence that any teacher actually avoided using the new technology. It may be the school's focus on change, particularly in relation to new technologies, that made it easier to adapt to the new technology.

When schools seek to improve, a focus on the values, beliefs and norms of both the school and the environment outside the school is necessary (Sarason, 1990). The effect of school culture on school improvement efforts is significant. The attitudes and beliefs of persons in the school shape that culture. Many times innovations are not put into practice because they conflict with deeply held internal images of how the world works, images that limit persons to familiar ways of thinking and acting (Senge, 1990). The school culture was one that was both steeped in tradition and one that was flexible enough to accommodate the changing educational environment. It supported a leadership team who promoted a vision, which focused on the students. It also supported teachers during a period when they faced major challenges to their basic beliefs and understandings about teaching and learning. The attitudes and beliefs of those in the leadership role create mental models of what schooling is and how others in the school should and could respond to events and actions.

Having a school climate that fostered and encouraged change may have also led to a culture that prevented overt resistance to change by deeming such resistance unacceptable. It is possible the teachers in this research censored their negative perceptions so as not to put themselves out on a limb and in opposition to the dominant culture. Such issues raise questions that could be addressed in further research, utilising methodologies to assess these cultural norms. It is beyond the scope of this study to do more than raise this question of the influence of the dominant culture on the responses of the teachers. The school culture or cultures are having a major influence on how teachers accommodate innovation in their classrooms.

According to Woodrow (1991), the success of any new educational program on computer technology depends largely upon the support and attitudes of teachers involved. He found teachers are likely to resist not only attempts but also suggestions for computer introduction if they perceived computer technology negatively. It is clear that teachers in this study expressed positive feelings in the use of the "Blackboard" program. Despite the fact these teachers were facing some problems with integrating the new technology, they were generally willing to "give it a try".

Data analysis showed most teachers believed the "Blackboard" program would at the very least increase their own skills and knowledge and reduce the workload in the longer term by saving course information for the future. Additionally, this particular group was receiving significant extra attention to their work due to being the participants of this research study. This extra attention may have led to a *Hawthorn Effect*, where the very fact that others were interested increased the teachers' positive feelings about their work (Bartol & Martin, 1991).

The possibility of a strong *Hawthorn Effect* having occurred in this study cannot be overlooked, as there was a number of factors that could have enabled its occurrence. A number of teachers in this study was receiving additional attention from the school administration team because of the integration of the "Blackboard" computer program in their teaching. They were the participants of this research, with me being another staff member. Within the school hierarchy some of these teachers have much contact with the school's administration, hence the effect of their involvement and interest would have been significant. The message being conveyed to these teachers from both the school leadership team and inadvertently from me was the importance of integrating "Blackboard" in their teaching, and their perceptions and views concerning the program were valuable.

As discussed earlier, some of the factors suggested by the literature as being necessary prerequisites for acceptance of a new technology were present. Bransford, Brown and Cocking (1999) provided many examples of how new technology work in practice and with what impact. They explored how these technologies can:

- bring exciting curricula based on real-world problems into the classroom;
- provide scaffolds and tools to enhance learning;

- give students and teacher more opportunities for feedback, reflection, and revision;
- build local and global communities that include teachers, administrators, students, parents, and other interested people; and
- expand opportunities for teacher training (p. 195).

Other factors that may also have led to this apparent acceptance include the school culture providing support for change overall; the minimal threat of loss of professional status, and their sense of being involved in the implementation of the program.

Conclusion

Teachers' attitudes towards mandated change are dependent upon how change affects them personally and professionally. Fullan (1993) argued a top-down process of mandating change discourages teachers' abilities to set goals, develop skills, respond to feedback, and become engaged in improving their practice. In contrast, it encourages teachers to become dependent on the latest innovation, driving them further from a sense of their own expertise and professionalism.

Based on the major findings that related to the main research question and sub-questions raised in this study, the process by which the school has introduced the "Blackboard" program into the curriculum has not incorporated an extensive professional development program for teachers nor the development and implementation of appropriate support infrastructure.

Despite arguments advocating the importance of professional development and teacher training, the school has largely left teachers to their own devices and time, with the instructions they were to integrate the "Blackboard" program in their subject areas. Teachers had no ongoing and structured professional development program nor has any support infrastructure been developed to assist teachers in coping with change to their teaching strategies.

This new technology not only represents a new method of teaching and learning, but new methods of delivery and assessment; as well the new technology needs to be

used to enhance collaborative teaching and learning. Use of the new technology in itself is not capable of achieving this. It requires innovation, creativity and adequate professional development for teachers and ultimately their students. Focussing careful attention on how new technology functions as a tool for teaching and learning can enable teachers to seize the opportunity to use this technology to enhance students' ability to construct understanding, share information and solve problems.

The idea of computing and information technology across the curriculum was to show students and teachers that information technology can be used for information handling in any disciplinary context. It can also be used to teach the basic concepts of certain types of applications and to provide an experience of information technology for all students. It was a broad approach to information technology awareness that sought to make the computers a "natural" part of students' and teachers' teaching and learning environments.

Teaching style was identified by a number of school documents to refer to the preferred relationship between a teacher and his/her students in the classroom. It included the grouping of students (whether the teacher preferred working with one large group of students, a number of small groups or individuals) preferred activities and communicative relationships.

For some of these teachers, a highly individualised classroom was "messy", uncomfortable and unacceptable. Changes to classroom organisation often required changes to teacher behaviour. The claim that technology has the potential to individualise learning had undoubtedly been attractive to Trish and Edward, but had the opposite effect on Rhonda and Anne.

Phillip and John saw their style as eclectic and hence providing no obstacle to the use of the new technology and computers. To these teachers, working on "Blackboard" meant each small group could be given a clear task to do. This may be the same or different but was ordered. It also contrasted favourably with other small group work in which students were working (or wanting to work) on very different tasks.

The success of any new computer technology program depends strongly upon the support and attitudes of teachers involved (Woodrow, 1991). For example, if teachers regard computers negatively or with suspicion, or believe that a new program (as it is

being introduced) will not work successfully, the educational utilisation of computers will be limited. A better understanding of the process teachers go through to integrate new technologies into their teaching will benefit not only teachers and administrators, but the students who will be learning in those classrooms.

