# Effective Implementation:

# A Case Study of the Introduction of ICT in One School

by

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## ABSTRACT

The objectives of this case study were to provide insights into conditions that assist effective implementation of ICT and online learning in one school, the assessment of innovation and change using a concerns based adoption model (CBAM) and how school leadership interventions have an impact on change management. The methodology involved questionnaires for all students from years 7 – 12 and all teachers from kindergarten to year 12, with an interview for a selective group of teachers, known for their "best practice" in online teaching. Findings include the utility of the CBAM model to monitor the implementation of educational change and to describe, explain and predict probable teacher behaviours with professional development planning. The study finds that effective ICT implementation can be compared with the effective implementation of any educational innovation. The focus on leadership and change management is as important as, or more important than the focus on technology.

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# CHAPTER 1: INTRODUCTION

> *The introduction of ICT into schools has not yet delivered the promised revolution and improvement in standards and student achievement. Is it a matter of keeping the faith, or persevering whilst making some further adjustments or abandoning the project as misconceived? Or do we need to do some radical rethinking?*
>
> (David Hargreaves, 2004, p.1.)

The aim of this exploratory and qualitative case study was to explore, develop and apply a range of methods for evaluating the effective implementation of ICT and online learning in a school. The study was undertaken because there is a need for evidence informed policy and practice on increasing levels of ICT and new learning infrastructures to drive school improvement and school effectiveness. The research outcomes from this case study are likely to assist in this regard.

School managements, state governments and federal policy makers have recognized that teachers need extensive resources so as to enhance organisational capacity and to change teaching practices in regard to the use of technology. Nominally, the key public policy factors for ICT innovation and change in schools are often grouped into six main areas: availability and provision of equipment, infrastructure and broadband connectivity, technical support, leadership, development of online educational content and professional development time. These same factors reflect the federal government's research themes (Ministerial Council on Education, Employment, Training and Youth Affairs, 2003) and in its inclusion of ICT in its '10 point agenda' for *Taking schools to the next level – the national educational framework for schools.* Other large scale funding examples of these key public policy trends are the technology grant programs in each of the Australian states in the last five years (White, 2004).

In March 2000, Australia's Ministerial Council for Employment, Education, Training and Youth Affairs (MCEETYA) had endorsed a policy guideline for the implementation of ICT in teaching and learning in its statement, called the *Adelaide Declaration on the National Goals for Schooling in the Twenty First Century*, MCEETYA 2000). The overarching goals of the plan, were that:

> • all students will leave school as 'confident, creative and productive users of new technologies, particularly information and communication technologies, and understand the impact of those technologies on society".
>
> (MCEETYA 1999, p. 2)

> • all schools will seek to integrate information and communication technologies into their operations, to improve student learning, to offer flexible learning opportunities and to improve the efficiency of their business practices.
>
> (MCEETYA 2000, p. 3)

MCEETYA's ICT in Schools Taskforce provides strategic advice to the Australian Education System Official Committee (AESOC) on the use of information and ICT to support teaching and learning. In 2000, it endorsed the development of an ICT in Schools Research Strategy to identify the kind of research important to the successful adoption of ICT in teaching and learning and proposes models whereby this research is made readily available to practitioners and the community. In proposing a conceptual model for a discussion paper on the emerging ICT research agenda, the authors, Pugh and Yaxley (MCEETYA 2002b) called for 'participatory action research' by stakeholders and a balance of four overlapping dimensions, namely learning possibilities, the necessary conditions for learning, educational effectiveness, and accountability. They argued that the task to establish for learners those conditions necessary for effective e-learning should be

the major focus of ICT research in education, which will in turn contribute to the ongoing need for accountability to all stakeholders.

## Background

In the past five years in the USA, UK and Australia, some educators and policy makers, often influenced by Cuban's (2001) dramatic critique of computers being "oversold and underused" in American schools, occasionally question the huge financial investment of ICT in schools and demand new evidence of the school or classroom effects or the gains in student achievement outcomes (Becker, 2000; BECTA, 2003a, 2003b; Cuttance, 2001; Hargreaves, 2004; MCEETYA ICT in Schools Taskforce, 2002a; OECD, 2001). In Australia, there have been concerns built on substantial evidence based practice that the potential for ICT in Australian schools has not been fully realised (Meredyth et al. 1999). Pragmatically, there is now an urgency for educators and school administrators to assess the research outcomes. Hargreaves (2004), as in the opening vignette, suggests some radical rethinking. He has called for a re-conceptualisation of ICT innovation and transformation in schools with a different "Research and Development" model.

There is a lack of consensus in relation to the purpose of technology in schools. Is it a teaching tool to prepare students for the workplace, for raising student achievement, to improve school climate and student engagement, or to foster other change and reforms, such as the way teachers teach? As a long time skeptic of educational technology in the U.S.A., Larry Cuban (2001) believed educators need to agree on the goals for using this technology, which would then enable more apt decisions to be made on how much to spend and on what conditions.

Most of the national research in terms of ICT use in Australian schools reports a heavy reliance on qualitative surveys rather than quantitative measures of differences in student achievement. Internationally funded and longitudinal studies (IEA sites, 2003; BECTA's ImpaCT2, 2003; OECD's CERI studies, 2003; and the ongoing PISA, 2000-2005 investigations), however, have sought to develop instruments for measuring the impact of ICT integration on students' achievement.

This study highlights those methodological problems that exist in attempting prescriptive or normative research approaches. One notable conclusion from this study is that more national longitudinal and empirical studies are needed to document the school and classroom effects of successful implementations of ICT and online learning. To achieve that, the studies will need to focus on more outcomes of the teachers' successful use of ICT and online learning. It is anticipated that the research outcomes from this study could help describe the conditions (environment, organisation and change strategies) in a school that are likely to assist the effective implementation of change and school improvement through the integration of ICT in teaching and learning.

To achieve these objectives, information has been retrieved via the web-based information services and networked subscription databases for the last ten years. In particular, the *Australian Education Index* via *WinSPIRS*, the American and Australian databases via *Proquest*, the *EdNA ICT research* website, the international *ISTE.org* and the English *BECTA ICT research discussion forum* have been the most valuable information services. Technology related publication links for 'white papers' on both Australian and USA federal government education websites have been major leads to what has been valued in the academic and tertiary sectors.

It is noteworthy that the success of the literature review for retrieving large systemic studies depended on these electronic databases and digital resources rather than the tradition printed journal and monograph literature. Notwithstanding the subject area, a preference on the part of the researcher existed for using the Internet connectivity of the educational innovation networks online and the online refereed papers from academic institutions disseminating descriptive research reports.

## Purpose and significance of the study

Beyond the integration of ICT into normal classroom practice, the research base for online learning and the conditions necessary to support the needs of learners online in junior and middle schooling in Australia is limited. In the tertiary and senior secondary sectors, where flexible learning, distance education and specialist IT discipline teaching models exist, the research provides new evidence that this new form of teaching and learning requires change strategies for professional learning, technology standards, curriculum standards and communication tools to be effective.

Too often, new ICT school programs and initiatives falter when teachers' concerns about changes are inadequately handled before the innovation or initiative is implemented. Supporting implementation is a function of leadership because it is the most likely stage (in the cycle of plan, develop, implement and evaluate) where an educational initiative is likely to fail (Darling-Hammond, 1996).

The current case study was intended to add to the scant literature which describes the conditions for effective implementation of online learning. Specifically, this case study had four purposes:

1. to better understand students' and teachers' attitudes to, and levels of use, of ICT;
2. to provide insights into the conditions that assist effective implementation, particularly the issues that must be addressed when instituting any new ICT program or innovation.
3. to capture the assessment of innovation and change using a 'concerns based adoption model' (CBAM) so as to describe, explain and predict probable teacher behaviours in the change process; and
4. to reflect on, and to provide an understanding of how to further develop change strategies and interventions that have an impact on school improvement.

This study was unique because assessment of the implementation of online learning as an innovation and change using the CBAM model had not been conducted in a K-12 Australian school. The only related study is the one by Newhouse (1999) in which the CBAM model was employed in a three year interpretive case study in an Australian secondary school where he examined how teachers adjusted to the availability of portable computers.

## Conceptual framework

The task of synthesizing the four purposes of this study, as pieces in one puzzle, from the point of view of the researcher's role as a change facilitator in the case study setting required a conceptual framework. Such a theoretical framework could potentially provide a holistic understanding, common terminology and a reduction in tautology.

Reflection has long been a guiding metaphor in the philosophy of education and the review of teaching practices. Writers and researchers alike have developed the metaphor, from

John Dewey's philosophy on the moral, situational aspects of teaching and Schon's reflective practitioner (cited in Smith, 2001). The role of reflection has been described repeatedly in studies of teacher effectiveness (Stronge, 2002) and principal leadership (Sergiovanni, 1999, 2000). They have refined the metaphor through multiple lens and views like refracted light on mirror images. The metaphor provided the writers and researchers with insight into contextual approaches and the connections between words and actions, even though they may contain assumptions beyond the explicit meanings that the researcher wishes to make.

> "When *I* use a word," Humpty Dumpty said, in a rather scornful tone, "it means just what I choose it to mean-neither more nor less."
> "The question is," said Alice, "whether you can make words mean so many different things."
> "The question is," said Humpty Dumpty, "which is to be the master - that's all."
> (Lewis Carroll's *Through the Looking Glass,1872, p. 198)*

The notion of a looking glass provides a useful metaphor for this study. The lens of the looking glass can reduce the complexity of the educational scene or context and highlight particular features for further study. From the literature search, these directions were discernible. First, the innovations model, and specifically Rogers' (1995) "diffusion of an innovation" model, could predict attitudes to and rates of adoption of ICT innovations. Second, the "concerns based adoption model" of the "stages of concern" and "levels of use" (CBAM, 1981) could prove a useful staff development tool for describing the effective implementation of ICT for online teaching and learning. Third, the leadership and organisational change implementation models could provide strategies for successful implementation of online learning.

These directions, or theoretical constructs, formed the conceptual framework of this study or the clear glass in the lens of a looking glass, rather than the reversed image facing Lewis Carroll's characters. One of the fundamental strengths of a looking glass or a magnifying glass is its ability to provide a different, but still unified view of what it is examining. It can remove the complexity of the view, in this study, that of the teachers' views, as it

removes data that is not relevant to them in their current role or task. Yet, at the same time, the lens cut through the surface view and exposes deeper levels. Both the focus and the magnification can be altered dynamically at any time. The study's context, rationale and significance as well as logic for organising the analysis of data is represented in the looking glass in Figure 1.1. In the hands of school leaders, it is a lens for guiding the teachers, providing the insights and the interventions into the conditions that assist effective implementation of ICT and online learning.

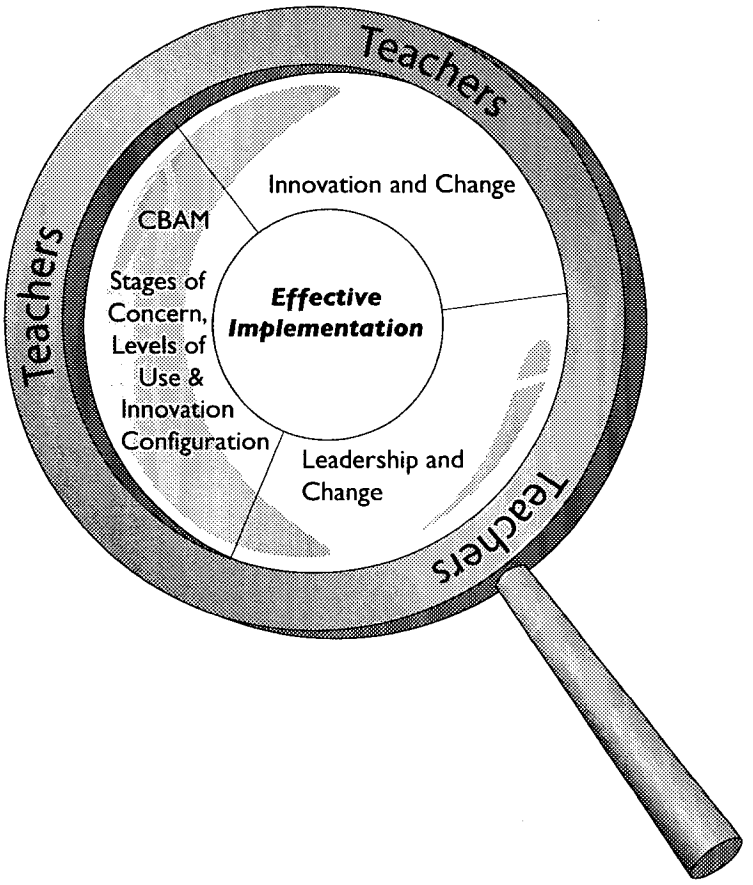


*Figure 1.1* Using the looking glass metaphor as a conceptual framework for the research study.

As Bailey (1991) describes, as the underlying constructs are encompassed, the scope of the research study is put into a context and defined, marking the boundaries of the study. The embedded 'units of analysis' are delineated (Yin, 1994, p. 22) and the logic for organising the analysis of data is clear. Nevertheless, as Hocking (1988) notes, the conceptual framework will not limit the introduction of new elements which can emerge in the course of the data collection, nor constrain the interpretation of the significance of, or relationships between the various elements.



## Scope of the study

As the focus of the study was on effective implementation and change, and the process rather than the outcome, the research methodology adopted was a case study. The methodological approach was a case study employing questionnaires for all students from years 7 – 12 and all teachers from kindergarten to year 12, with an interview for a selective group of teachers, known for their "best practice" in online teaching. The project was conducted over a period of two years at an independent school in Tasmania, which is a school for boys, aged from kindergarten to year 12. As an entity in itself, comprising bounded units of mini-schools, staff and student groups, and facilitating purposeful sampling, this school is in terms of this study, nominally representative of large independent schools in Australia.

In part, the study involved a questionnaire that focused on students' computer use and online learning and one that focused on the adoption of ICT and online learning for innovative teaching practices. It was not intended as an evaluation or as an audit of ICT skills and teaching practice, but rather as a profile of one school in a case study.

The process for approval of the research within the school grew out of discussions over a number of years, between the Principal and the researcher (who is employed as a teacher at the school). Discussions regarded a mutual aim to focus on the change occurring with the implementation of ICT programs. The Principal gave approval in writing to formalise Stephens School's [pseudonym] support of this research study and the case study methodology.

## Assumptions

One major assumption that is not testable in the research methodology of this case study is that of the underlying belief in the value of ICT in school improvement. Also inherent in this case study is the assumption that the examination of the change process of the effective implementation of ICT is a valid measure for the impact of ICT on student performance or achievement.

## Limitations of the study

The study was conducted with some limitations. One weakness in the exploratory case study research was the subjectivity and intensive use of empirical evidence and a volume of rich data with a temptation to try to capture everything. This is similar to Eisenhardt's (Huberman & Miles, 2002) point of view that the result of theory building which is rich in detail can lack the simplicity of overall perspective.

A possible limitation is the close involvement taken by the researcher in the participant-observer role. As Burns (2000) describes, where the observer is part of the context being observed, data collection can be both modified and influenced by this context giving a role conflict. Nevertheless, as Babbie (1999, p. 265) contends, "*anything* that the participant-

observer does or does not do will have some effect on what is being observed or what happens, it is simply inevitable". Conversely, the danger is to "go native" and lose scientific detachment. Sensitivity to these limitations; however, as Babbie (1999) concludes, may provide a partial protection. It is a more ethical stance than the complete participant where the group under study is not aware of the research. Burns (2000) suggests that the end result is an analytical description and interpretation of a highly complex system. In the end, Babbie (1999) advises that the researcher has to rely on understanding and good judgement about the situation, guided by both methodological and ethical considerations.