The integration of the "Blackboard" program offered teachers in this case study school a unique opportunity to practise collegiality and support successful practices when effectively using the new technology in their classrooms. We now understand teachers need support in thinking about curriculum integration using new technologies. Teachers often become overwhelmed with their initial introduction to the new technology.

Teachers need time to practise using new technology in teaching in order to effectively access the massive amount of material available for them. Teachers are expected and do put in more time than ever before in their working lives. Add to that the access issues and stresses of trying to teach in innovative ways and professional development becomes an important factor. The following factors appear to be at the forefront: time; access; workload; professional development; technical assistance and support; and leadership support.

Time

Teachers who were integrating the new technology into their classrooms found time was a definite factor. Time to learn, time to practise and time to plan lessons using the new technology. It took time to learn how to use the new technology and to adapt the curriculum to incorporate it. The school organises every Monday a general staff meeting, so practice and planning has to come out of other "after school time" or evenings. Marking assignments and homework also has to be considered.

Time can be used as an excuse for not starting or doing a task. However, these teachers were all incorporating and working on advancing their use of "Blackboard" in the classroom as opposed to not starting at all. Even though they identified time as a constraint or limitation, they all found enough time somewhere to get started using "Blackboard" in their classrooms. They would all have liked more time to work on developing new lessons and technology skills. The complexity of finding time had not stopped them from progressing in the process. Teachers need time to gain initial

familiarity with new hardware or software, learning and practising for sustained periods. Teachers also need time to discuss new technology use with other teachers, whether face to face or through email (Renyi, 1996).

Access

Access was an important factor to the teachers as part of the process of integrating the new technology into their teaching. School and home access were important because teachers didn't usually have enough time during the school day to work on preparing lessons and other projects.

Time and access are two major factors which determine how effectively a teacher will plan and use new technology in their classroom lessons. These two issues are directly related to the funding that any school is willing to invest in new technology equipment and training time for the teachers. The time and access issues identified by the teachers in this study extend beyond the school building to their homes as well.

Workload

Another factor that impacted on teachers was stress and workload. Change of any kind is stressful! "Innovation in education is a stressful and often painful process for all involved, and particularly for teachers" (Black, 1997, p. 78). During the past three years at the case study school, the technology has changed from a Macintosh to IBM format and from stand-alone to networked computers. Changing from one computer system to another, learning how new systems work, planning how to implement the ICT are all stressful activities.

Successful implementation is the integration by the teachers of the ICT into teaching and learning. The extra time required in planning, practising and creating a new and innovative project is significant. Integrating new technology can be very stressful and undoubtedly impacts upon the teachers. Taking teachers from their more comfortable traditional methods of teaching and asking them to change the way they teach; put in more time to learn more technology and use the computer; practise, plan and create increases pressures on an already pressured profession.

A school can have the best technology ever made and access to the World Wide Web on every computer. It will not see much difference in student learning unless its teachers know how to apply the technology in their teaching and learning (Trotter, 1999). Research has demonstrated that providing basic familiarity with technology followed by individualised classroom support through tutoring, peer coaching, collaboration, networking, and mentoring is the best way to help teachers at a variety of experience levels to integrate new technology into their classroom practices (Miller, 1998; Norton & Gonzales, 1998; Saye, 1997). While providing technology-training programs worthy of teachers' time is important, inducing all teachers to enhance their job skills may ultimately require stronger incentives than self-motivation. Teachers must have substantial time if they are going to acquire and, in turn, transfer to the classroom the knowledge and skills necessary to effectively and completely infuse technology into their curricular areas (Boe, 1989).

Professional Development

The process by which the school has introduced the "Blackboard" program into the school curriculum has not incorporated preparing and running an extensive professional development for teachers nor the development and implementation of appropriate support infrastructure, like giving all teachers laptop computers on which to practise. Teachers have not had ongoing and structured training nor has any support infrastructure been developed to assist them in coping with change to their teaching strategies. In Term 1, 2004, teachers were offered only one internal professional development workshop on integrating the "Blackboard" program into their classrooms.

Teachers cannot be expected to accomplish the integration of the "Blackboard" program into their lessons without adequate ongoing training, collegial and technical support. Collegial support is an important aspect to ensure implementation continues. The environment in which the effective technological development of teachers occurs is built around collaborative learning. Because teachers varied in their level of expertise at the time of their initial training, the context which surrounds their technological professional development, must provide a non-threatening environment that is sensitive to the individual teacher's level of expertise and experience (Shelton & Jones, 1996).

McLaughlin (1978) states professional development is not a one-time event but is instead ongoing and immersed in a strong support group of other learners who help and learn from each other.

The teachers' descriptions of how they acquired their "Blackboard" knowledge and skills contain similar components. All have participated in one in-service workshop. Some of them have read manuals and learnt by working through the program until they encountered a problem, which forced them into the documentation or to collegial help. All have worked with a partner to learn new skills. All reported their new technology learning involved time outside of the regular school hours.

Technical Assistance and Support

It could have been very easy for teachers to become discouraged when something did not go right with the integration of "Blackboard" to return to old traditional methods of teaching. Technical support was essential for continued progress with integrating the new technology. The best way to win widespread use of new technologies is to provide just-in-time support, assistance, and encouragement when needed (McKenzie, 1998).

When teachers are trying to use a new technology in their classrooms and they encounter difficulties, they needed immediate help and support. Teachers will return to more traditional ways of teaching if the problems they encounter cannot be solved quickly and efficiently (Killion, 2000). Teachers must also become comfortable with supporting their students, who are frequently comfortable and adept at using the "Blackboard" program, to become more responsible for their own learning.

Leadership Support

A related issue that emerged from this research was the importance of the Key Learning Area Leaders, or other designated leaders recognising and supporting teachers in the school. With the assistance of effective Key Learning Area Leaders in the school, colleagues can more easily understand and more effectively apply the concepts of successfully integrating new technology in their classrooms. Effective Key Learning Area Leaders can help their area teachers feel more motivated with their new roles as facilitators of cooperative learning when integrating the new technology. Teacher leaders

can help peer teachers be more comfortable and more effective in this role by giving them guidance and support.

Teachers using the "Blackboard" program gain many benefits. These include communicating with other teachers and students electronically, information collection and organisation, collaborative problem solving and online assessment. Students will then successfully create projects through the effective use of "Blackboard", demonstrating their newly acquired knowledge and skills.