This case study research will not necessarily produce propositions that can be generalised across all ICT implementations in K-12 independent boys' schools; however, it is intended to go beyond mere reflection of one change facilitator and participant-observer to report on multiple dimensions and to provide the insights into conditions that assist effective implementation in similar schools. Using multiple sources of evidence to increase validity (Yin, 1994), and to guide empirical inquiry under rubrics of trustworthiness and authenticity (Lincoln & Guba, 2002) can be strengths of case study research.

The need for balancing ethical and methodological considerations occurred with data collection as well. The Principal believed that his permission for the case study in the school, his governance and the existence of the school rule which covered the collection of personal information "in loco parentis" meant that the researchers' requirement for active consent by parents (that is, parents signing a consent form and returning it to the researcher) created unnecessary logistical issues at the school. It could be argued, therefore, that this requirement reduced participation rates through the iterative process and

contributed to some teacher resistance to ongoing involvement in the research. By the time the teachers who were also class tutors, received their copy of the teachers' questionnaire, they could have handled several distribution and receipt/return batches for the parent consent forms and student questionnaires.

One diagnostic instrument of the CBAM model, the concept of the mapping of the Innovation Configuration (Hall and Loucks, 1981), was outside the scope of this study. It involves identifying and defining the operational components of a professional development program, then analysing the patterns of use of the components by the teachers and the interventions by change facilitators. The configuration is the form a process or product takes on during actual use and adaptation. A limitation rather than a weakness of the study, it meant that the important benefit of the innovation configuration for consensus building was not available. In this study, Innovation Configuration has been employed in a different way to meet the purpose of achieving a better understanding of students' and teachers' attitudes to, and levels of use of ICT. Data has been gathered on student use at home and students' experiences at school, students' skills, competencies and understandings of ICT, as well as teachers' use, skills and attitudes to ICT and online learning.

## Definition of terms

*'ICT' is 'Information and Communications Technology'* and generally refers to the hardware, software, skills and communications of using networked computers. Specifically, it refers to the convergence of information and communications technologies.

*'Online learning'* was used in the study in its broadest sense of the learning that occurs

when the delivery is via the online tools, the Internet or an Intranet, that is, computing and communications technologies. It includes courses, parts of courses or units of work that involve an integral online component.

The term, *learning technology*, adopted by most Australian states represents a process wherein students are engaged in activities or strategies for working and thinking using technological tools or processes (ACCE, 2000). An identifiable change of focus from the term to a "more commonly shared reference of ICT" has occurred in the most recent years (Finger and Trinidad, 2002, p.2).

Teachers' *technology competencies* refers to those competencies or capabilities that teachers demonstrate when using technology, such as when using computers and the internet in their classrooms (ISTE 2002).

*Teacher behaviour* is the way a teacher performs in their normal process of teaching.

An *effective school* is defined as one in which students are able to achieve, in a wide range of endeavours, at a level consistent with their potential (DEST, 2004).

*School improvement* is defined within a framework of teacher effectiveness and the capacity of every student to learn, given the right support and learning environment (DEST, 2004).

The *case study* is defined as an empirical study that investigates a phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident (Yin, 1994).

*Innovation* is used in terms of substantive and positive change brought and d*iffusion of innovation* is the process by which an innovation is communicated through certain channels over time among the members of a social system (Rogers, 1995).

Along a theoretical continuum of models of integration of ICT skills and competencies in teaching and learning, often termed simply as *integration of ICTs,* there are existing descriptions of curriculum management and varied pedagogical approaches over the last 20 years as well as years into the future. First is the specialist IT subject in a school curriculum which integrates ICT skills and competencies with information technology from the subject discipline. In this model, other subjects may remain unchanged or cross-curriculum links may be developed. The second model focuses on equipping all teachers with ICT skills and competencies to enable them to integrate ICTs into classroom practice. In this second model, there is an expected impact on teachers' pedagogical practices and classroom organisation. Third, when the ICT is a lever for curriculum change, it impacts potentially on curriculum content, teachers' pedagogical practice and students' information literacy. Along this continuum, is a systemic model of innovation and whole-school change for transformative leadership, school improvement and student outcomes. Finally, as reminded by Rogers (1995), the continuum involves the discontinuance of innovations as they are replaced by promises of more rewarding innovation and change.

The *Concerns-Based Adoption Model (CBAM)* is a conceptual framework that describes, explains and predicts likely teacher behaviours in a change process (Hall and Hord, 2001). It includes three principal diagnostic dimensions or change measurement tools: Stages of Concern (SOC), Levels of Use (LoU) and Innovation Configuration (IC). *Stages of Concern (SOC)* is a dimension of CBAM in which educators can experience seven different reactions when they are implementing an innovation. *Levels of Use (LoU)* is the second dimension of CBAM which educators experience as they become more familiar with using an innovation. The third dimension of *Innovation configurations (IC)* or different ways in which teachers adapt innovations their own situations. Innovation Configuration has been employed in a different way to meet the purpose of achieving a better understanding of students' and teachers' attitudes to, and levels of use of ICT. . Data has been gathered on student use at home and students' experiences at school, students' skills, competencies and understandings of ICT, as well as teachers' use, skills and attitudes to ICT and online learning.

## Summary

This chapter introduced the study, including its background, the purpose and significance, the conceptual framework, scope, assumptions, limitations and the definition of terms. In summary, the purposes of the exploratory study are:

- provide insights into the conditions that assist effective implementation, particularly the issues that need to be addressed when instituting any new ICT program or innovation;
- describe, explain and predict likely teacher behaviours in the change process; and

- provide an understanding of how to develop change strategies and interventions that have had an impact on school improvement.

## Outline of the study

The next section, Chapter 2, explores and reviews recent research and literature, building the conceptual framework relevant for this study as well as identifying some criteria by which this exploratory study can be judged successful. In Chapter 3, the exploratory case study approach, the CBAM Stages of Concern and the CBAM Levels of Use diagnostic instruments are introduced. The methodology in Chapter 3 continues with the selection of participants, the recruitment of those student and teacher participants, as well as the data analysis procedures for the students' and teachers' questionnaires, teachers' interviews and teachers' open-ended statements are described. Chapter 4 focuses on the results from the surveys, interviews, and the open-ended statements. Chapter 5 discusses the findings, compares those findings with outcomes in related studies, presents the interpretation of the findings, the implications of the study, and concludes with the recommendations for future research.

# CHAPTER 2: LITERATURE REVIEW

> *But wasn't ICT meant to usher in a transformation of education? Isn't that why governments spend so much on it? Is this why the critics write books with titles like 'oversold and underused' or the 'false promise of technology in the classroom?'*
>
> (David Hargreaves, 2004 p. 4.)

## Introduction

This literature review examines current research literature and empirical studies investigating the effective implementation of ICT and online learning in K-12 education in Australia and internationally. The main areas of focus are innovation, concerns-based theory, leadership and change in education. The review focuses on the reports of recent studies identified through database indexing services. Recent studies are reviewed systematically against the conceptual framework of selective models of educational innovation and change, as indicated in the "aide de memoire" in Table 2.1.

Table 2.1

*Theoretical background and empirical studies used in building the conceptual framework*

| Theoretical models | Research studies |
|---|---|
| **Case study model**<br>(See Chapter 3: Methodology) | • Yin (1994) |
| **Innovation** models:<br>Rogers' (1995) diffusion of innovations defined as the [change] process by which an innovation is communicated through certain channels over time among members of a social system where the innovation is an idea, practice, or project that is perceived as new | • Rogers' (1995)<br>• OECD/CERI (1999-2001)<br>• Venezky &Davis (2002) |
| **Concerns model**:<br>Concerns Based Adoption Model (CBAM) comprising **Stages of Concern** (SOC) and the **Levels of Use** (LOU) and **Open-Ended Statements** | • Hall, George & Rutherford (1977)<br>• Hall & Loucks (1981)<br>• Hord et al., (1987)<br>• Hall, Loucks, Rutherford & Newlove (1975)<br>• Loucks, Newlove & Hall (1998)<br>• Newhouse (1999)<br>• Cheung, Hattie & Ng (2001)<br>• Hall and Hord (2001)<br>• Adams (2002)<br>• Newhouse, Trinidad & Clarkson (2002)<br>• Schiller (2003) |
| **Leadership and change implementation models:** | |
| Envisioning the future | • Fisher, Dwyer & Yocam (1996)<br>• Dwyer (1994)<br>• Fullan (2003)<br>• Hargreaves (2004)<br>• Bishop & Mulford (1996)<br>• Silins & Mulford (2002)<br>• Cuttance (2001)<br>• Stoll, Fink & Earl (2003)<br>• Eadie(2000) |
| Enablers and barriers to ICT | • Meredyth, Russell, Blackwood, Thomas & Wise (1999)<br>• BECTA (2003)<br>• Zhao et al. (2002)<br>• Tearle (2003)<br>• Oliver (2005) |
| Trust | • Bishop (1999)<br>• Fullan (2003)<br>• Bryk & Schneider (2003)<br>• Mulford & Johns (2004) |
| Alignment | • Fullan (2003)<br>• Gurr & Broadbent (2004) |
| Interventions | • Hall & Hord (1987)<br>• Hall & Hord (2001) |

| | |
|---|---|
| | • Schiller (2003)<br>• Hall & Hord (2005) |
| Transformational Leadership | • Sergiovanni (1999)<br>• Leithwood, & Riehl, (2003)<br>• Cuttance (2001)<br>• Venezky & Davis (2002)<br>• Silins & Mulford (2000)<br>• Silins & Mulford (2002)<br>• Mulford & Silins (2003)<br>• Mulford & Johns (2004a, 2004b) |
| Boys and ICT at home and school | • DEST (2003)<br>• Downes (1998)<br>• Meredyth et al. (1999)<br>• Silins and Mulford (2002)<br>• Cuttance & Stokes (2003) |
| Learning communities | • Hord (1997)<br>• Hall & Hord (2005)<br>• McLaughlin (1998)<br>• Cuttance (2001)<br>• Stoll, Fink & Earl (2004) |
| ICT and the transformation of education | • MYCEETYA (2000)<br>• DEST (2001) |

## Innovation models

Everett Rogers' (1995) *Diffusion of Innovation,* which first appeared in 1971, contributed a typology for the adopter of an innovation going through the several stages of awareness, interest, trial, decision and adoption. Rogers found that participants in his studies differed in their readiness to accept change, with some adopting the change quickly and others taking much longer. The five adopter categories were labelled on an S-shaped curve based on a normal distribution (see Figure 2.1):

- *innovators,* (enthusiasts – 2.5%) eager to try new ideas;
- *early adopters*, (visionaries – 13.5%) or leaders, open to change;
- *early majority* (pragmatists 34%), but followers as more cautious in their adoption of an innovation;
- *late majority* (conservatives – 34%); and the

- *laggards* (skeptics – 16%) or resistors.

That is, Rogers (1995) argued that plotted graphically, the pattern of the adoption and diffusion of the innovation would typically follow this bell-shaped curve. The implication is that over time, over 80% would eventually take up the innovation following the early adopters. In addition, Rogers (1995) argued that change agents can affect these adoption rates by the provision of knowledge or training. It was to become a classic and well known model that described the change process, as it identified five common categories of people relative to their rate of adoption of innovations.

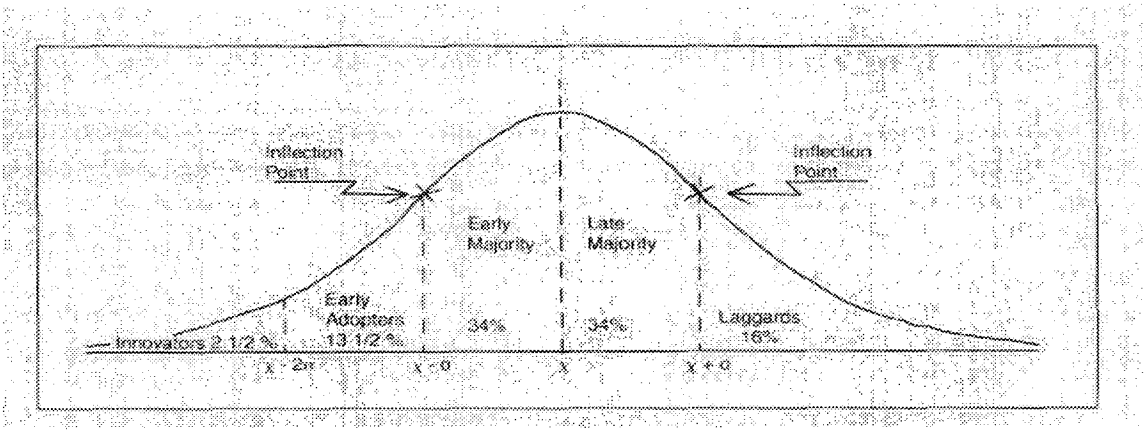


*Figure 2.1* The Rogers' Diffusion of Innovation Model "Adopter categorization on the basis of relative time of adoption of innovations". (Rogers, 1995, p. 257)

thirty years where innovation, change and diffusion were interlinked yet evolving concepts. In this revised theoretical framework, updating a 1983 edition, Rogers (1995) also identified the five characteristics by which an innovation may be described: relative advantage, compatability, complexity, trialability, and observability. The characteristics were 'perceived attributes' showing how individuals' perceptions of these characteristics can predict the rate of adoption of the innovation. As well as the five attributes identified in the 1983 edition, Rogers (1995) named four other variables that affect the rate of adoption: the type of innovation decision (optional, collective or authority); the nature of

the communication channels diffusing the innovation (e.g. mass media or interpersonal); the nature of the social system (e.g., its norms); and the extent of the change agents' efforts in diffusing (promoting) the innovation. Hence, on the basis of Rogers' claims, the rate at which the innovation is adopted in any organisation is affected by the adopters, the innovation and the information disseminated about it (see Figure 2.2). In addition, the importance of this change research model in predicting the likely future rate of adoption of innovations based upon the attributes perceived was a recognition also, that the receivers' perceptions count as much or more than the change agents' perceptions.

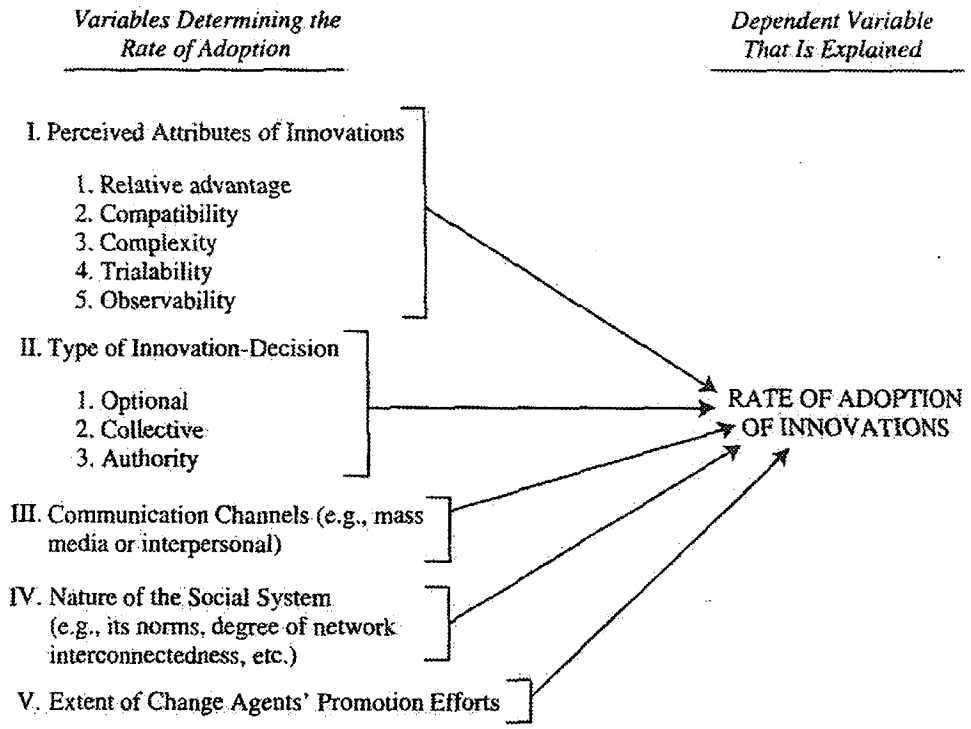


*Figure 2.2* Rogers' Rate of Adoption "Variables determining the rate of adoption of innovations" (Rogers, 1995, p. 207).