Today, secondary classroom teachers implement activities in which learners' outcomes and assessment strategies require students to apply new knowledge and create a product that will demonstrate the newly acquired knowledge. Recent research indicates classroom teachers are more important than ever and the role of the teacher has expanded to that of facilitator. Instead of teachers being replaced by online learning and other technologies, the role of the classroom teacher is evolving. In the future, the need for instructional leaders in the classroom will be more important than ever if successful learning is to occur (Collinson, 2001).

As the teachers develop skills with the new technology as a means to support their desired styles of classroom practice, they also have the opportunity to observe their colleagues and reflect with each other on alternative styles and practices, and the beliefs that undergird them.

Recommendations to Improve Practice and for Further Research

The following recommendations are based on the major findings of this study and the literature that complements this research. If implemented, they may result in improvements in individual schools and within the case study school in the future.

Recommendations for Schools

1. Not all teachers are motivated to use new technology. Teachers may resist for many reasons, including the fear of that technology threatens their role as experts and the feeling of inadequacy resulting from lack of prior mastery of technology skills.

Authors, such as Matherly and Matherly (1985) proposed strategies for overcoming the fear people have of computers and technology and their resistance to change. They point out some people will welcome and quickly adapt to change while others will resist it. However, there appear to be methods of introducing and implementing change that foster acceptance of the change. They add that approaches that minimise resistance could include teacher participation in the entire process, involving the users at all points in the decision-making process and ensuring their views are taken into account.

2. The best leadership and administration teams enable teachers to become the best they can be through consultation, collaboration, communication, support and encouragement. Active participation in the change process by all stakeholders, including students, teachers, parents, administrators and others from the school community is needed. Conner (2002) suggests technology leaders can begin to close the communication gap with teachers and teachers can become more informed about the benefits of planning and more involved in integrating technology.

3. Support teachers with limited experience of the new technology in the classroom by teaming them with teachers (colleagues) who have been successful in integrating "Blackboard" in their classrooms. Sharing successful stories with the rest of the staff and recognising those teachers who were successful, as well as those who are becoming successful. Jacobsen (1998) stated teachers who have adopted technology early are those who have much to contribute. She also wrote early adopters' efforts should be widespread and training, rewards/incentives and support should be considered to build a strong structure for teaching and learning.

4. School administration and Key Learning Area Leaders should publicly recognise, encourage and reward those teachers who have become leaders in the integration of new technologies in their classrooms. These teachers should be provided with additional time for training and mentoring other teachers with less experience.

5. Implementing a new technology can only succeed when the school leadership team commits to it in word and deed. One strategy for getting teachers involved with new technology integration is to give or lease all teachers laptop computers for their personal and professional use. Many state and private schools have set up such initiatives, typically with certain requirements, such as attending workshops on how to integrate new technologies. Crystal (2001) suggested teachers should be given laptop computers, which provides them with the flexibility to develop their skills and apply their new knowledge.

6. Teachers need adequate time to update their teaching methods in line with the latest developments in educational technology. Lesson preparation that incorporates these technologies places greater demands on teacher time and resources. The primary concern for most teachers is to have sufficient time (Shelton & Jones, 1996) to learn, train and practise.

7. Effective development of ICT skills and knowledge and enhanced use of ICT in the school requires a holistic approach comprising appropriate training (appropriate in terms of skills, knowledge, relevance to educational goals and priorities and delivery); ready access to ICT resources; and ongoing support and advice to encourage progression beyond any formal training. Classroom teachers should be involved from the beginning in planning the development sessions so they can be certain their specific needs will be addressed (Guhlin, 1996).

8. Professional development workshops seldom have the desired effect if teachers do not have an immediate opportunity to apply their new knowledge and skills. A successful professional development program should provide ongoing pedagogical and technological training that is tailored to teachers' needs. It should also support a learning environment where teachers are motivated to increase their technology skills and knowledge. A well-planned, ongoing professional development program tied to the school's curriculum goals, designed with built-in evaluation and sustained by adequate financial and staff support is also essential (Brand, 1997).

9. Unless teachers' beliefs, attitudes and values are addressed, then even the best developed implementation plans to support adoption are at risk. Rogers (1995) notes, "attitudes toward technology and its uses…play a substantial role in determining what will and will not be considered" (p. 140). Teachers will have a difficult time applying new technology skills in the classroom unless there is a direct linkage with the curriculum, teaching strategies or improvements in student achievement.

10. Teachers with positive attitudes to the use of new technologies should be encouraged to take risks and become lifelong learners. They should be encouraged to develop strategies to support "Blackboard" adoption and any new technology to improve student achievement. A positive attitude is required to develop strategies for using "Blackboard" to enhance engaged learning for "at-risk" students and using the new technology to enhance problem solving and critical thinking skills.

11. Each school needs to develop and maintain an active information and communication technology (ICT) planning committee, made up of the school (ICT) coordinator, support staff, administrators, key learning area leaders, teachers and parents. The committees must be established and play an active role in the planning and evaluations at the school level. New technology purchases and training expenditures at the school level must be made according to the school's wide vision and plan.

12. In order for schools to successfully introduce and integrate new technologies in their curriculum, it is essential that they consider the implications of adopting ICT standards/performance indicators for their teachers prior to wading into this large technology pond. It is also hoped that education systems, employer groups and individual schools will consider these standards in forming policy and implementing programs to develop competency. While it is evident that technology has a lot to offer education, it is important that it is not taken at face value and that adequate thought

and preparation is given to the introduction of new technology into the school curriculum.

Recommendations for Classroom Teachers

1. Teachers should be encouraged to familiarise themselves with new technology visions and plans established by their school. They should experiment with various technology applications, share ideas and collaborate with colleagues on new technology projects and uses. They should also be encouraged to participate in new technology evaluations that can support their own teaching and learning growth.

2. Teachers need to help Key Learning Area Leaders and coordinators know what is needed in the way of training, software and hardware. They need to let them know what does and does not work, and why, in order for well-guided decision making to take place.

3. In the constructivist classroom, the focus tends to shift from the teacher to the student. Constructivist teachers encourage students to constantly assess how the activity is helping them gain understanding. By questioning themselves and their strategies, students in the constructivist classroom ideally become "expert learners". This gives them ever-broadening tools to keep learning. With a well-planned classroom environment, the students learn how to learn (Strommen & Lincoln, 1992).

4. In assuming their new roles, teachers are expected to upgrade their knowledge and acquire new skills in the following areas:
    - *Pedagogy*: Teachers need new pedagogical skills so they can take full advantage of the potential of the new technology to enhance student learning.
    - *"Blackboard" integration*: Teachers need strategies to meaningfully integrate "Blackboard" into their classrooms. "Blackboard" must be considered as a learning tool and teachers need long-term skills and strategies for using the

program to support their curriculum, student outcomes and student learning goals.

5. Teachers will need to:
    - recognise the need for change and work towards it;
    - learn the most effective ways of implementing and using new technology with their students; and
    - communicate and collaborate with colleagues, and parents in order to nurture student learning.

    They should also enable their students to become:
    - information seekers, analysers and evaluators; and
    - problem solvers and decision makers.

There are a number of issues that have been presented and discussed in this study. Schools and teachers need to address these issues or at least consider them if they are going to successfully introduce new technology into the curriculum. Careful considerations need to be given to the teachers' perceptions and expectations.

Information obtained from this study will contribute to the growing body of research in the area of new technology introduction and integration in schools.

Recommendations for Further Research

Based upon results of this research, a follow-up study could be constructed to explore methods of planning, implementing and evaluating a professional development program that supports the use of "Blackboard" (or other technology innovations) in teaching. Technology is rapidly changing in today's society and because of this change a study could be replicated in two to three years on the school's population using a quantitative approach to investigate a larger number of teachers and students adopting new technology in their classrooms.

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APPENDIX A

LETTER OF PERMISSION FROM SCHOOL PRINCIPAL

15 October, 2003

Edison Shamoail

Dear Edison,

I am happy for you to undertake your research as described with teachers from the (School Name) College staff according to the protocols for research with human subjects of Victoria University.

I hope your research goes well and that you reach successful completion of the work.

Yours faithfully,
(Name)
Principal

APPENDIX B

GUIDING INTERVIEW QUESTIONS

FIRST INTERVIEW PROTOCOL-Term 2, 2004

Background information/ and knowledge, skills, and perceptions regarding the "Blackboard" Learning System (Release 6)

Teacher:
Location:
Date/Time:

When answering these questions, please feel free to explain and clarify your answers.

1) **Background Information**: *To obtain information about teachers' feelings, perceptions and prior knowledge, and experience with computers, and technology.*

- How many years have you been teaching?
- How do you feel about the use of technology in teaching?
- What are your best hopes and fears about this process of integrating a new technology into your teaching?
- Do you use a computer at home to do any work or only at school?
- Describe your role in the classroom when teaching with new technology? Change? Is that a change for you?
- Do you have computer skills, i.e. MS WORD, MS POWER POINT? If not, have you ever used MICROSOFT? If so, how did you manage?

2) **Knowledge about "Blackboard" Learning System (Release 6):** *To obtain data about the amount of knowledge the teacher has about the system, where that knowledge came from, training, etc.*

- When did you first hear about BLS. R6? How did you find out about it then?
- What do you know about BLS R6?

  - Purpose:

  - Why it's introduced:

  - Desired effects:
- What do you believe is the purpose of the introduction of BLS R6?

3) **Expectations regarding BLS R6:** *To obtain data regarding anticipated effects of BLS R6.*

- How do you feel about the time involvement that you are making to learn and integrate BLS into your teaching?

- Do you think BLS will make any difference to your workload? If so, in what ways? If not, do you anticipate any changes because of BLS?
- What is your greatest concern about integrating the "Blackboard" program?
- How do you think BLS will affect your computer skills?
- Do you have any fears/concerns re "Blackboard"? If so, what are they? If not, is there anything that worries you at any time about "Blackboard"?
- Do you think "Blackboard" will make any change to:

  - Face-to-face with students?

  - Change in the content of discussions with students/teachers?
- What do you think students will learn from using "Blackboard" technology?

OUTCOMES: *To obtain data regarding perceptions of possible outcomes following the introduction of "Blackboard".*

- Have you any thoughts as to what you would do if you were not happy working with the new computer system?

- Do you think "Blackboard" will affect your teaching method? If so, how?

Thank you for your time.
Do you have any questions you wish to ask me?
I will see you again for our second discussion on August 2004.

SECOND INTERVIEW PROTOCOL-Term 3, 2004

Implementation/Effects of "Blackboard" on teachers' work

Teacher:

Location:

Date/ Time:

1) **Information about "Blackboard":** *To obtain data about any changes in teaching responsibilities since the last interview and whether "Blackboard" is being used.*

- How do you feel now about the use of "Blackboard" in your teaching?
- How is the new technology changing the way you teach?
- How did "Blackboard" influence your view of teaching and learning?
- How did it influence your students' approaches to studying and learning?
- How do you use "Blackboard" computer program to prepare teaching lesson plans?
- Describe your (positive/negative) experience with "Blackboard"? (Time, access to computers, professional development, etc.)

- Positive Experience:

- Negative Experience:

a) Implementation of "BLACKBOARD":

- What types of problems or barriers did you experience in integrating "Blackboard" into your teaching practice?
- Could you describe your experiences in acquiring new technology knowledge and skills?
- How long have you been using "Blackboard" for? What percentage, approximately, of your teaching is now being performed on the new program?
- What tasks?
- What type of support would help you continue your progress in using "Blackboard" in your teaching? (e.g., KLA Leaders, collegial, etc.)
- Have you had any training on running the program?
  If so, what has it involved?
- Number of hours?
- In/out school
- Who from?

If not, will you be getting training?

Are you having any difficulties with using "Blackboard"?

If so, what are they?

Is it more or less difficult to use than you expected?

b) What are the reasons for you not using "Blackboard" yet? e.g., personal decision; workload; problem with computers; etc?

Effects of "Blackboard" on work: *To obtain data regarding perceptions of the effects of "Blackboard" on the work and expectations.*

- Using new technology in your teaching can take additional time and sometimes be frustrating, so why use "Blackboard" in your teaching practice?
- What differences, if any, has "Blackboard" made to your work?
- Have your hopes regarding what "Blackboard" could do been met? (Recall of hopes from first interview if appropriate)
- Have your fears/concerns regarding "Blackboard" proven correct? (Recall of fears/concerns from first interview if appropriate)
- What do you think the students have learned from using "Blackboard"?
- Describe your personal feelings towards "Blackboard" integration in your teaching.