Employing one part of Rogers' diffusion research model, Venezky and Davis (2002) report a three-year research scheme was conducted from 1999-2001, within an international group

of 94 school-based case studies in 23 member countries for the OECD/CERI (Organisation of Economic Co-operation and Development/ Centre for Educational Research and Innovation) ICT Program. Called *ICT and the Quality of Learning,* the project's objectives were to examine the different ways that ICT relates to school innovation, and to uncover the critical variables that relate to the successful implementation of school improvements and effective ICT.

The aim of the project methodology was to develop an evidence-based elucidation of school policy and practices with ICT through confirmation or validation of a set of five research hypotheses. Leask (2001, 2) reported that one research hypothesis (hypothesis 2) was that "the diffusion of the innovation/improvement (and therefore of ICT) followed the traditional diffusion pattern for innovations, as outlined by Rogers (1995".

The OECD/CERI ICT study did not attempt to describe the *process* of adoption beyond the Rogers' (1995) traditional diffusion model described in Figure 2.1 above. Venezky and Davis (2002, 21) found that the traditional pattern did hold in most cases, across all the case studies internationally. The exceptions were schools where a "high intensity ICT site" had recently been built, where a selection of staff had been involved in intensive training or where other administrative pressures gave teachers no alternative but to accept the ICT as part of their teaching. Reports from the case studies were often quite different in their descriptions of what innovation was actually being diffused or adopted: some highlighted teacher ICT competencies or classroom practices, and others highlighted organisational or pedagogical structures.

Another research hypothesis (Venezky and Davis 2002) attempted to probe the elements required for successful implementation of ICT. Successful implementation of ICT depends mostly upon staff competence in the integration of ICT into instruction and learning. This hypothesis assumed that teachers mediate ICT applications when they are successful, and that ICT's academic value relates positively to teacher competence. The rival hypothesis is that the school technological infrastructure and student ICT competence rather than staff competence determine ICT implementation outcomes.

Hence the critical elements suggested were staff ICT competence, ICT infrastructure and student ICT skills. Despite the lack of a consistent pattern emerging initially, the notion of "critical levels" and context were found to make a difference. Venezky and Davis (2002) report that in Germany and Singapore, case studies indicated that a critical level of ICT infrastructure must be reached before teacher ICT skills had any impact, and that where demands on teachers are high, teacher competencies are critical or where the demands are mostly on the technology, then the latter becomes the dominant factor.

Accepting that they were each school's own goals and critical levels for innovative use of ICT, Table 2.2 concatenates or links the comparable features of the multiple-site case studies at a glance. This table is gleaned from the case studies reported by both the Venezky and Davis report (2002) and the individual country reports.

Table 2.2

*Features of four case studies in the OECD/CERI project*

| Research/ Case studies | Hypothesis 2: Rogers' traditional diffusion pattern for innovations | Hypothesis 3: Successful implementation of ICT depends mostly upon staff competence in the integration of ICT... |
|---|---|---|
| *USA* | • Rogers' model applied in the early stages. As additional innovations were introduced, most cases were not consistent with the traditional model.<br>• Discrepancy derived from top-down imposed ICT reform plans | • Most successful implementations would have all three elements: staff competence, student ICT competence and infrastructure. |
| **England** | • Rogers' model applied in the earlier stages in the technology-rich school environments.<br>• Staff were expected to use ICT innovations or move to other schools. | • Teachers able to overcome faulty ICT infrastructure – ICT development happened in spite of these problems.<br>• Staff ICT competence was critical to the success of the whole school improvement initiative.<br>• Technical problems were major factors hindering change, but ICT developments happened in spite of the problems. |
| **Australia** | • Diffusion was assisted by a mentoring process or coaching approach.<br>• Staff moved through the traditional stages at different rates, with assisted staff being more successful<br>• Laggards who were resisting change were helped to overcome issues as performance with ICT was tied into annual performance plans, | • Successful implementation results from staff ICT competence, though technology infrastructure must be reliable, efficient and powerful |
| **Singapore** | • All schools except two followed the traditional diffusion pattern.<br>• The two exceptions had 'top down' patterns as teachers were not given a choice | • Staff ICT competence is main factor where teachers are expected to develop their own web-based resources<br>• ICT infrastructure is the main factor in 2 schools where teachers use ICT primarily for communication. |

[This tabular summary builds upon the overviews presented by OECD/CERI reports, (OECD, 2002)].

In their report, Venezky and Davis (2002) concluded that the adoption generally followed a traditional pattern for diffusion of innovations, except where schools selected staff on the basis of their ICT abilities or had other means of over-riding the normal diffusion pattern. Significantly, they found that the acquisition of ICT skills by staff did not necessarily lead to deployment of those skills in teaching. The optimal conditions, such as sufficient professional development opportunities, or adequate ICT infrastructure or appropriate leadership could advance the diffusion process.

Several clarifying distinctions emanating from this research are relevant to the later reviews of the *Concerns Based Adoption Model* of *Levels of Use* of an innovation. Although the outcome of the OECD/CERI study in many participating countries was that the teaching staff ICT competencies and the reliable technical infrastructure were both required for successful implementation of ICT in a school, the balance is critical and that also depended on the individual school context. The stages of the implementation were important as the teaching staff become more competent in both implementing ICT into the curriculum and adapting ICT to their own style of teaching and assessments.

The OECD/CERI project does not deal with the discontinuance of innovation which Rogers (1995) describes as either a result of the replacement by a more effective innovation or disenchantment due to failure of the innovation to bring results. One major outcome from the OECD/CERI project is not immediately relevant for this study. It is that the ways in which ICT is used is one of the most critical variables for determining its impact on student achievement, due to increased access to educational resources and increased motivation for learning.

## Concerns-Based Adoption Model

Developed at the Research and Development Center for Teacher Education at the University of Texas at Austin, the Concerns Based Adoption Model or CBAM was originally conceptualised by Hall and colleagues in 1974 (Hall and Hord, 1987; Hord, Rutherford, Huling-Austin and Hall, 1987). According to Hord (1990), they were working in teacher education, where they identified categories of teachers' reactions or concerns as those teachers experienced adoption and implementation processes for new curricula. It has evolved into a comprehensive and systemic change model that allows change facilitators and researchers to understand organisational change, particularly educational change from the point of view of those affected by the change.

The assumption made by CBAM regarding innovation was that it is a dynamic process and that change involved developmental growth. The diagnostic tools developed each use a different measure to collect contextual data concerning aspects of the implementation of the innovation. In turn, the data collected and intervention strategies can be used to design a blueprint for change, such as a staff development plan.

The summary by Hord, et al.(1987, pp. 5-6) identified the major implications for planning any professional development program:

- Change should be characterized as a process, not an event.
- Change is accomplished by individuals, not organisations.
- Change is a highly personal and highly individual experience.
- Change involves developmental growth as individual users increase skill levels with experience.

- Change is best understood in operational terms that relate to daily practice.
- The focus of facilitation should be on individuals, innovations, and the user environment, instead of material or physical components.

Hence, the CBAM identified the pre-conditions or the issues that a change facilitator needs to be sensitive to, in order to understand how the change is being perceived and that some change can be anticipated. The diagrammatic CBAM in Figure 2.2 below, as developed by the CBAM project team illustrates the relationship between the diagnostic tools for the change facilitator.

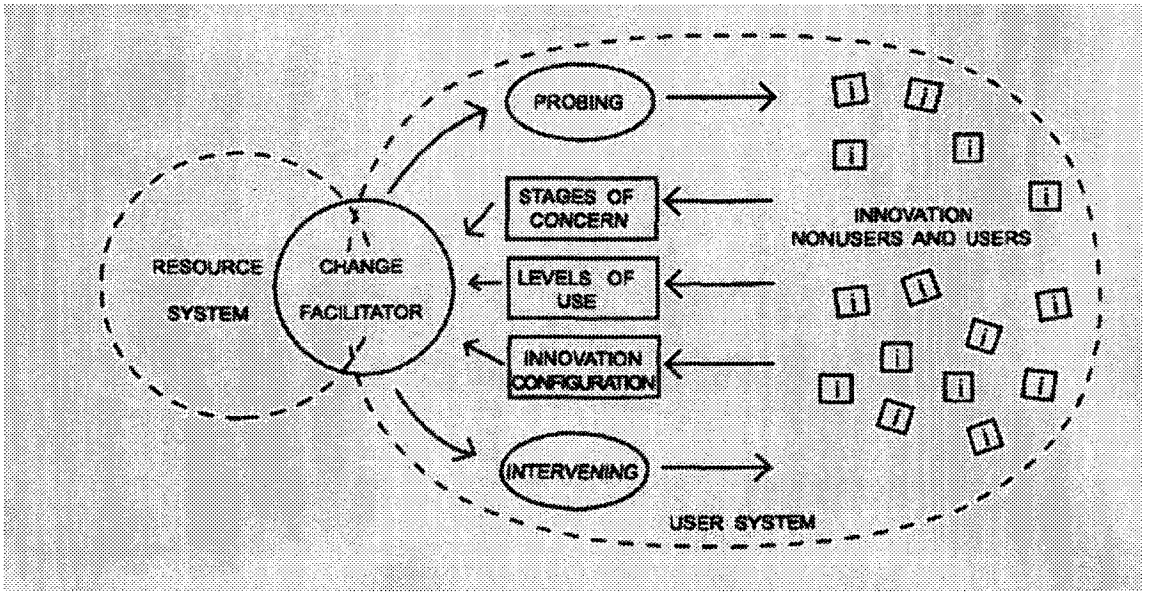


*Figure 2.3* Concerns Based Adoption Model (Hord et al., 1987, p. 10)

As a contemporary theoretical framework that explains and predicts likely teacher behaviour in the change process, CBAM offers several diagnostic dimensions and actual

tools for studies about educational innovations and change. They include the Stages of Concern or SoC (Hall, George and Rutherford, 1977), Level of Use or LoU, (Loucks, 1975) and the Innovation Configuration or IC, (Hall and Loucks, 1981). The first two dimensions are explanatory and focusing on the implementation, whilst the third is diagnostic, developed much later and focuses on the nature of the innovation itself. Each dimension has its own research method and instrument to collect and present the analysed data. As this research study is concerned only with only the first two dimensions, they are summarised below in Table 2.3.

Table 2.3

*Stages of Concern (Hall, George, and Rutherford, 1977) and Levels of Use (Hall, Loucks, Rutherford, and Newlove, 1975)*

| **Stages of Concern** | **Levels of Use** |
|---|---|
| 0 Awareness | 0 Non-use |
| 1 Informational | I Orientation |
| 2 Personal | II Preparation |
| 3 Management | III Mechanical use |
| 4 Consequence | IVA Routine |
| 5 Collaboration | IVB Refinement |
| 6 Refocusing | V Integration |
| | VI Renewal |

***Stages of Concern***

The Stages of Concern [SoC] (Hall, George and Rutherford, 1977), describe how teachers or any adopters perceive an innovation and their feelings about it. The purpose of this affective SoC dimension is to analyse feelings, observations, problems, successes, and failures whilst progressing through the change process. The stages were not mutually

exclusive, but the intensity of specific stages varied as implementation progressed. It uses a set of seven to describe teachers' concerns about the innovation. The instrument used is a questionnaire, (see Appendix III) with a set of scales to prepare both numerical and graphical representations of the type and strengths of participants' concerns in the *SoC Quick Scoring Device*, (reproduced in Appendix VIII).

The strength of the SoC model is its application to monitor implementation of educational innovations in staff development planning (Hord, 1987). Change facilitators are able to determine the readiness of individuals to embrace an innovation. It requires attention to the individuals' needs for information, assistance and support prior to a focus on the impact of the innovation. The concerns model, originally proposed by Fuller in the 1960's abstracted to 'self' (Stages 0, 1), 'task' (Stages 3, 4) and 'impact' (Stages 5, 6) served as a basis for the development of the SoC stages (Hall, George, and Rutherford, 1977, p. 12). Table 2.4 brings together the stages of concern, and the typical expressions of concern about an innovation at each stage.

Table 2.4

*Types of concern, stages of concern about the innovation and typical expressions (compiled from Hall and Hord, 2001, pages 61-63)*

| Types | Stage of Concern | Typical Expression of Concern |
|---|---|---|
| Self | **0 Awareness** | *I am not concerned about it*<br>Little concern or involvement with the innovation is indicated. |
| | **1 Informational** | *I would like to know more about it.*<br>A general awareness of the innovation and interest in learning more detail about it is indicated. The person seems to be unworried about himself/herself in relation to the innovation. She/he is interested in substantive aspects of the innovation in a selfless manner such as general characteristics, effects, and requirements for use. |
| | **2 Personal** | *How will using it affect me?*<br>Individual is uncertain about the demands of the innovation, his/her inadequacy to meet those demands, and his/her role with the innovation. This includes analysis of his/her role in relation to the reward structure of the organisation, decision making, and consideration of potential conflicts with existing structures or personal commitment. Financial or status implications of the program for self and colleagues may also be reflected. |
| Task | **3 Management** | *I seem to be spending all my time in getting material ready.*<br>Attention is focused on the processes and tasks of using the innovation and the best use of information and resources. Issues related to efficiency, organizing, managing, scheduling, and time demands are utmost. |
| Impact | **4 Consequence** | *How is my use affecting kids?*<br>Attention focuses on impact of the innovation on student in his/her immediate sphere of influence. The focus is on relevance of the innovation for students, evaluation of student outcomes, including performance and competencies, and changes needed to increase student outcomes. |
| | **5 Collaboration** | *I am concerned about relating what I am doing with what other instructors are doing?*<br>The focus is on coordination and cooperation with others regarding use of the innovation. |
| | **6 Refocusing** | *I have some ideas about something that would work even better?*<br>The focus is on exploration of more universal benefits from the innovation, including the possibility of major changes or replacement with a more powerful alternative. Individual has definite ideas about alternatives to the proposed or existing form of the innovation. |

***Interpretation of Stages of Concern profiles***

In a school setting, the Stages of Concern (Hall, George and Rutherford, 1977), profile can be drawn from the data collected. As discussed in the manual (Hall et al., 1977), interpretation ranges from the simplest form (to identify the highest stage score), through to the complex profile (wherein the highs and lows of the percentile scores for all seven stages are drawn). The higher the score, the more intense are the concerns, although the higher and lower scores are not absolute, being relative to other stage scores for the individual.

According to the authors of this instrument, there are two ways to treat group data. One is to tally the number of individuals who are high on each score. Another way is to aggregate group data by developing a *concerns profile* that presents the mean scores for the group. The authors' (Hall et al., 1977, p. 41) caution that the "more individuals are aggregated, the less likely the mean is to be representative of the individual scores" is an important consideration for the present study. Normally, group averages reflect the dominant high and low SoC of the composite group; however, individual highs need to be checked first in the event that there are distinct subgroups. This can be the first straightforward translation of the group data, wherein a frequency count can be provided of high stage scores (Hall et al., 1977).

As it is possible to have concerns at more than one stage at a time, and at various intensities, this array of concerns is reflected graphically in a concerns profile. The stages of concern are represented on the horizontal axis. The relative intensity of the concerns is represented on the vertical axis. The peaks indicate stages that are more intense and the troughs show the less intense stages. Analysis of the concerns profiles, either in tabulated form listing percentile scores or plotted as a graph provides a more complete interpretation.

For example, in a concerns profile that is representative of a non-user or an early user in an innovation process, that person has the greatest concerns at Stage 1 (Information) and Stage 2 (Personal) as described in Table 2.4 above. This concerns profile indicates the need for more knowledge about the innovation itself and about the personal impacts. Therefore, this person is less concerned with Stage 3 (Management) and even less concerned with the consequences of Stage 5 (Collaboration) or how the innovation will impact on students or be modified and used in the future with Stage 6 (Refocusing). If the person becomes more experienced with the innovation over time, the self concerns decrease and the task or management concerns increase (Hall, George and Rutherford, 1977).

As Hall and Hord (2001, 65) explain, the typical concerns profiles collected over time extend the snapshots into a motion picture, wherein there is a hypothesized pattern of "wave motion" as a change process unfolds as it is intended. Following first use of the innovation, self concerns diminish and task concerns become more intense. Within time, impact concerns increase in intensity. At that time, self and task concerns decrease. Figure 2.4 presents a graphical representation of this normalised and rounded wave motion pattern for the stages of concern in the implementation of an innovation and change process.

As such, with typical stages guiding the understanding, the researchers intended that the interpretation of the profiles could be an effective guide to facilitate the implementation of staff development planning or a change process at any particular time in the life-cycle of the implementation of an innovation. Then, analysis of the concerns profile could enable concerns-based interventions to resolve the concerns and move the individual or the group to a more advanced stage in an innovation process.

This instrument had major implications for teacher professional development planning. Referring to the typical expressions of the stages of concern in Table 2.4, one implication was the importance of addressing the questions teachers ask and when they ask, ensuring that the "how to" questions are not addressed before the self-concerned questions. That is, do not be concerned with student learning or achievement before monitoring the teachers' own concerns regarding materials or strategies. The strength of the model is to give attention to the individual and need for information. Another implication was that the model implied implementation over a period of time with the trend lines of highs and lows of concerns progressing in a wave motion from left to right when the concern profiles are progressively plotted. In a school setting, this may mean that teachers will expect to have their concerns addressed before any practical workshop.

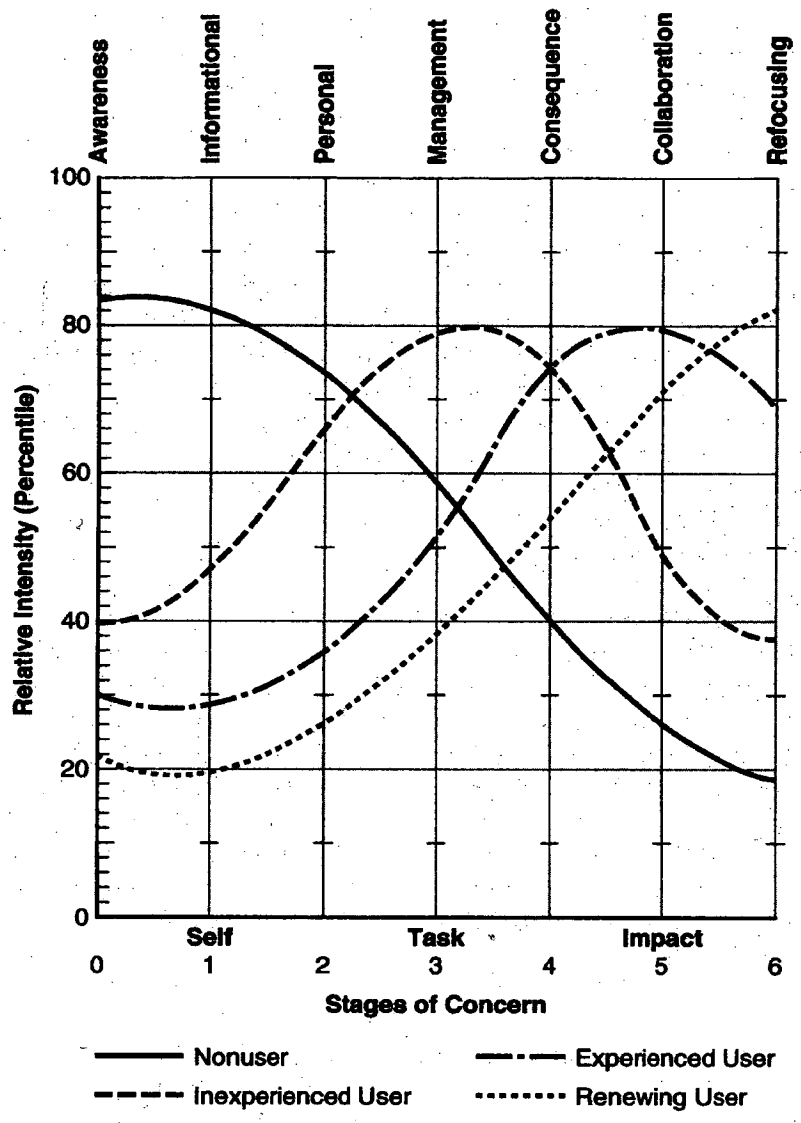


*Figure 2.4* SoC Stages of Concern (Hall and Hord, 2001, p.56)

***Techniques for assessing stages of concern***

Monitoring of any change process included three ways to assess the concerns: the One-Legged Interview, the Open-Ended Concerns Statements and the SoC Questionnaire. Over the decades of CBAM research documenting the interventions by school principals and school improvement teams, since the 1977 studies, Hall and Hord (2001, p. 66) recall the

small unnoticed interventions that they call incidents or critical opportunities whereby the change facilitator has a conversation or 'one-legged interview' with an innovation user . Another intervention is the task of asking teachers to write a description of their concerns when given a blank piece of paper that has the following statement written at the top:

> When you think about [the innovation] what concerns do you have?
> Please be frank and answer in complete sentences.

This simple technique described in the manual by Newlove and Hall (1998) and used to provide a description of the concerns that can be content analysed is a useful tool with many strengths (Hall and Hord, 2001). It is a well-recognised technique for trainers or commonly used by professional development facilitators, for example, when endeavouring to understand expectations of the participants at the outset of a workshop, however; it is a technique that can be used at any time. Further, a very effective validation strategy for a workshop presenter is to match the feedback from participants at the end of the workshop to ascertain is their concerns have been effectively targeted. Newlove and Hall (1998) cite Hall's own earlier comments:

> Educators would like to think that they always function at the impact concern level. However, it is a basic finding of [our] research that almost everyone, when first confronted with a "new innovation", will have relatively intense personal and informational concerns. It is important to recognise that self-concerns are a fully legitimate part of change. Rather than indicting people for having self concerns, the role of the adoption agents and policy/decision-makers should be to aid in the resolution of self concerns and to facilitate movement toward task- and impact-related concerns. When planning for innovation implementation, managers of change need to anticipate self concerns and initiate actions to accommodate and resolve them at the outset of the innovative effort. The crime is in not having self concerns, but in others not accepting their legitimacy and constructively addressing their resolution.
>
> (Newlove and Hall, 1998, p. 3)

In terms of reliability, there are two key potential disadvantages with this technique. The first is that respondents provide different amounts of information – complex sentences to

simply a few dot points or nil information, turning in a blank sheet. Second, assessors may not agree or be trained on the content analysis.

In contrast to the Open-Ended Concerns Statements, the Stages of Concern Questionnaire (See Appendix VI) is a rigorous technique for measuring concerns. According to Hall and Hord (2001, p. 68), the thirty five item questionnaire has strong reliability estimates (test/retest reliabilities from .65 to .86) and internal consistency (alpha co-efficients range from .64-.83 Constructed to apply to any educational innovation, the thirty five questions in the questionnaire can stay the same, except for the small change of inserting the name of the innovation. The SoC Questionnaire is used to construct 'concerns profiles'. Such a technique has both strong reliability and validity, being able to be used for formal implementation assessments. The only disadvantage is that it involves a questionnaire which can develop resistance in a program evaluation if is used too often. Using the SoC Quick Scoring Device (Appendix VIII) the raw score obtainable for each stage is converted using a percentile table to develop the graphical representation.

***Levels of Use***

In contrast to the affective dimension of the Stages of Concern Questionnaire, the Levels of Use (LoU) is a behavioural dimension, representing how respondents are acting with respect to change. Table 2.5 indicates the levels of use of the innovation by identifying the typical behaviours.

Table 2.5

*Levels of Use – part of the LoU Chart or framework of indices and typical behaviours with decision points. (Adapted from Hall and Hord, 2001, p. 88 Figure 5.2)*

| Level of Use | | Typical behaviours |
|---|---|---|
| 0 | Non-use | No action is being taken with respect to the innovation. |
| I | Orientation | The user is seeking out information about the innovation.<br>*Decision Point A: Takes action to learn more detailed information about the innovation* |
| II | Preparation | The user is preparing to use the innovation.<br>*Decision Point B: Makes a decision to use the innovation by establishing a time to begin.* |
| III | Mechanical Use | The user is making changes to better organise use of the innovation.<br>*Decision Point C: Changes, if any, and use are dominated by user needs.* |
| IVA | Routine | The user is making few or no changes and has an established pattern of use.<br>*Decision Point D-1: A routine pattern of use is established* |
| IVB | Refinement | The user is making changes to increase outcomes.<br>*Decision Point D-2: Changes use of the innovation based on formal or informal evaluation in order to increase client outcomes.* |
| V | Integration | The user is making deliberate efforts to coordinate with others in using the innovation.<br>*Decision Point E: Initiates change in use of innovation based on input of and in co-ordination with what colleagues are doing.* |
| VI | Renewal | The user is seeking more effective alternatives to the established use of the innovation.<br>*Decision Point F: Begins exploring alternatives to or major modifications of the innovation presently in use.* |

The LoU (Loucks, Newlove and Hall, 1998) dimension relates to the amount of usage of an innovation. This dimension identifies what the adopter or teacher is doing or not doing relative to the innovation. It is the sequence of eight levels that users pass through as they gain confidence or skill in using an innovation as in Table 2.5. In addition to the eight levels of use, each level is further defined and differentiated in terms of seven 'categories' (as described in Table 2.6) or key functions that describe the typical behaviours that users at that level are engaged in when they are using an innovation. Each level comprising the

seven categories is limited by the decision points, noted in Table 2.5 that indicate any action that moves the user to the next level. For example, a non-user may take an initiative to learn about an innovation and he/she has reached decision point A and moves from LoU 0 to LoU I.

Table 2.6

*Levels of Use Categories (Adapted from Hall and Hord, 2001, p. 90 Figure 5.4)*

| Levels of Use | Categories |
|---|---|
| Knowledge: | That which the user knows about characteristics of the innovation, how to use it, and consequences of its use. This is cognitive knowledge related to using the innovation, not feelings or attitudes. |
| Acquiring information | Solicits information about the innovation in a variety of ways, including questioning resource persons, correspondence and resource agencies, reviewing printed materials and making visits |
| Sharing | Discusses the innovation with others. Share plans, ideas, resources, outcomes and problems related to its use. |
| Assessing | Examines the potential or actual use of the innovation or some aspects of it. This can be a mental assessment or can involve actual collection and analysis of data. |
| Planning | Designs and outlines short- and/or long-range steps to be taken during the process of innovation adoption; i.e., aligns resources, schedules, activities, meets with others to organise and/or coordinate use of the innovation. |
| Status Reporting | Describes personal stand at the present time in relation to use of the innovation |
| Performing | Carries out the actions and activities entailed in operationalizing the innovation |

The eight levels, decision points and seven categories, representing a developmental growth continuum are incorporated in a LoU chart, developed by Hall, Loucks, Rutherford and Newlove, (1975). The chart is an essential part of the instrument along with semi-structured or focussed interview and an interview rating procedure.

Levels of Use represent one part of the change process in the adoption of an innovation. After three cycles of research use, the researchers, Loucks, Newlove and Hall, (1998) claim that 30%-40% of an innovations users are stable at LoU IVA (routine) excluding the non-users. As a general rule, 60%-70% of the first year users of an innovation will be at the

mechanical LoU III. Many innovation users never reach LoU IVB (refinement) or LoU V (integration). Finally, the rare LoU VI individuals are those who are searching above and beyond the present innovation for ways to increase student learning. If the innovation calls for collaboration, eg team teaching, then a few users usually reach LoU VI (renewal). The researchers contend that levels of use are a reality and that all change facilitators need to consider this dimension and instrument to understand where individuals and groups need appropriate support or intervention to further the change process.

***Innovation configuration***

The concept of the Innovation Configuration (Hall and Loucks, 1981, p47) , originated in 1978 and involves identifying and defining the operational components of a staff development program, then analysing the patterns of use of the components by the teachers. The configuration is the form a process or product takes on during actual use. The term, innovation, refers simply to any program, which requires a change in behaviour of individuals involved. This instrument was not used in this study as it required intensive planning and monitoring of staff professional development programs. In this study, Innovation Configuration has been employed in a different way to meet the purpose of achieving a better understanding of students' and teachers' attitudes to, and levels of use of ICT. Data has been gathered on student use at home and students' experiences at school, students' skills, competencies and understandings of ICT, as well as teachers' use, skills and attitudes to ICT and online learning.

***Subsequent studies***

Since its research, development and testing in the USA from the early 1970s, the CBAM model and its instruments have been used internationally and extensively to provide models of school change, to plan and track outcomes of professional development programs in educational settings, plus specifically, changes in attitudes and concerns over periods of time when implementing innovations. The change measurement tools have proved valid and reliable in successive studies; however the original 35 item, 7 stage SoC Questionnaire has been refined and reduced to a 22 item, 5 stage SoC instrument (Cheung, Hattie and Ng, 2001). Database indexing searches on the three diagnostic dimensions of the Concerns-Based Adoption Model [CBAM]; Innovation Configuration [IC], Level of Use [LoU], and Stages of Concern [SoC] yield over one hundred research projects. Search engine retrievals yield in excess of 12,000 hits. The Southwest Educational Development Laboratory (SEDL) in Austin, Texas facilitates this research model with published literature.

Some research projects and studies which have employed the three diagnostic tests identify barriers to the implementation of ICT innovations (Adams, 2002; Schiller, 2003). Other researchers have adapted models (Newhouse,1999; Cheung, et al., 2001) whilst others have defined intervention strategies from the application of the CBAM instruments (Hall and Hord, 2001 p.221-223; Schiller, 2003). In a review of the literature on quality pedagogy and effective learning with ICT, Newhouse, Trinidad & Clarkson (2002, p. 32) acknowledge the usefulness of the classification of models to draw attention to "the critical facets" of those models. The authors recognise that Rogers (1995) Diffusion of Innovation model is a population model whereas the CBAM model focuses largely on the individual rather than any ICT components.

## Leadership and change models

Leadership and organisational change implementation models from both the research literature on ICT and the mainstream literature on change in education reveal information about the conditions to assist, or provide evidence-based strategies about, the effective implementation of ICT and online learning. As in the other models of educational innovation and change in the 'aide de memoire' in Table 2.1 of this chapter, Tearle's (2003, p. 578) position is pertinent because it suggests that models for ICT implementation have "more in common with the implementation of any new educational initiative than is commonly credited". That is, the focus on the technology and the barriers to effective implementation, such as lack of teachers' ICT skills can dominate the research focus, rather than the need to address the fundamental issues of leadership and change management.