THIRD INTERVIEW PROTOCOL-Term 4, 2004

Teacher:
Location:
Date/ Time:

This is the final interview and the purpose of this interview is to see how things are going now that "Blackboard" has been in operation for almost six months. Again, I am particularly interested in any changes that you think "Blackboard" has caused to your work as a teacher, and your thoughts and feelings about "Blackboard" integration in your teaching.

The format will be exactly the same. If you could answer the questions first, and again I am using it to help find any change in your perceptions over time. I will be using the tape-recorder again to ensure I have an accurate record of the interview unless you have any objections.

Thank you so much for giving me some of your time

OBSERVATION PROTOCOL

Teacher:

Subject:

Year Level:

Date/Time:

Description of teacher/student settings:

- Role of the teacher:

- Role of the student:

Description of the activity delivered using the “Blackboard” program:

Researcher/Observer Comments:

APPENDIX C
CONSENT FORM FOR SUBJECTS

CERTIFICATION BY SUBJECT

I certify that I am 18 years old or over (if not, please do not agree to the interview), and that I am voluntarily giving my consent to participate in a set of interviews as part of a research project entitled: "Teachers' Perceptions and Experiences in Adopting the "Blackboard" Computer Program in a Victorian Secondary School: A Case Study".

I certify that the objectives of the research, together with any risks and safeguards associated with the procedures listed hereunder to be carried out in the research, have been fully explained to me, and that I freely consent to participation.

I certify that I have had the opportunity to have any questions answered and that I understand that I can withdraw from this research at any time and that this withdrawal will not jeopardise me in any way.

I have been informed that the information I provide will be kept confidential.

Signed……
Witness other than the researcher……..
Date……

Any queries about your participation in this project may be directed to the researcher (Name: Edison Shamoail Ph. 94602789) or Dr Bill Eckersley (Supervisor:
Ph. 97477453). If you have any queries or complaints about the way you have been treated, you may contact the secretary, University Human Research Ethics Committee, Victoria University of Technology, P.O. Box 14428 MCMC, Melbourne, 8001
(Ph: 03 9688 4710).

APPENDIX D

SCHOOL'S POLICY ON TEACHING AND LEARNING

PREAMBLE

Central to the activities of a school is Teaching and Learning. Teachers at (the school) should strive to develop relationships with students that foster positive attitudes to improve learning. This should include the development of a love of Learning in the students as well as an ability to reflect upon their own learning. The importance of the partnership between home and school is understood and teachers should work with parents and colleagues in an open and supportive way to improve the Learning environment of the College.

PRINCIPLES

1. Teachers should engage in critical self-reflection of professional practices to improve the quality of Teaching and Learning and contribute to collegial reflection, sharing and dialogue.
2. Teachers should actively participate in Professional Development activities and programs, and demonstrate a commitment to continuous career learning.
3. Teachers should understand and work within the framework of school/employer policies and regulations and the law.
4. Teachers should have a good understanding of the principles of Teaching and Learning, including the characteristics of learners and their developmental needs.
5. Teachers have an obligation to motivate and engage students in their learning while using a range of teaching *methods, strategies and technologies* appropriate to learning context.
6. Teachers should use a variety of assessment strategies to provide multiple sources of information about student achievement.
7. Teachers should communicate with parents or guardians, students and colleagues in a professional and constructive way.
8. It is the responsibility of each teacher to undertake professional reading in order to be up to date with the latest educational theories and research.

GUIDELINES

1. Effective classroom management strategies should be used to encourage students to take responsibility for their learning and promote cooperative Learning environments.
2. Teachers should work with colleagues to ensure a common interpretation of student Learning outcomes, according to the school's curriculum framework.
3. Teachers should also work with colleagues to plan and implement new ideas, teaching strategies and applications of Learning technologies that improve learning outcomes for students.

4. Teachers need to have knowledge of strategies of classroom management and organisation.
5. Knowledge of the educational context including current and emerging system initiatives and the curriculum goals contained in the Mission statement of the school is required.
6. Detailed, accurate and informative reports on student performance should be provided to parents.

IMPLEMENTATION

1. Each staff member will develop a Professional Development plan, in accordance with the current agreement.
2. Teachers will work in designated faculty groups to design and evaluate courses and update related materials.
3. Teachers will maintain accurate and comprehensive records of student progress and achievement.
4. Teachers will provide ongoing feedback to the students on performance in a way that builds confidence and encourages continued effort.
5. Clear, challenging and achievable expectations for students are to be established by each subject teacher.
6. Through Professional Development opportunities and professional reading, teachers will be assisted to understand how students learn, and how they might modify their teaching practices to recognise this.
7. It is incumbent on all teachers to *continually improve their IT skills*, and to actively seek out ways to incorporate *Information and Communication Technologies (ICT)* into their teaching.

APPENDIX E

SCHEDULE OF TIMES FOR INTERVIEWS

Prior to Implementation of "Blackboard" Term 2, 2004

Monday	Interview	1	11:00am – 11:30am
	Interview	2	3:30pm – 4:00pm
	Interview	3	1:00pm – 1:30pm
Tuesday	Interview	4	11:00am – 11:30am
	Interview	5	12:00pm – 12:30pm
Wednesday	Interview	6	4:00pm – 4:30pm
	Interview	7	12:00pm – 12:30pm

During the Implementation Phase Term 3, 2004

Monday	Interview	1	11:00am – 11:30am
	Interview	2	12:00pm – 12:30pm
	Interview	3	5:00pm – 5:30pm
Tuesday	Interview	4	11:00am – 11:30am
	Interview	5	12:00pm – 12:30pm
Wednesday	Interview	6	11:00am – 11:30am
	Interview	7	12:00pm – 12:30pm

Post Implementation Term 4, 2004

Monday	Interview	1	11:00am – 11:30am
	Interview	2	12:00pm – 12:30pm
	Interview	3	1:00pm – 1:30pm
Tuesday	Interview	4	11:00am – 11:30am
	Interview	5	5:30pm – 6:00pm
Wednesday	Interview	6	11:00am – 11:30am
	Interview	7	12:00pm – 12:30pm

APPENDIX F

Member Checking Sample
and
Email Correspondence Sample

As part of member checking, I am sending you some interview transcripts that had been developed for your review.