Hence, bringing together the models of transformational leadership and change from the mainstream literature about 'effective implementation' as well as other evidence-based research on the conditions that assist ICT implementation forms the third part – the focus of the lens for the conceptual framework for this study. Specific and converging threads to blend together can inform the current research. These threads include:

- Envisioning the future (Fisher, Dwyer and Yocam, 1996; Fullan, 2003; Hargreaves, 2004; Eadie, 2000)
- Enablers and barriers to ICT ((Meredyth, Russell, Blackwood, Thomas, and Wise, 1999; BECTA, 2003; Zhao et al., 2002; Tearle, 2003)
- Trust (Bishop, 1999; Fullan, 2003; Bryk and Schneider, 2003; Mulford and Johns, 2004)
- Alignment (Fullan, 2003; Gurr and Broadbent, 2004)

- Interventions, (Hall and Hord, 1987; Hall and Hord, 2001; Schiller, 2003) and
- Transformational Leadership (Sergiovanni, 1999; Leithwood and Riehl, 2003; Cuttance, 2001; Venezky and Davis, 2002; Silins and Mulford, 2002; Mulford and Silins, 2003; Mulford and Johns, 2004a, 2004b)

***Envisioning the future***

The most widely known qualitative and longitudinal study has been the *Apple Classroom of Tomorrow (ACOT) Project* carried out from 1985-1998 in several American school districts in K-12 schools in collaboration with universities, research organisations and Apple Computer (Fisher, Dwyer and Yocam, 1996). It focussed on the length and importance of the implementation *process* to embed ICTs into classroom practice, change teachers' pedagogical practices and achieve impacts on student achievement.

The ACOT project demonstrated that significant investment of time and support was needed for teachers to achieve the intended outcomes. Such a conclusion is also consistent with findings from other 'non ICT-based' school change initiatives (Bishop and Mulford, 1996; Cuttance, 2001; Hargreaves, 2004; Mulford and Silins, 2003; Stoll, Fink and Earl, 2003)

In relation to the integration of technology, the ACOT study found that technology encourages different forms of interactions among students and between students and teachers; it engages students systematically in higher order cognitive thinking and prompts teachers to question old assumptions about instruction and learning (Dwyer, 1994). In addition, the research produced a five stage adoption model of thought and practice for

schools when taking up technology: the stages were entry, adoption, adaptation, appropriation and invention.

The significance of the long term ACOT project outcomes and the wealth of project review literature highlighted two key areas. They were:

- *the vision* of technology and learning for the future, held by a community of teachers and students involved in the project; and
- the interaction and engagement of those students and teachers in a *model of innovation and change* in education; known as their 'adoption model' or the 'stages of instructional evolution'.

Similar to a concerns based adoption model (Hall and Hord, 2001), instructional changes in the ACOT classrooms were an evolutionary process as teachers moved in their five stages through a concern-based approach to implementation.

Eadie (2000) posed two research questions for her 2000 study of current trends in ICT and innovative practices in schools in Australia, New Zealand, USA, UK and Hong Kong. These were: how is the availability and use of ICT changing the use of existing spaces and how is ICT use changing the way teachers and administrators approach curriculum delivery? The research by Eadie revealed a set of observable trends in the use of classroom spaces with ICT. Eadie found that the use of ICT is changing the ways schools in the study operate. The changes are described in these five ways:

- rethinking the timetable;

- growth of online learning;
- rethinking what is being taught;
- real-life learning experiences; and
- teachers collaborating to share and develop expertise.

In her study, Eadie (2000) concluded that once ICT becomes an integral part of student learning, their teachers' teaching styles and classroom organisation cannot remain unchanged. The continuing focus on ICT streamlines many administrative tasks undertaken by teachers. In addition, it gives 24 hour access to learning resources to many students who have access to computers and internet connectivity at home.

***Enablers and barriers***

*Real time: computers, change and schooling* (Meredyth, Russell, Blackwood, Thomas, and Wise, 1999) is the national study of the computing skills of Australian school students, conducted during 1998 by the Australian Key Centre for Cultural and Media Policy at Queensland's Griffith University, under the auspices of the Ministerial Council on Education, Employment, Training and Youth Affairs (MYCEETA) Annual National Report on Schooling in Australia (ANR) Task Force. The most important aspect of the study was to provide baseline data to help monitor a section of the 1989 Common and Agreed National Goals for Schooling, Goal 6D which is "to develop in students skills of information processing and computing". The study surveyed 6213 students, 1258 teachers, 222 principals from 222 schools out of 399 surveyed. The surveys were supplemented by policy information and several commissioned papers. It was the largest study of its kind in Australia, and enabled comparison to the American studies. It provided:

- the review of information technology provision in schools,
- the review of ICT professional development of teachers, as well as
- a comprehensive picture of ICT implementation in Australian schools.

The report (Meredyth et al.1999) found that students enjoyed using computers at school and were confident of their skills (unlike their teachers' confidence levels). Nearly all the students (67%) had acquired the basic IT skills, (saving and printing documents, creating and moving files, etc). and another 48% reported that they could create an IMM presentation with 38% being able to create a web page. These latter or advanced skills were ahead of their teachers' skills (Meredyth et al 1999). Students reported that they acquired those skills at home.

The report (Meredyth et al.1999) linked technologically-enhanced home environments with an enhanced capacity to acquire ICT skills and knowledge. A higher proportion of students at schools in high-income areas had advanced computing skills than students at schools in low-income areas. Students whose families had low incomes were less likely to have computers at home, and their schools were less likely to have adequate computing resources. Students surveyed in the study who lived in urban areas believed that computer skills would be important for future work and study. The indigenous students and those from small rural, schools reported having less advanced skills. The report found a strong correlation between the level of computing skills and the average income of households in the school area.

These findings from the report (Meredyth et al.1999) are supported by the report *Use of the Internet by Householders* (2001) released by the Australian Bureau of Statistics (ABS) in 2001. This ABS report found that 73% of Australian adults with incomes of over $80,000

used the Internet in 1999, compared to only 34% of Australians with incomes of less then $40,000. Similarly, 52% of households with incomes over $100,000 had Internet connections, compared to 31% of households that earned between $50,000 and $75,000. Only 6% of households with an income of less than $25,000 had Internet access. Among employed adults, 54% used the Internet, but only 19% of unemployed adults did.

Only two years later, in the more recent annual survey, *Use of the Internet by Householders* (2003) released by the Australian Bureau of Statistics (ABS), the report gave the percentage of Australian households with access to a computer at home was 66% in 2003 and the percentage of Australian households with access to the Internet at home was 53% in 2003. Households with children and those on higher incomes were more likely to have access to computers and the Internet at home. Households in metropolitan areas, with children under 15 years of age were more likely to have access to computers and the Internet at home. The percentages for access to computers and the Internet at home respectively had risen from 65% and 29% in 1999 to 855 and 68% in 2003. Significantly, use of the computers and Internet at home is consistently grater for males than females. Most children aged 5-14 years (95%) used a computer in the 12 months to April 2003 during or outside of school hours (graph 23.23). The proportion of children using the Internet in the same period was 64%. Computer and Internet usage increased with age. Children were most likely to have used a computer at school (89%), followed by home (82%), someone else's home (40%) and a public library (11%). The Internet was most likely to have been used at home (51%), followed by school (45%), someone else's home (16%) and a public library (4%). In summary, these annual statistics support the findings of Meredyth et al. (1999) concerning the acquisition of skills by children at home, males lagging behind females in computer and internet use at home, and the disparity between students' advanced skills in urban and rural schools.

Meredyth et al. (1999) found that students from independent and single-sex boy's schools reported the most advanced skills. Girls lagged behind boys in acquiring the advanced information technology skills. The study also found that girls were less likely than boys to have their own computer at home, and were less likely to use computers for games and communications. These findings are strongly underpinned by evidence in gender and ICT studies in Australia (Downes, 2002; Collins, C., Kenway, J., and McLeod, J., 2000).

The information technology resources of schools were found to impact on student learning. Where student-to-computer ratios were advantageous, students were more confident about their own basic and advanced skills and more likely to report that they enjoy using computers at school. A majority (60%) of schools principals regarded IT as important to students' learning (Meredyth et al., 1999). The great majority of schools (90%) indicated that they gave a high budget priority to the provision of hardware and software for students, 86% for staff development, 75% for technology support, 72% for communication/network and 69% for the provision of hardware for staff. They reported that funding represented one of the *main barriers* to developing students' IT skills. The report is careful in interpreting the finding that principals in independent schools and schools in high income areas indicated a very high priority in their budget for funding for IT because it could be argued that these principals exercised greater autonomy over their total school budgets.

The findings (Meredyth et al., 1999) indicated that there has been a strong focus on providing computers for student use in schools. Using the student-computer ratio alone, to measure provision resulted in the divide between smaller and larger schools becoming obvious. Schools with low student-computer ratios were likely to be Independent or Catholic schools. The greater the student-computer ratio, the more time students spent on computers at school, both alone and in small groups, and the wider and more sophisticated

their use of IT across the curriculum. The study cautioned against placing an overemphasis, however, on the amount of equipment within schools, as measured by student-computer ratios. Students in this study were asked where they first acquired a range of 'core' and 'advanced' IT skills; and distinctions were made between the learning activities at school or at home.

Some of the most noteworthy findings (Meredyth et al., 1999, p. 93) relate to the age of the children: students at the end of primary school used computers outside school more than those at the end of middle or lower secondary school, and reported higher levels of enjoyment. These findings need to be further supported by longitudinal study and compared to, for example, middle schooling outcomes.

Key findings in the BECTA-commissioned and companion reviews of the research literature identified the barriers (BECTA, 2003) and the enablers (Scrimshaw, 2004) for teachers' successful use of ICT. These commonly identified factors were found to be barriers:

- teachers' lack of confidence, time shortages and access to quality resources;
- recurring technical faults in the network management and support;
- resistance to change; and
- the close relationship between these barriers.

Key enablers were:

- strong principal or school based leadership and planning;
- collegial sharing of resources;

- reliable ICT technical support; and
- schools working with each other or their local community.

A recommendation of the report reviewing the research on the barriers was that there needed to be trialling of the specific actions that were possible *interventions* (BECTA, 2003).

In a large American grant program in the state of Michigan, from the Centre for Applied Research in Educational Technology (Zhao et al. 2002), 118 K-12 teachers were awarded funds to innovate with technology in their classrooms. Enabling conditions were characterised as organisational, technical and social, but in the end, the classroom technology innovations were found to be influenced mostly by the teacher as the innovator rather than the context of the school. These three domains did not contribute equally to the success of the technology innovation projects. The study claimed that "when the teacher was highly capable, [their] projects seemed to have a better chance to succeed" (Zhao et al., 2002 p.33).

British case studies of three government secondary schools where ICT was implemented as a tool for teaching and learning across the curriculum have been reported by Tearle (2002; 2003; 2004). The case studies researched the way the schools focused on the enablers rather than the barriers in terms of ICT implementation across the school. The mixed method case study strategy, research questions, methodology, data collection instruments (and some aspects of the findings) are similar too those used and emerging in this study.

According to Tearle (2003) the main keys to effective whole school ICT implementation were fourfold:

- a whole-school vision and strategy for ICT;

- visible and practically demonstrable actions of the Principal;
- visibility of use of ICT in the school; and
- parallel need for expectation to use ICT and support provision for doing so.

Tearle (2003) found that the process through which the ICT is implemented effectively is a visible, flexible and staged one. As well, it involves the recognition of the need for time to learn and develop meaningful practice plus a recognition of the changing needs and practices of the participants. Key events, characteristics and strands of the process were also identified: Key events included the appointment of pivotal staff – ICT co-ordinator and network manager, financial allocation for hardware and technical infrastructure and an ICT training program. Key characteristics included attention to preparation and planning and the quality of leadership, access to resources, simultaneous training and support, time, shared responsibility and ownership. Not surprisingly, they also in effect became the first order barriers if not present (Tearle 2004):

- availability of the technology;
- support and training;
- leadership; and
- time.

When teachers in the study were asked directly to comment on the factors that had enabled ICT implementation, they noted the factors which had motivated them as well as enabled it. The most important features that they noted were availability of resources, support and enthusiasm of colleagues, quality of resources and student responses.

Tearle's findings (2004) unveiled a range of issues which are in effect, enabling features, some related to ICT implementation and others related to whole school culture and characteristics:

Whole school enabling characteristics:

- the need for a whole school vision and a strategy for ICT;
- the visible and practically demonstrable actions of the Principal;
- the visibility of ICT use in the school;
- the parallel need for expectation to use ICT and support in doing so

Access and availability of resources:

- ease and flexibility of computer access;
- resources which are robust and best support the purpose for which they are to be used;
- a programme for resources to be updated and replaced;

Support and training:

- infrastructure of technical support;
- training and the identification of needs;

The process through which ICT is implemented:

- a planned and visible process by which ICT is to be implemented;
- recognition of the need for time to learn and develop meaningful practice;
- a staged implementation process;
- recognition of the changing needs and practices of teachers;

The whole school characteristics, culture and ethos:

- an outward and forward looking approach;
- positive approach to external mandates;

- a collaborative culture and one which promotes learning; and visibility of management and high expectations of staff and students.

In an examination of his question, "How far have we travelled?" Oliver (2005, p. 18) finds that despite the growth of ICT expertise and expectation for teachers to use computers in their teaching, the students' use of ICT at home and the ratio of computers to students, that the use of ICT in teaching and learning is still sporadic with levels of use impeded by a number of factors. Those factors include:

- many teachers are faced with delivering full curriculums not conducive to the use of ICT;
- many teachers prefer directed teaching modes based upon the delivery of content where ICT offers little opportunity or advantages; and
- teachers can still find themselves in settings where ICT use is limited as planning that relies on ICT availability can be disrupted.

In order to see the newer and emerging technologies, such as portable hand-held devices, mobile multimedia, any voice, text and media communications, wireless networking and accessible storage taken up ubiquitously, by most teachers, Oliver (2005) believes that one of the key strategies is to further the research activity that explores implementation issues. He argues that applications and activities need to be driven by the teachers and students themselves when they see the need for the tool of trade, not as a top-down activity.

***Trust***

Bishop (1999) revealed that trust is essential for effective school leadership in research on relationships between Victorian teachers and principals. A combination of the principals' personal and professional characteristics and work practices helped to develop and

maintain that trust with the teachers (Bishop, 1999; Fullan 2003). Recent research in the USA showed clearly that effective leadership of principals involved the combination of trust with vision building (Bryk and Schneider, 2003). In their longitudinal study of a large number of Chicago schools, the Bryk and Schneider, (2003, p. 118) found that the relational trust discerned in social exchanges of teacher and parent groups with the principal was vital in building effective school communities. It was comprised of four specific issues of respect, personal regard, competence in core role responsibilities, and personal integrity. Schools with high trust were more likely to provide greater "orientation to innovation." Successful school leaders promote a culture of collegiality, collaboration, support and trust as well as encouraging and supporting innovation and risk-taking (Mulford and Johns, 2004).

***Alignment***

The implementation of ICT is perceived by principals to be complex and fraught with difficulties (Schiller, 1997). The transformative changes to work environments in resource-rich schools in Australia have resulted in a renewed interest in the alignment of ICT and school leadership. Modern organisations have changed as a result of the introduction of ICT. In the environments mediated by this alignment, the concept of e-leadership has grown (Gurr and Broadbent, 2004). Gurr and Broadbent suggest that emerging views of leadership have not explored the implications of the ways in which leadership behaviours are mediated by ICT. Hence, e-leadership is explicit acknowledgement of this alignment.

***Interventions***

Hall and Hord, (2001 p. 105) defined 'interventions' as "any action or event that influences the individuals involved or expected to be involved in the process" Innovation-

related interventions and change facilitation support can be delivered by any individual who assumes the role of change facilitator, explicitly or implicitly. In their research, Hall and Hord described six types or functions of interventions that were deemed necessary for making change happen. As such, they were the change facilitators' job descriptions. Four of these types related to planning, providing resources, training, checking progress and evaluation, but two involved developing a shared vision and creating the context for the changes. In those contexts, participants such as school leaders value change in order to improve their effective practice (Hall and Hord, 2001).

Hall & Hord (2005) elaborate on the guiding principles of interventions and assert that the successful implementation of any new policies, programs processes, practices and even new personnel does not just happen. Interventions make the difference. Any personnel can act as change facilitators if they assume roles and responsibilities. Many types of interventions are necessary – large and small, for change process success. Hall & Hord (2005) found that over the years, the CBAM research resulted in the identification of several functions of interventions:

- Function I: Developing, articulating and communicating a shared vision of the intended change;
- Function II: Planning and providing resources;
- Function III: Investing in professional learning;
- Function IV: Checking on progress;
- Function V: Providing continuous assistance; and
- Function VI: Creating a context supportive of change.
- Additional: Communicating externally; Disseminating information.

Policy interventions, game plan components, strategies, tactics and incidents are all sizes, types and elements of interventions in the Hall & Hord model. Anatomy, analysis and coding of interventions (Hall & Hord, 1987) can be done by researchers to reflect and analyse a change effort.

Apart from recent research studies which demonstrated that ICT is having a huge impact on the ways in which principals work (Schiller, 2003; Venezky and Davis, 2001), and explored potential relationships between leadership styles and uses of technology (Hughes and Zachariah, 2001), the ICT research literature has tended to overlook the role of the principal. There is little evidence based research on ICT implementation and the role of the school principal (Schiller, 2003) or the impact of ICT on the way in which principals work (Gurr, 2001), despite the substantial literature which identifies the school principal as a key factor in bringing about educational change (Cusack, Gurr and Schiller, 1999; Fullan, 1990, 1996; Cuttance 2001; Hall and Hord, 2001; Mulford & Johns, 2004a, 2004b). Further, principals often provided interventions that increased the potential for change or implementation success (Schiller 2003).

In a report of their exploratory studies in three Australian states, Cusack, Gurr and Schiller (1999) found that the successful implementation of computers in teaching learning and administration included: a focus on school IT policy and implementation plans, opportunities for teachers to work in non-threatening environments, understanding of the large variation in teachers' competencies and applications, and active involvement by the school principals. In the particular survey of 217 principals in NSW in 2001, Schiller (2003) found large variations between principals' use and concerns for ICT. The major findings from this study were that there were huge variations between principals in terms of their perceived competencies, and in their preferences for learning about ICT. In a second

phase in 2003, with case studies of effective principals, Schiller (2003, p. 295) found that many principals regarded their interventions of support, assistance, modelling, coaching, monitoring, collaboration and visioning as "crucial to increasing the degree of implementation success in their school". The quality and quantity of the ICT interventions may impact on the implementation of ICT. Schiller described the intervention behaviours of these principals as fitting the concept of the change facilitator styles (Hall and Hord, 2001).

***Transformational Leadership***

A major Australian report, *School Innovation: pathway to the knowledge society* by Peter Cuttance (2001) documented the findings of 107 innovative school projects of which 20 had a focus on technology innovations. The projects provided evidence that schools were beginning to use ICT infrastructures as 'glue' that supports teaching, learning and administration. Schools viewed ICT as a set of tools to amplify, extend and transform learning and to provide the resources and skills to do so by extending the school into the local community. They used ICT to enhance teaching and learning with technology (developing skills) and critically supporting constructivist approaches of learning through technology.

Cuttance (2001) found that the major challenge faced by the schools was that inherent in all innovation and change processes of getting support and commitment from a critical mass of staff to give credence to the innovation. This involved winning over staff who were wary of continual change in schools. Where schools had implemented ICT-based innovations, they had also implemented substantial other changes. Thus, the impact of the ICT component of their innovation was confounded by the impact of the other changes that they had made in the school. When implemented as part of a more wide-ranging reform of

school organisation, management and teaching practice, the second-order effects of ICT provided opportunities for students to learn in more constructivist and flexible ways. Students gained substantial additional learning outcomes in schools which had implemented ICT innovations. These gains by students included the capacity to regulate and manage their learning and the skills and capacities for collaborative and cooperative learning to achieve team-based outcomes that were beyond those achievable by students working individually.

As noted earlier, Venezky and Davis (2002) concluded in their OECD/CERI report, *Quo Vademus? The transformation of schooling in a networked world* that adoption of ICT generally followed a traditional pattern for diffusion of innovations. Significantly, there were five optimal conditions that assisted in the effective implementation. They were:

- sufficient professional development opportunities;
- support;
- with compensated time off for training;
- adequate ICT infrastructure; and
- appropriate leadership.

The application that most *transformed* schooling was advanced communications, which brought together the different partners in the delivery of instruction and delivering materials on an anytime/anywhere basis.

The work of school leaders is being changed as a result of ICT (Gurr & Broadbent, 2004). Gurr & Broadbent claim that the transformative changes to work environments in leading

schools is resulting in a renewed interest in the alignment of ICT and leadership. Some of the changes reported by the principals surveyed in the study by Gurr &Broadbent (2004) were transformative, including the development of new practices, such as sophisticated information management systems for human and physical resource management as well as the accountability requirements of reporting student performance and curriculum provision. In these environments mediated by the ICT innovation and leadership, the concept of e-leadership had been developed (Gurr & Broadbent, 2004).

Reports from the research in progress conducted as part of an Australian Research council Linkage project, called *Children, online learning and authentic teaching skills in primary education* (Webb, Roberston and Fluck, 2003) cited evidence about participants' expression of transformative teaching experiences. Webb et al. (2003) raised the issue that most transformations have been temporary, episodic or situational. Webb, et al. (2003a) presented a paradox that authentic teaching and online learning are potential constraints in the achievement of sustained transformation of schools' teaching and learning. Webb et al. (2003a) concluded that they have little evidence that the provision of reliable technology is enough for sustained transformation of teaching and learning. At this point in time, sustainable transformation appeared to involve the vision, knowledge and insight, strategy for change management as well as motivation (Webb, 2003b)

Using research-based knowledge, Leithwood and Riehl (2003) provided defensible claims about school leadership, its contribution to student learning and the basics of successful practice which complimented research literature and evidence-based research on transformative leadership. Sergiovanni (1999) believed that the transformative leadership has the ability to tap the higher depths of human potential and to produce levels of

performance that are beyond expectations). A number of studies showed that the transformational form of the principal's leadership has been perceived by teachers to generate the most helpful management practice in change contexts (Silins and Mulford, 2002). Silins and Mulford (2002) found that student outcomes are likely to improve if leadership is distributed throughout the school community and teachers are empowered. Moreover, principals' transformational practices promoted collegial co-construction of vision, goals, learning requirements and culture (Bishop, 1999).

In the LOLSO Project (Silins and Mulford, 2002; Mulford and Silins, 2003; Mulford and Johns, 2004a, 2004b) on three aspects of high school functioning – leadership, organisational learning and the impact of both on student outcomes, Mulford and Silins (2003) and Mulford and Johns (2004a, 2004b) variously summed up the focus of successful school leadership. The transformational leadership focus of the principal included:

- individual support;
- a culture of caring and trust among staff;
- a structure of distributed leadership and participative decision making;
- a whole staff consensus on vision and goals;
- high performance expectations with innovative staff; and
- intellectual stimulation encouraging staff to reflect on their own practice.

This longitudinal LOLSO research with predictive validity and integrity (Mulford and Silins, 2003, p. 176), using teacher surveys ("teacher voice") and student surveys ("pupil voice") rather than just leaders' views included the concept of organisational learning (OL). OL involved the sequence of a trusting and collaborative climate, shared and monitored mission, and then, risk-taking and initiatives, within a context of relevant professional development.

There is a lack of interest in the link between ICT and leadership. Gurr & Broadbent (2004) do not find this situation surprising as they find that there is little acknowledgement in the research literature even though many leadership behaviours are mediated by ICT. Fullan (2003, p. 9) draws on Collin's (2001) research and description of "technology accelerators" in transformational leadership in the world of business to suggest that good-to-great leaders think differently about technology. They do no use it as a primary means of igniting transformation, but paradoxically, they use carefully selected technology.

## Boys and ICT at home and school

DEST (2003) strongly argued that boys, and especially boys who are underachieving at school, responded favourably to the use of ICTs at school. Nevertheless, in Australia, there has been a lack of specific evidence-based research which has targeted how the links between home and school are affected by leadership despite the growing body of evidence on boys' education issues. Gender differences were still evident in that boys were more likely to own and operate a dedicated video or game machine in the home, and they tended to play different types of games to the girls (Downes, 1998). Meredyth et al. (1999) linked technologically enhanced home environments with an enhanced capacity to acquire advanced ICT skills and knowledge; and students from independent and single-sex boy's schools reported the most advanced skills (p. 298-299).

The importance of the impact of the home environment on students' achievement has been highlighted in an Australian study by Silins and Mulford (2002). They concluded that schools need to work with parents to assist those parents understand how they help their children with the supportive home environment. Support of the parents was critical to the success of innovations in a report by Cuttance and Stokes (2000) who found that a number

of schools with ICT based innovations had established linkages with organisations and businesses to support students' learning.

## Learning communities

When teachers and school leaders continuously seek and share learning in order to enhance their effectiveness as professionals so that students benefit, Hord (1997) described it as communities of continuous inquiry and improvement. The term "learning community" has become commonplace in the literature, particularly in relation to descriptions of teachers' reflection for extending their classroom practice. McLaughlin (1998, p. 77) stated that learning communities of teachers are "essential supports for the intensive teaching technologies associated with reinvented practices, the collegial consciousness and the knowledge that they assumed". The most powerful innovations in schools involved teachers learning together as "learning teams" (Cuttance 2001). For Stoll, Fink and Earl (2004) in their close analysis of learning communities and school culture, the real power of learning communities meant ultimate improvement in student learning.

In their three year (2002-2004) and ongoing study of classroom computer climate and teacher reflections for the purpose of re-envisioning pedagogy in Australian schools, Robertson, Fluck, Webb and Loechel (2005) argue that authentic pedagogy for ICT can evolve through the creation of communities of practice. Data gathered from their classroom observations to date form the basis of their working model for professional learning. In this model (Robertson, Fluck, Webb & Loechel, 2005, p. 5), "cooperative approaches with peers helps create a community of practice from which to develop ICT competence and confidence to engage in new practices". Constraints and concerns were the second major theme (44% of respondents) after ICT learning having an increasing focus (66% of

respondents) as expressed by teachers when questioned about the future of classroom teaching. Teachers who demonstrated success and comfort in incorporating ICT into their class programs consistently reported having a personal professional learning support network. Interview results confirmed that teachers needed to be supported by their "expert" colleagues.

## ICT and the transformation of education

Along the theoretical continuum of models of integration of ICT skills and competencies in teaching and learning, there are mixed views and thinking about whether a continuum exists, or if indeed, it has meant a paradigm shift with education and technology convergence. In Chapter 1 of this research study, in defining *integration of ICT*, four models were defined:

- The specialist IT subject in a school curriculum which integrates ICT skills and competencies with information technology from the subject discipline;
- Equipping all teachers with ICT skills and competencies to enable them to integrate ICTs into classroom practice;
- Curriculum changes, impacting on curriculum content, teachers' pedagogical practice and students' information literacy; and
- A systemic model of innovation and whole school change for transformative leadership, school improvement and student outcomes.

Advice about school level organisation and IT infrastructure as well as education sector and system-wide professional development funding, such as that by MCEETYA (2000) supported the notion that this continuum exists, with the following structural supports and

knowledge base for each of the four models:

- Scheduling, supporting and teaching IT subjects, such as programming;
- Providing a laptop for every teacher with a sustained professional learning and accreditation program;
- Cross curriculum approaches to teaching and assessing ICT skills and competencies supported by flexible access: school wide clusters and studios of desktop computers or laptops for students;
- Broadband and wireless supported information culture with ubiquitous and embedded ICT across all management and student services, and online communities with significant impact on systems integration, student achievement and outcomes;

The "literature indicates that distinctly different models of teacher professional development exist, and that these tend to be associated with different approaches to defining what is required from ICTs," (DEST, 2001, p. 32). In this national report on the models of teacher professional development for the integration of ICT into classroom practice, DEST contended that each model is a different approach and a different world view which does not translate into a pathway or continuum. Paradoxically, DEST does concede that the outcomes from the final model are not achievable unless large scale successes are achieved with the second and third models.

## Summary

This chapter has highlighted research which has considered ICT innovation and implementation as well as leadership and change management which serves as a foundation

and springboard for the looking glass metaphor of the conceptual framework of this study. The first task has been to focus the lens on the areas of interest. The main areas of focus are innovation, concerns-based theory, leadership and change in education. To uncover the critical paths that relate to the effective implementation of ICT, the research reviewed suggests a specific focus on these outcomes.

Innovation models

- Where ICT relates to school innovation, the diffusion of the innovation follows the traditional diffusion pattern for innovations.
- The acquisition of ICT skills by teachers does not necessarily lead to deployment of those skills in teaching.
- Successful implementation of ICT depends upon a critical balance and context for teacher competence, school technological infrastructure and student ICT skills.
- The stages of implementation are important as the teachers become more competent in implementing ICT for their own style of teaching.

Concerns model

- The utility of the CBAM model for the change facilitator is in its capacity to identify the pre-conditions or the issues to be sensitive to, in order to understand how the change is being perceived and that some change can be anticipated.
- The CBAM interpretation of profiles can be an effective guide to facilitate the implementation of teacher professional development program or a

change process in any particular time in the life-cycle of the implementation of an innovation.

- Analysis of the CBAM concerns profile that enables interventions to resolve concerns and move the individual or group to a more advanced stage in the innovation process has major implications for teacher professional development planning.
- A strength of the CBAM model is that it gives attention to the individual and their need for information.
- Change facilitators need to consider the dimensions of the levels of use to understand where individuals and groups need appropriate interventions, both large and small to further the change process.

Leadership and change models

- The focus on fundamental issues of leadership and change management for such school transformation is as important as the focus on technology (and the barriers to effective implementation, such as lack of teachers' ICT skills).
- Barriers to ICT implementation are teachers' lack of confidence, time and access to quality resources, support for any recurring technical faults, and full curricula not conducive to the use of ICT.
- The enablers are highly effective leadership and planning, including a whole school vision and strategy for ICT, visible and practically demonstrable actions of the Principal, with visibility of use of ICT in the school, and leaderships' expectation and support for staff using ICT.

- Teachers who demonstrated success in incorporating ICT into their class programs consistently reported having a personal professional learning support network or involvement in learning communities.
- The role of the principal is a key factor and often enables interventions that increase the potential for change or implementation success such as sufficient professional development opportunities, support, with compensated time off for training, adequate ICT infrastructure, and appropriate leadership.

Principals' transformational leadership focus includes interventions which are a key to change. The best leadership for organisational learning and a range of improved student outcomes include individual support and trust, distributed leadership and participative decision-making, a whole staff consensus on vision and goals, intellectual stimulation and support, risk taking and initiatives, relevant professional development and high performance expectations.

The next chapter describes the methodology used of the case study approach. In addition, the research methods, the selection and the recruitment of subjects that are used are described. Then the survey instruments used and the data analysis instrument are explored in detail.

# CHAPTER 3: METHODOLOGY

## Introduction

This chapter describes the case study approach, the research methods as well as the selection and recruitment of subjects that are used in the study. The survey instruments and data analysis procedures are defined in detail.