Researcher: What I did after conducting the interviews was summarise them and then I have grouped them into major themes. One of the major themes that was talked about were the positive and negative aspects of the "Blackboard" program, and the way that you have been using the program and you mentioned lack of access and time as negatives. You also mentioned that "Blackboard" has been especially valuable online communication tool and it helped you in communicating with teachers, students and parents.

Participant: This is mainly what I use the program for.

Researcher: After reviewing the transcriptions, do you think it fits with your perceptions and ideas about "Blackboard" program?

Participant: Yes, it fits with my perceptions about "Blackboard". But there was only one thing I didn't like what I had said…what I meant was… so could you add these words to what I said and I think it will make more sense.

Researcher: And, then you went on to say… and you mentioned that you didn't have time to prepare lessons with "Blackboard" program… so could you please elaborate on this?

Email Correspondence with Informants

From: Edison Shamoail [eshamoail@ (school name).vic.edu.au Sent: Mon 17/9/04 9:30am
To: John, Rhonda, Lisa, Trish, Anne, Phillip, Edward
Subject: follow up from interviews

Dear All,

I am sending you this message as a follow-up to our last interview. You all mentioned that KLA leaders and collegial support, access, time, and ongoing professional development are very important factors in integrating "Blackboard" in your teaching and enhancing students learning. Could you please tell me more about some other issues that you feel would be useful to you to integrate "Blackboard" in your teaching, especially areas that were not covered in our interviews?
I am glad that our previous interview was completed successfully.
Thank you so much for your help. I will eagerly await your reply.

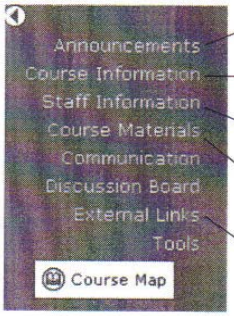
Kind Regards,
Edison Shamoail
Researcher

APPENDIX G

Blackboard Version 6 – User Documentation

Blackboard Navigation Buttons

Note: Your may choose to use the 'Text Navigation' (as shown below) menu rather than "Buttons". You might not use all of the tools listed below.



You have the option of viewing announcements from today, the last 7 days, the last 30 days or all of them. It is a good idea to post announcements about new assignments, an upcoming test, or a guest speaker, etc.

This area usually contains the course syllabus, course description and other information about the course.

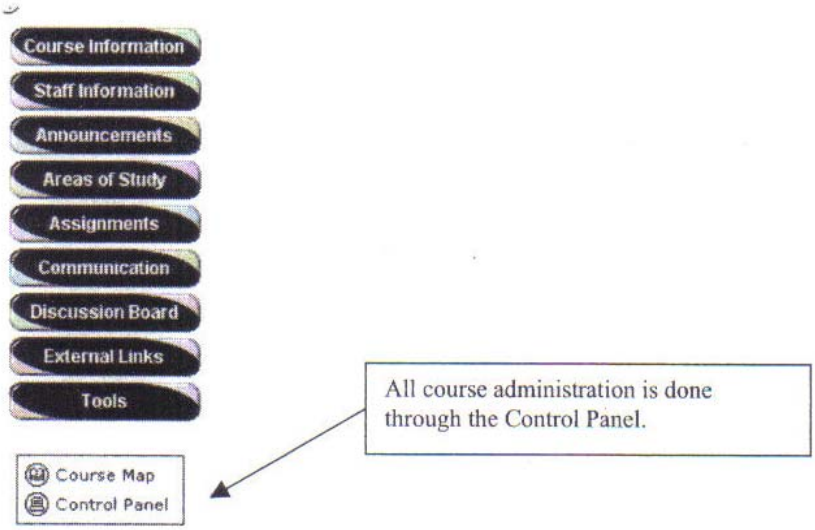
This area usually contains professional information about your e-mail address, phone number and office hours.

This area usually contains handouts for your subject.

Links in this section contain web sites to support learning materials covered in the course. Be sure to review the links to ensure they are still live.

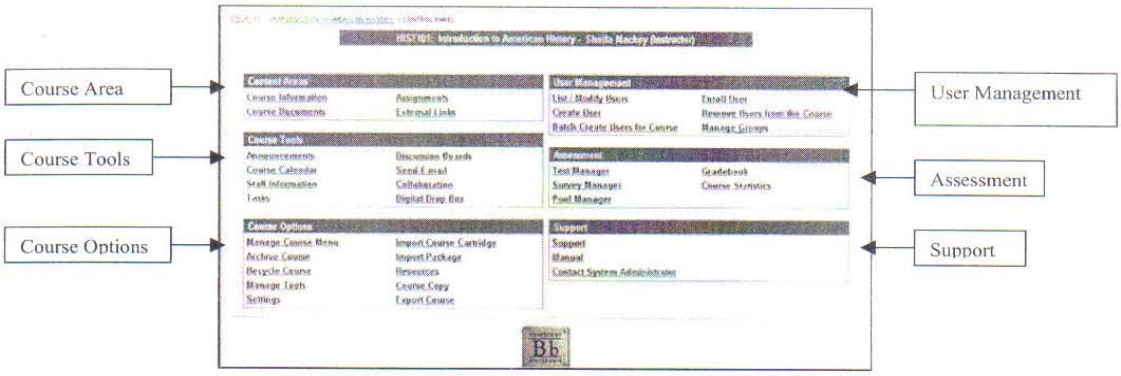
Control Panels

The control panel allows Instructors to upload files, read discussion boards, collect files, change the name of buttons etc. Students do not have access to manage the course.



The Course Control Panel is comprised of six areas:

Part	Function
Content Area	This area provides the tools necessary to add text, files, and information into a course.
Course Tools	This area contains the communication tools for Instructors to send email, create tasks, and work with groups.
Course Options	This area contains security and customization options for management of course components.
User Management	This area provides tools for the Instructor to manage users and enrollments.
Assessment	This area provides tools for building Assessments, recording grades, and tracking user activity.
Support	This area offers support contacts and online documentation.