## Case study approach

As a qualitative research method, the exploratory case study allows the researcher to explore in-depth a program, an event, an activity, a process or more, bound by a sustained period of time and activity. It is a research strategy that Yin (1994) describes simply as the preferred one when 'how' and 'why' questions are posed and when the investigator has little control over events. The exploratory case study methodology used in this study is that defined most succinctly by Yin (1994) whereby the program being studied is not easily distinguished from the context of the case study with its multitude of variables. It focuses upon understanding the dynamics present in a real-life context and typically combines data collection methods such as checking of archives and artefacts, systematic interviews, questionnaires plus participant observations. It needs rigorous and fair representation of the empirical data, but in turn, retains the holistic and meaningful characteristics of the real-life context. This methodology is able to deal uniquely with the range of evidences – documents, records, as well as interviews and observations. According to Yin (1994) in this all-encompassing method, there will be many more variables of interest rather than data points. A result can rely on multiple sources of evidence, with the data needing to converge in a triangulating fashion, and another result may benefit from the development of theoretical propositions to guide data collection and analysis.

Five components of case study research design are advocated by Yin (1994, p. 20) as particularly important. They are:

- clarifying the study's questions, in terms of "who", "what", "how" and "why";
- its propositions, if any, to direct attention to something that should be examined in the scope of the study – the design of the study will call them *the purpose* as well as *the criteria* by which the exploration can be judged successful;
- its unit/s of analysis or defining the "case", whereby each unit has its own research design or data collection strategy;
- the logic linking the data to the propositions, or 'pattern-matching';
- and the criteria for interpreting the findings

Covering all five of these components forces the researcher to begin to construct a preliminary theory related to the topic of study. Interestingly, Yin (1994) describes this as the one point of difference between case studies and other methods, such as ethnography or grounded theory which avoid specifying any propositions at the outset. Such clarification is vital for this current exploratory case study so as to clarify what is to be explored, the purpose of the research, and the criteria by which it may be judged successful.

Burns (2000) describes the case study subject as an entity in itself, or a bounded system that focuses on the process rather than outcome, or on discovery rather than confirmation (p.460). Cresswell (2003) states that the researcher collects open-ended and emerging data, and collects it with the primary intent of developing themes from that data.

Eisenhardt's chapter in Huberman and Miles (2002) provides several guiding insights into case study research. One view concerns the selection of an appropriate population which helps to control extraneous variables and define the limits for generalizing the findings. Another view is that the tentative constructs from the literature review that are potentially important can be explicitly measured in the interview and questionnaires. When several constructs emerge, there can be triangulation of multiple data collection methods on which to ground the emergent theory development. Last, the juxtaposition of conflicting results from the literature review can provide richer analysis for the emergent theory development, as well as sharpening the limits of the generalizability.

In Huberman and Miles (2002), Eisenhardt claims some methods which outline specific techniques for analysing qualitative data, using a variety of devices such as tabular displays, graphs and methods do not risk destroying the meaning of the data through intensive coding. Nevertheless, Sadler (Huberman and Miles 2002) is more cautious. He warns that naturalistic research approaches are susceptible to a hazard of biases due to the limitations of information processing. Sadler sensitises the naturalist researcher by elaborating on the faulty intuitive biases - such biases as data overload, uneven reliability of information, or missing information.

In terms of inference and extrapolation of theory or outcomes from the research, it is important to revisit the issues among some writers in relation to the generalizability of qualitative research. Traditionally, greater attention was paid to validity and reliability than generalizability. It was a widely held view in qualitative research literature that generalizability is not important, useful or obtainable. Schofield (Huberman and Miles 2002) describes the shift that occurred during the 1970s with the inclusion of qualitative

components in large-scale education quantitative research projects with tests for external validity leading to an associated value of generalizability. One approach for qualitative researchers has been the synthesis of pre-existing studies or meta-ethnography. Another has been the 'case study method' advocated by Yin (1994) because of its reduction of rich description to quantifiable data, albeit having a danger of ignoring the unique data in the specific cases.

Recalling Yin's (1994, p. 30) advice for theory development, one outcome is that generalization can occur, if noting the difference between "analytic generalization" and "statistical generalization" about a population based upon empirical data collected from the sample. As case studies are not sampling units, the method of "analytic generalization" is necessary. It can be used as a template to compare the empirical results of the case study. When several cases are shown to support the same theory, replication may be claimed.

Schofield's (Huberman and Miles 2002, p. 180) claim is that there are three targets of generalizability – "what is", "what may be" and "what could be". The goal of studying what is or what is typical is relevant in this exploratory study. In other words, the notion that the choice of study of a large independent school that is typical of its kind can be combined with the kind of thick description emphasised by Stake (1995) can potentially provide some generalizability.

A further component of the criteria for judging the quality or success of the research design is informed by Yin (1994). In reiterating the four common tests of quality in empirical research, Yin identifies several tactics for dealing with the tests in the conduct of case study

research. The tests of construct validity, internal validity, external validity and reliability each deserve particular attention to be able to inform this current study.

The first test of construct validity can be problematic when a researcher may fail to develop objective measures or make subjective judgements in collecting data. Tactics available to increase the objectivity are choosing multiple sources of evidence; establishing a chain of evidence and having key informants review the draft report. The second test for internal validity is relevant for exploratory studies making causal statements, which is rare in educational research (Gay, 1992). Even the general problem of making inferences will be managed by anticipating the problem of internal validity. Three tactics are pattern-matching, explanation-building and time-series analysis. Generalizability is the issue for the third test of external validity. The sample in a case study does not generalise to the population. Hence, the tactic of replication logic must occur in the research design, to enable replication of findings from multiple-case studies. The final test is reliability and tactics involve the use of case study protocol and a case study database to deal with the documentation. Yin (1994) describes this last set of tactics as those of an auditor doing the reliability check by repeating the procedures and arriving at the same results.

In summary, this exploratory case study methodology used in this study is that defined most successfully by Yin (1994) and particularly in terms of the recommendations for five components of the blueprint, the theory development, the rich description, the theoretical framework supported by existing knowledge, the template for the analytic generalization and the tests of quality. Simply stated, the goal is to be studying "what is" typical in this exploratory study to allow a potential generalizability.

Bailey (1991) highlights the use of time-series analysis as one of three commonly used methods of data analysis in case study research, as derived from Yin's first 1984 edition (Yin, 1994). The other two methods are pattern matching and explanation building. According to Bailey (1991), the analysis of chronological events in time-series analysis is a strength of case study research methodology for it allows the "how" and "why" questions to be asked about the relationship of events over time. Explanation building or stating a set of causal links about the case is a preliminary to developing ideas and hypotheses for further study. Hence the goal of explanation building for Bailey (1991) is clearly to build a general explanation that fits all similar cases.

## Development of the CBAM Stages of Concern questionnaire and Levels of Use interviews

In the early 1970s, the CBAM project research began at the Research and Development Centre for Teacher Education at the University of Texas at Austin. From the first pilot instrument for the Stages of Concern questionnaire, through to the Levels of Use interviews, the Open-Ended Concerns Statement to the diagnostic Innovation configuration, these methods for assessing individual concerns with the adoption of innovation and implementation of change evolved over the subsequent 30 years with extensive validation through countless international trials (Cheung, D., Hattie, J., and Ng, D., 2001; Hall and Hord, 2001).

Internal reliability for the SoC questionnaire and LoU interview tapes was obtained after two years of extensive cross-sectional and longitudinal studies of many different educational innovations and reported extensively (Hall, George and Rutherford, 1977). Internal reliability was reported for the the SoC (Hall and Hord, 2001). Validity could not

be demonstrated as easily since other measures of concern did not exist. Evidence for the validity of the stages of concern included inter-correlation matrices, and judgements of concerns based on the interview data.

The research of Cheung, D., Hattie, J., and Ng, D (2001) re-examined the seven stages of concern and following an extensive psychometric and conceptual analysis, they supported a five stage, 22 item SoC questionnaire rather than seven stage one. None of the models provided a good fit to their observed data, and they expressed a lack of empirical information about the reliability, construct validity and simplex structure of the SoC questionnaire data. As cross-validation of the Cheung et al (2001) model has not occurred, compared to the original instruments having had extensive testing over 30 years research into educational innovations in many countries, it was resolved that the original instruments were an appropriate measure for teaching staff concerns about the implementation of ICT and online learning in this case study.

## Methodology

As the focus in this study is on effective implementation and change, plus the process rather than the outcome, the research methodology adopted was a case study. The methodological approach included a case study which employed questionnaires for all students from years 7 – 12 and all teachers from kindergarten to year 12, with an interview for a selective group of teachers, known for their best practice in online teaching.

The project was conducted at Stephens School [pseudonym] which is an elite and long established independent school for boys in Hobart, Tasmania, aged from K-12. As an entity in itself, comprising bounded units of mini-schools, staff and student groups, and

facilitating purposeful sampling, this school is representative of large independent schools in Australia.

The process for approval of the research within the school grew out of discussions over a number of years, between the Principal and the researcher employed as a teacher at the school. Discussions regarded a mutual aim to focus on the change occurring with the implementation of ICT programs. The Principal gave approval in writing, to formalise the school's support of this research study and the case study methodology.

The research data collection was conducted during the period, October 2003 to May, 2004 and in February, 2005. The first data collection involved a letter, information sheet, sample questionnaire and consent form being mailed to parents/guardians. Signed consent forms were returned in stamped self addressed envelopes mailed to the investigators at the school. The second data collection took place one month later with a follow up three months later for participating students whose parent consent forms had been received. At the same time, the third data collection source was the questionnaires to teachers, delivered to individual mail boxes in the School following receipt of the teachers' signed consent forms. The fourth data collection was the interviewing of the smaller and selective group of ten teachers, known for their 'best practice' in online teacher professional development who were invited by a letter to take part in audio-taped interviews at their convenience. The fifth and last data collection was the teachers' statements of concern.

Data sets are analysed using the models described in Chapter 1, that is, the 'diffusion of an innovation model', the conceptual framework of the 'concerns based adoption' and 'levels of use' model and the 'implementation of change' model.

***Selection of participants***

Students from the Middle and Senior Schools, all male, aged 13 – 18 years old (years 7-12) form a population sample of 664 students. A letter, information sheet, sample questionnaire and consent form were forwarded to parents/guardians seeking permission for their son/sons to participate in the study. Participating students were invited to respond to the questionnaire surveying their computer use at home and at school, their ICT competencies as well as their attitudes to ICT and learning online.

Teachers from K-12 – Junior, Middle and Senior Schools, male and female, in a population sample of 101 teachers were invited to respond to a questionnaire surveying their computer use, and stages of concern in relation to the introduction of online learning. They were invited by letter introducing the study with the information sheet, the sample questionnaire and consent forms. Using the case study model, a smaller and selective group, numbering ten teachers, from the selection criteria known to all teaching staff as their best practice in providing an online teacher professional development program were invited to take part in audio-taped interviews in a similar letter with the information sheet, the sample questionnaire and consent forms. They were asked essentially, to reflect on their expertise developed over time at the School.

***Recruitment of participants***

A letter was received by the researcher from the Principal who granted permission

indicating the permission granted on the 20th June 2003 to conduct the study at Stephens School [pseudonym] and confirmed his understanding that the study would involve a questionnaire for staff and students as well as selective interviews for some staff.

***Students***

The parent introductory letter, information sheet, sample questionnaire and consent forms were enveloped and mailed to parents of boys in class/year groups from years 7-12 on the 17th October, 2003. On 30th November, 2003, following receipt of the signed and posted consent forms through the mail to the investigators, the letters, questionnaires and self-addressed and stamped return envelopes were distributed to students of consenting parents. They were handed to these students via routine tutor or pastoral meeting times available for the distribution of personal notices and circulars. A final follow up letter and questionnaire from the researcher was mailed to parents on 12th January 2004.

***Teachers***

The introductory letter inviting teachers to take part in the study, with the accompanying information sheet and consent forms, were provided directly to all teachers via their individual school mail boxes or 'pigeon holes' in the three major staff common rooms from the period of the 30th November – 12th December, 2003. Approximately one week after receipt of consent forms, the questionnaires were distributed. Between the 10th and 16th May 2004, an additional ten teachers were invited to participate in the audio-taped interviews. Those consenting were interviewed in their non-teaching time at their convenience in their own staffroom. The final data collection of Open-Ended Statements of Concern from teachers occurred on the 4th February 2005 at a whole staff meeting

wherein teachers could opt to not participate, complete or hand in the single A4 sheet paper response.

### *Data Analysis*

This exploratory case study using questionnaires, interviews, observations, artifacts, document analysis and statements of concern was effective in developing useful responses to the research questions. Students' ICT skills, attitudes and experiences were explored largely through the questionnaire survey. The questions are described briefly here and provided in full in Appendix II Student Questionnaire. Five point Likert-type scale questions sought attitude responses ranging from "strongly agree" to "strongly disagree". Statistical reporting is in the form of tabular frequencies and percentages.

Some additional tabular evidence is presented through the school sponsored sampling of students' ICT skills and competencies of students exiting Year 8, administered every December, 1999-2004. This analysis of the Year 8 students' skills evaluation data available using the Mankato self assessment instrument is reported in Chapter 4.

#### *Teachers' questionnaires*

Teachers' questions and interviews are provided in Appendix III Teacher Questionnaire and Appendix IV Teacher Interview Schedule. From the total of 101 teachers surveyed in December 2003 to February 2004, 61 questionnaires responses giving a response rate of 60.4 per cent. The teachers' questionnaires and interview responses to each question were analysed according to major and minor themes in addition to the 'concerns based adoption model' (CBAM, 1981), a conceptual framework described in Chapter 2 that describes, explains and predicts teachers' likely behaviour in a change environment. Each of the

diagnostic dimensions of CBAM (Stages of Concern, Open-ended Statements and Levels of Use) that are applied has a different method and instrument to collect and analyse the data associated with them. As Newhouse (2001, p. 7) experienced in the application of CBAM to his research on computers in classrooms, each of the dimensions 'requires the researcher to be immersed within the scene of the innovation and to continually refine judgements associated with the diagnostic tools".

### *Students' questionnaires*

A total of 664 students were surveyed in November 2003, and questionnaire responses were received from 304 students giving a response rate of 45.78 per cent. Such a response rate was acceptable given the view expressed by Burns (2000) that response rates to mail questionnaires seldom exceed 50 per cent and rates between 15 –50 per cent are more common (p. 581). Obtaining a high return on the student questionnaires was challenging. The ethical requirement for active consent by parents whereby parents signed a consent form which had to be returned to the researcher at the school, prior to the distribution of the questionnaire to the student, created logistical difficulties for teachers, possibly reduced participation rate and certainly teacher resistance to involvement in the research. The use of a stamped and addressed envelope for return of the consent forms, and again, with the follow up letter in the final weeks of the last term of the year assisted in increasing the rate of return.

## *Procedures for the application of the Concerns Based Adoption Model within the Teachers' Questionnaire*

Although the status of the copyright for the application of the CBAM instruments, controlled by the Southwest Educational Development Laboratory (SEDL) was not able to

be clarified, permission to use the principal instruments and diagnostic tools was requested and gained via the purchase of manuals and publications from SEDL (Available online from URL: www.sedl.org/pubs/catalog/items/cbam.htm)

One part of that CBAM model as illustrated in Figure 2.2 involved the administration of the Stages of Concern Questionnaire to assess the development of the concerns of the teachers during the process of implementation. The instrument was incorporated into the Teacher Questionnaire (Appendix III). It uses an eight point Likert scale of 35 items with three anchors: I (not true of me now), 4 (somewhat true of me now), and 7 (very true of me now). The instrument measures the intensity of concerns around three main clusters (self, task, and impact concerns). For each stage, there are five statements from which a raw score is calculated by adding the five individual responses per stage of concern. Appendix VII shows the 35 item numbers and statements arranged according to the Stages of Concern. A mean score for each stage of concern is calculated to obtain the overall scores for the group of teacher participants. A percentile chart is provided in the Hall, George and Rutherford (1977) manual or later publications by Hall and Hord (1987; 2001) called the *Stage of Concern Quick Scoring Device* (reproduced in Appendix VIII) to convert the raw scores into percentiles. It enabled the hand scoring on sheets. The baseline data were the scaled scores for each of the stages of concern. Graphic representation or 'concerns profiles' of the percentile scores, assisted by the formula functions of Microsoft Excel facilitated the researcher's interpretations of the scores.