Course Content

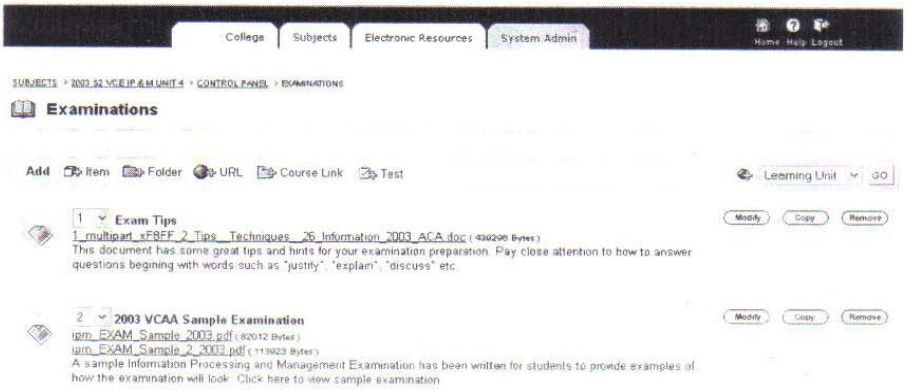
Overview

Course content areas are configured to meet the needs of the course Instructors. Instructors can use this area to organize all of their course materials. The following are examples of some of the more common items incorporated into content areas:

Tests: Tests are on-line evaluations that can be used to measure a Student's understanding of the course. Assessment properties, such as availability and presentation options, are managed through the Content area.

Assignments: Assignments include a description for class work and a due date. The Instructor may post an Assignment that includes attached files and Students may submit an Assignment that includes attached files.

Learning Unit: Learning Units enable the Instructor to set a structured path for progressing through a set of content within a course.

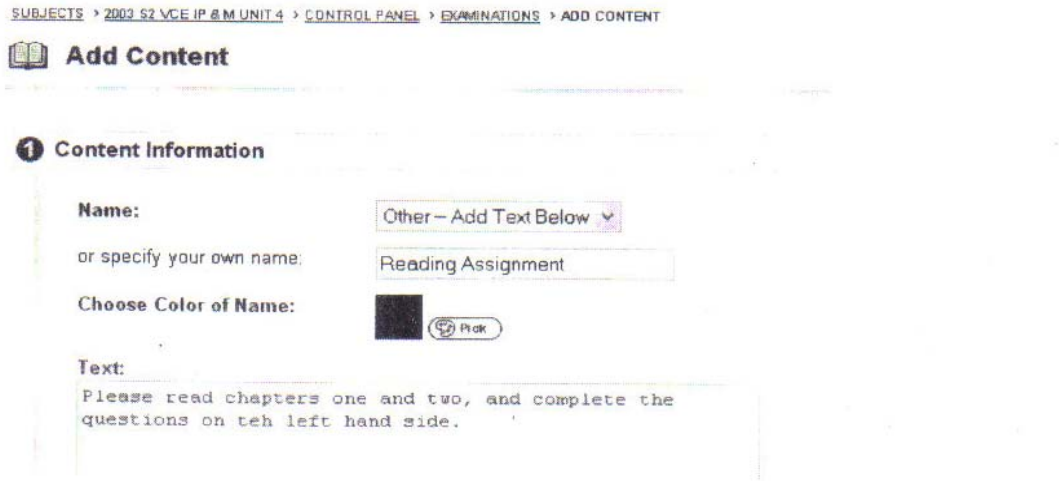


The functions available on this page are described in the table below.

To . . .	click . . .
add content	**Add Item** The Add Content page will appear. On the Add Content page text can be entered and files attached.
add a folder	**Add Folder.** The Add Folder page will appear. On the Add Folder page new folders may be created to group similar information together.
add a link	**Add URL**. The Add URL page will open. Please note that URLs may also be entered when adding content by selecting Smart Text or HTML when entering text.
add a course link	**Add Course Link.** The Add Course Link page will appear.
add Test	**Add Test**. The Add Test page will appear.
add another type of content	the drop-down menu and choose a content type from the list: · Select **Survey** and the Add Survey page will appear. · Select **Assignment** and the Add Assignment page will appear. · Select **LRN Package** and the Add LRN Package page will appear.
set or modify test properties	**Modify** next to an assessment. The Modify Test page will appear.
preview an Assessment	the name of the Assessment. The Preview Assessment: *Assessment Name* page will appear.
modify an item, folder, Learning Unit, link, or assignment	**Modify.** The Modify page will appear. On the Modify page the item name and text may be changed, files and links may be modified or removed, and the options may be changed.
remove an item, folder, Learning Unit, or link	**Remove**. A warning pop-up window will appear. Removing an item or folder is irreversible.
order content	the drop-down arrow and select a number. Content will appear to Students in the order selected.

Add/Modify Course Content Item

The Course Content areas enable Instructors to organize all of their course content. Items may be added or modified by accessing the Add Item page or Modify Item page. The fields on the Add Item page and Modify Item page are the same. The Add Item page and Modify Item page function in a similar manner. The difference being, the Add Item page opens with empty fields while the Modify Item page opens with populated fields.



Recognised Content Attachments

The Content Attachments area of the page includes options to create a link, display a media file, or unpackage a file. If **Display a media file within the page** is selected, the attached file must be a format recognisable by the *Blackboard Learning System*. If it is not, the *Blackboard Learning System* will automatically create a link to the file.

The following file types are recognized by the *Blackboard Learning System*.

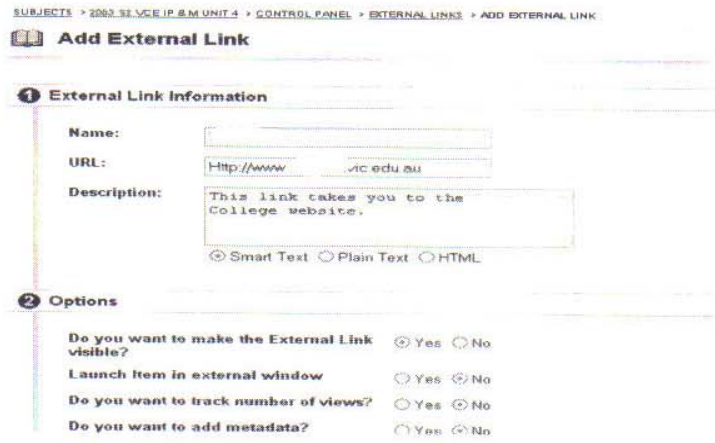
Extension	File Type	Programs associates with the file type
.aam	Multimedia	Macromedia® Authorware® plug-in
.aiff	Audio	Audio program
.asf	Multimedia	Microsoft® .NET™ Show
.au	Audio	Real Audio Player™
.avi	Video	Video player (not Macintosh® compatible)
.doc	Text	Microsoft® Word® or other word processor
.ea	Audio	Java™ enabled Web browser
.ev, .ev2	Video	Java™ enabled Web browser
.exe	Executable	
.gif	Image	Graphics program or Web browser
.html, .htm	Web page	HTML editor or Web browser
.image	Image	Graphics program or Web browser
.jpg, .jpeg	Image	Graphics program or Web browser
.jif	Image	Graphics program or Web browser
.mpe	Audio/Video	
.mpg, .mpeg	Image	Graphics program or Web browser
.moov	Movie	
.mov, .movie	Video	Movie or media player
.pdf	Text	Adobe® Acrobat® Reader®
.ppt, .pps	Slide show	Microsoft® PowerPoint® and PowerPoint Player®
.qt	Movie	QuickTime®
.ra	Audio	Real Audio Player™
.ram	Video	Real Audio Movie™
.swa	Audio	Macromedia® Shockwave® plug-in
.swv, .swf	Multimedia	Macromedia® Shockwave® plug-in
.tiff	Image	Graphics program or Web browser
.txt	Text	Text or HTML editor, word processor
.wav	Audio	Audio program
.wma	Audio	
.wmf	Graphic	Microsoft® Windows®
.wmv	Media/Audio	Microsoft® Windows®
.wpd	Text	WordPerfect® or other word processor
.xls	Spreadsheet	Microsoft® Excel®

The table below details the fields on the Add Content and Modify Content pages.

Field	Description
Item Information	
Name:	Select a name that best describes the content that is being added.
Or, specify your own name:	Enter a customized name for the information being added.
Choose Color of Name:	Click **Pick** to select an alternate test color for the name of the item. The default color is black.
Text:	Enter text into the field by either typing directly into the box or copy and paste text from another source. Select a text type from the following options: · Smart Text: Automatically recognizes a link entered in the text box. Smart text recognizes the ENTER key as a paragraph tag and accepts HTML tags as well. Smart Text will also prompt to load images if an image source text is used when adding smart text as part of a content item. · Plain Text: Displays text as written. · HTML: Displays text as coded using HTML tags. · ∑: Opens the MathML Equation Editor. · +: Opens the WebEQ Equation Editor. Click **Preview** to view the text as it will appear.
Content Attachments	
File to Attach:	Enter the file path or click **Browse** to locate a file. The file will appear with the item as either a link or the actual file contents. This option is specified in the **Special Action** field.
Name of Link to File:	Enter the name of the link that Students click to access the attached file.
Special Action:	Select the special action for the link from the following options: · **Create a link to this file**: Selecting this option attaches the file to the document. A link is automatically inserted below the document title to access the file. · **Display media file within the page**: Selecting this option embeds certain kinds of media within the page itself instead of creating a link. · **Unpackage this file**: Selecting this option indicates to the system that the file must be unpackaged before displaying. If the file format is not one of the supported digital media formats, the **Display media file within the page** feature will default to the **Create a link to this file** feature. A list of the file types supported by *Blackboard Learning System* can be found in Content Attachments.
Currently Attached Files:	The attached files are listed here.
Options	
Do you want to add offline content?	Select **Yes** or **No** to indicate that offline content is allowed or not allowed. Offline content is a direct path to a specified file on a CD-ROM that is usually provided by an Instructor. To access this file the user must have the correct CD in their computer.
Do you want to track number of views?	Select **Yes** to indicate that the system is to track the number of times a user accesses this item. Use the Course Statistics page to view a comprehensive report. Select **No** to indicate that the number of times this page is accessed will not be tracked.
Do you want to add metadata?	Select **Yes** or **No** to indicate if metadata will be used. Metadata is data about the added item, such as ownership, resource format, and copyright information. If this option is selected **Describe** will appear next to the item in the Content Area. Click **Describe** to access the Content Metadata page.
Choose date restrictions	Select the range of dates that the content will appear using the drop-down lists or click the icon for a calendar interface. To display content from a date forward, select a date in **Display After** but do not check **Display Until**. To display content from a set date until a future date, select a date in **Display After**, check **Display Until** and select a date.
Do you want to make content visible?	Select **Yes** to indicate that the item will be available for viewing when a user accesses the Content Area. Select **No** to indicate that the item will not to be available.

Add or Modify External Link

The Course Content Areas enable Instructors to organize all of their course content, including course items, folders Web links, and course links. Web Links may be added or modified. The fields on the Add Link page and Modify Link page are the same and they function in a similar manner. The difference being, the Add Web Link page opens with empty fields while the Modify Web Link page opens with populated fields.



The table below details the fields on the Add URL or Modify URL page.

Field	Description
External Link Information	
Name:	Select a folder name from the drop-down list.
URL:	Enter the Web address to the link. When adding a URL, do so as http://www.blackboard.com, not www.blackboard.com or blackboard.com
Description:	Enter a description of the folder. Select a text type for the description from the following options: · Smart Text: Automatically recognizes a link entered in the text box. Smart text recognizes the ENTER key as a paragraph tag and accepts HTML tags as well. Smart Text will also prompt to load images if an image source text is used when adding smart text as part of a content item. · Plain text: Displays text as written. · HTML: Displays text as coded using HTML tags.
Options	
Launch item in external window?	Select **Yes** or **No** to indicate if this item should open in a separate browser window.
Do you want to track the number of views?	Select **Yes** to indicate that the system is to track the number of times a user accesses this item. Use the Course Statistics page to view a comprehensive report. Select **No** to indicate that the number of times this page is accessed will not be tracked.
Do you want to add metadata?	Select **Yes** or **No** to indicate if metadata will be used. Metadata is data about the added item, such as ownership, resource format, and copyright information.
Do you want to make External Link visible?	Select **Yes** or **No** to make the content visible to Students. If **No** is selected, none of the information entered on this page will appear to Students.