Hall, George and Rutherford (1977) and again in Hall and Hord (2001) recommended several methods for dealing with the grouped data. One method is to aggregate the individual teacher data by developing the concerns profile that is based on the mean score

for each stage of the individual teachers in the group. The aggregate score is derived from the sum of the responses to the five questions in each stage of concern. As Hall, et al.(1977) recommend, the goal of interpreting the Stages of Concern Questionnaire (SoCQ) data is the development of an overall and holistic perspective, and a description of the relative intensity of the different stages of concern about the effective implementation of ICT and online learning. The aim was to attempt to "develop a gestalt based on all Stages of Concern", which then enabled the exploration of alternative interpretations against other parts of the SoCQ data to be acceptable also (p. 53).

The individual teacher data was aggregated to develop this composite concerns profile that is based on the mean score for each stage of the 61 individual teachers in the group. The aggregate raw scores were derived from the sum of the responses to the five questions in each stage of concern. Then the mean of the raw scores for each stage were used to plot a composite concerns profile for the group of 61 staff.

Another method recommended by Hall et al (1977) concerns the highest stage score or peak score interpretation wherein a tally is given of the number of teachers that score high on each stage to obtain the range of peak scores within a group. The higher the score, the more intense are the concerns. To develop additional insight into the dynamics of the concerns, the second high stage score is analysed as well.

***Teachers' interviews***

The administration of the Levels of Use instrument involved a focussed interview, (rather than a structured interview with standardised questions and probes) constructed from the format suggested by the CBAM manual by Loucks, Newlove and Hall, (1998) reproduced

as Appendix IV: Teacher Interview Schedule and diagrammatically, in Appendix X: Format for the LoU Branching Interview. It involved additional questions based on the smaller and selective group of the thirteen teachers' own observations which needed to be individualised, or reveal action, behaviour or relationships that cannot be observer by the researcher. The interviews were transcribed from the audio recordings. The CBAM provided a LoU rating sheet that is a two-dimensional grid which consists of eight levels forming the rows and seven categories of LoU forming the columns. Each cell provides a general description of behaviour likely to indicate that the level should be applied to that dimension. Using the transcripts, a level was allocated for each dimension, using a table that linked interview questions with the dimensions. To assign a level to the interviewed teacher, the 'decision point' question was the starting point, more evidence was gathered by probing each of the categories, and then relevant information from the interview was used by the researcher to develop a gestalt of the LoU of the teacher (Loucks et al.,1998). The probes allowed teachers to reflect on how they had developed their levels of use over time.

***Teachers' open ended statements***

For the straightforward Open-Ended Statements of Concern, administered in a whole staff meeting on a professional development student-free day at the beginning of term, in February 2005, 55 teachers present were handed a blank sheet of paper which had written at the top:

> When you think about integrating ICT and online learning into the curriculum, what are you concerned about?

The sheets were anonymously filled in by all 55 respondents, the total number of teachers present on the day, and thereby a 100% response rate. The sheets were left at a central collection point in the conference room facility. The researcher explained to teachers that no participant would be given access to anyone's completed sheet. In addition, the

researcher ensured that the sheets were not tampered with once they were left at the collection point. This was done by the researcher. The papers were collected and content analysed by the researcher as described in the manual (Newlove and Hall, 1988). The statements were read to determine if there were overall themes that were unrelated, self, task or impact concerns. The statements were then re-read and a Stage of Concern was assigned to each sentence or dot point in order to make more holistic assessments. The collation of the open-ended statements involved all responses from teachers giving multiple statements.

***Documentary evidence***

During the period of undertaking the study, published documentary materials were available for a time-series analysis which contributed to an understanding of both the conditions that assisted effective implementation, and the change strategies and interventions for school improvement. Documentary materials provided for the staff community included curriculum change planning meeting minutes and ICT implementation policy. Documents as published materials for the whole school community were:

- Principals' welcome statements and the school mission statement on the school's website;
- annual ICT implementation plans and updates published in school magazines and on the websites;
- detailed policies and guidelines on the ICT skills and competencies to be developed by teachers and students;
- results of an annual survey of students' ICT skills and competencies over six years using the Belllingham Mankato Scale described in Chapter 4; and

- an online survey of staff attitudes developed by the staff of South Australia's Technology School of the Future, and also described in Chapter 4.

These documents were manually coded to a phrase level where they could be tabulated to facilitate evidential review as well as representative quotations. The documents were matched, in part, against the Silins and Mulford's (2000) leadership model for organisational learning and student outcomes (LOLSO).

## Summary

This chapter describes the case study used in this study because of the design considerations and the strengths of such an approach. Also in this chapter are details concerning the selection and recruitment of subjects and data gathering instruments that are used in the study. The survey instruments and data analysis procedures are described in detail with some discussion of their reliability and validity. In the next chapter, findings from the student and teacher questionnaires, the teachers' interviews and the teachers' open-ended statements as well as the documentary evidences are reported.

# CHAPTER 4: RESULTS

## Introduction

In this chapter, findings from the survey of students and teachers who completed the questionnaires, the teachers' interviews and the teachers' open-ended statements are reported. In the first section about students, the results are divided into the three separate parts: one reporting the students' home computers, connectivity and use; the next, students' experiences at school; and finally, their acquisition of ICT skills, competencies and understandings. Also, in the section about teachers, the results are divided into three separate parts: one reporting teachers' home ownership and nature of ICT use outside school; the next, computer based teaching; and finally, their stages of concern in online learning and levels of use of ICT in teaching and learning. The statistics reported in this chapter are either percentages or usage frequencies.

## Students

The students' questionnaire is attached as Appendix II. A total of 664 students were surveyed in November 2003, and questionnaire responses were received from 304 students yielding a response rate of 45.78 per cent. The response rate for each of the Years 7-12 varied between 37.75 and 50.79 per cent. This distribution of the responses across the year groups is illustrated in Table 4.1 and Figure 4.1. The percentage distribution of student responses by year group is given in Figure 4.2.

Table 4.1

*Students' questionnaire responses*

| Year Level | Number of students | Number of responses | % of students |
|---|---|---|---|
| Year 7 | 112 | 56 | 50.00 |
| Year 8 | 104 | 47 | 45.19 |
| Year 9 | 126 | 64 | 50.79 |
| Year 10 | 109 | 48 | 44.03 |
| Year 11 | 115 | 52 | 45.21 |
| Year 12 | 98 | 37 | 37.75 |
| TOTAL | 664 | 304 | 45.78 |

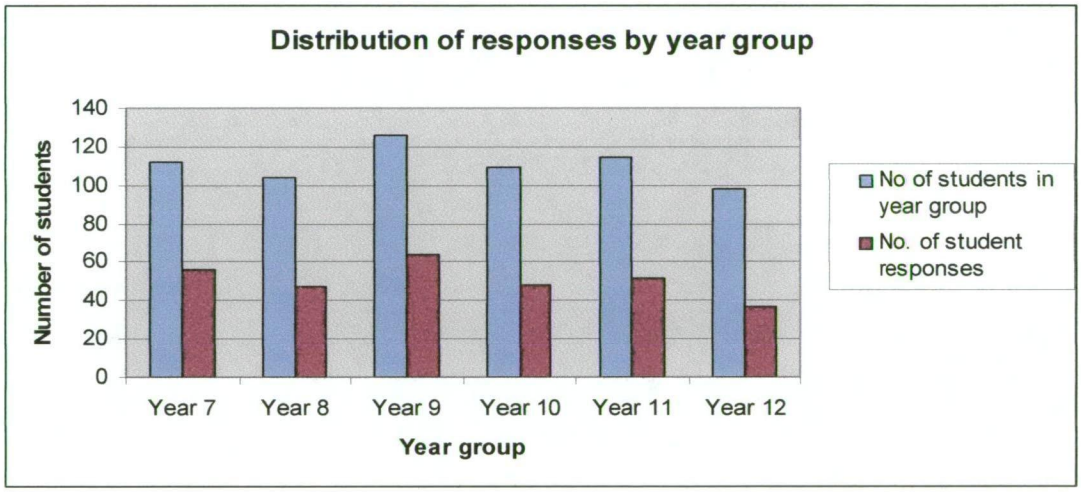


*Figure 4.1* Distribution of student responses by year group.

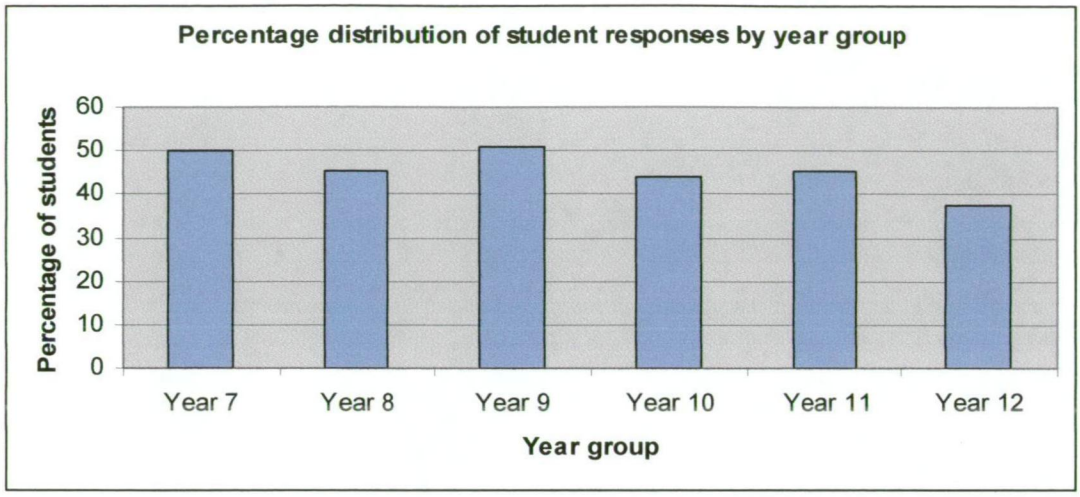


*Figure 4.2* Percentage distribution of student responses by year group.

### *Students' home computer use*

#### *Connectivity*

Table 4.2 presents students' Yes/No responses to the questions about home computer ownership and use of the internet, intranet and email by year groups. Almost all students (99%) had a computer at home with an Internet connection (95.4%). Ninety eight percent (98.03%) indicated that they used a computer at home, as shown in Table 4.3. An email account at home is used by 90.4%; however, only 52% access the school's intranet site and only 39.8% access the school's email account. Figure 4.3's bar chart presents this same information for the students responding affirmatively, as well as the overall percentage frequency for all students in Years 7-12.

Table 4.2

*Students' home computer use and connectivity (N=304)*

| Year | 7 | 7 | 8 | 8 | 9 | 9 | 10 | 10 | 11 | 11 | 12 | 12 | % Total | % Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Q 2: At home, do you** | **Yes** | **No** | **Yes** | **No** | **Yes** | **No** | **Yes** | **No** | **Yes** | **No** | **Yes** | **No** | **Yes** | **No** |
| Have a computer? | 56 | 0 | 47 | 0 | 64 | 0 | 48 | 0 | 51 | 1 | 37 | 0 | 99 | 1 |
| Have an Internet connection? | 52 | 4 | 46 | 1 | 64 | 0 | 43 | 5 | 48 | 4 | 37 | 0 | 95.4 | 4.6 |
| Use an email account? | 49 | 7 | 40 | 7 | 60 | 4 | 42 | 6 | 48 | 4 | 36 | 1 | 90.4 | 9.6 |
| Access the School's Intranet site? | 24 | 32 | 26 | 21 | 25 | 39 | 27 | 21 | 29 | 23 | 27 | 10 | 52 | 48 |
| Access your School email account? | 17 | 39 | 21 | 26 | 20 | 44 | 20 | 28 | 25 | 27 | 18 | 19 | 39.8 | 60.2 |

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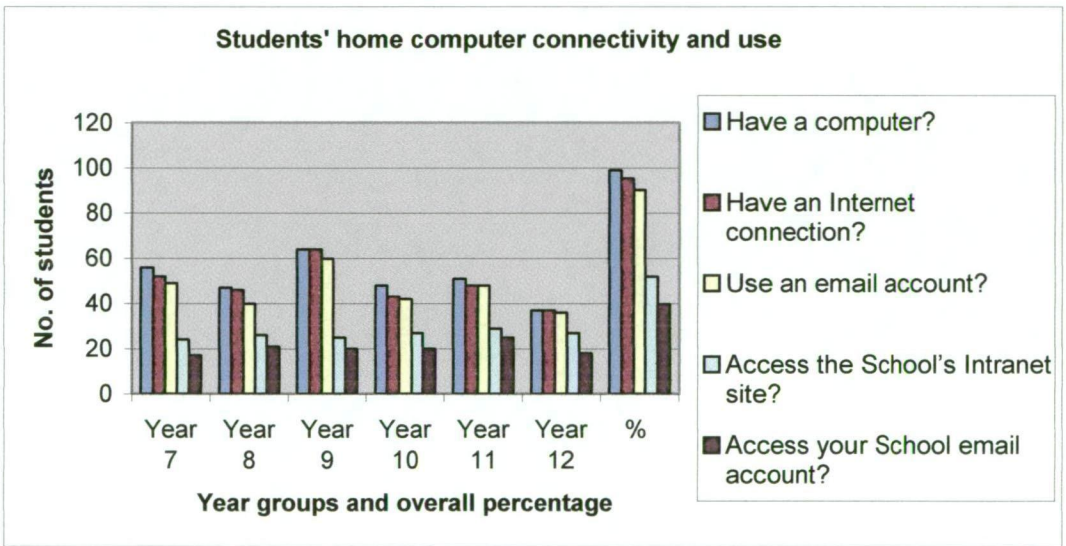


*Figure 4.3* Frequency and percentage distribution of home use and connectivity by year group.

Table 4.3

*Students' use of computers outside school (N=304)*

| Year | 7 | 8 | 9 | 10 | 11 | 12 | Total | % |
|---|---|---|---|---|---|---|---|---|
| | Yes/No | Yes/No | Yes/No | Yes/No | Yes/No | Yes/No | Yes/No | Yes/No |
| Use a computer outside school | 54 / 2 | 47 / 0 | 64 / 0 | 48 / 0 | 48 / 4 | 37 / 0 | 298 / 6 | 98.03 / 1.97 |

### *Location*

A high proportion of students used computers daily at home, and some occasionally at a friend's house or occasionally at a relative's house. A lesser number of students used computers occasionally at a public or branch library and an Internet café. Some other options were rarely or never nominated. Table 4.4 details the extent and frequency of use of computers outside school. Figure 4.4 presents this percentage frequency of students' options for computer use outside school at a glance.

Table 4.4

*Frequency of students' computer use outside school (N=304)*

| | Daily | Several days/week | Weekly | Occasionally | Rarely | Never | No response |
|---|---|---|---|---|---|---|---|
| At home | 159 | 76 | 21 | 32 | 3 | 12 | 1 |
| At a family or relative's house | 8 | 11 | 13 | 77 | 99 | 83 | 13 |
| At a friend's house | 5 | 20 | 28 | 102 | 71 | 54 | 24 |
| At a public or branch library | 6 | 8 | 7 | 38 | 79 | 166 | 0 |
| At an online access centre | 4 | 4 | 1 | 12 | 45 | 191 | 47 |
| At an Internet café | 3 | 4 | 3 | 20 | 52 | 208 | 14 |
| Elsewhere (Please list) *Games place, Computer lab, Dad's work, & Army cadets* | 3 | 6 | 3 | 7 | 1 | 11 | 273 |

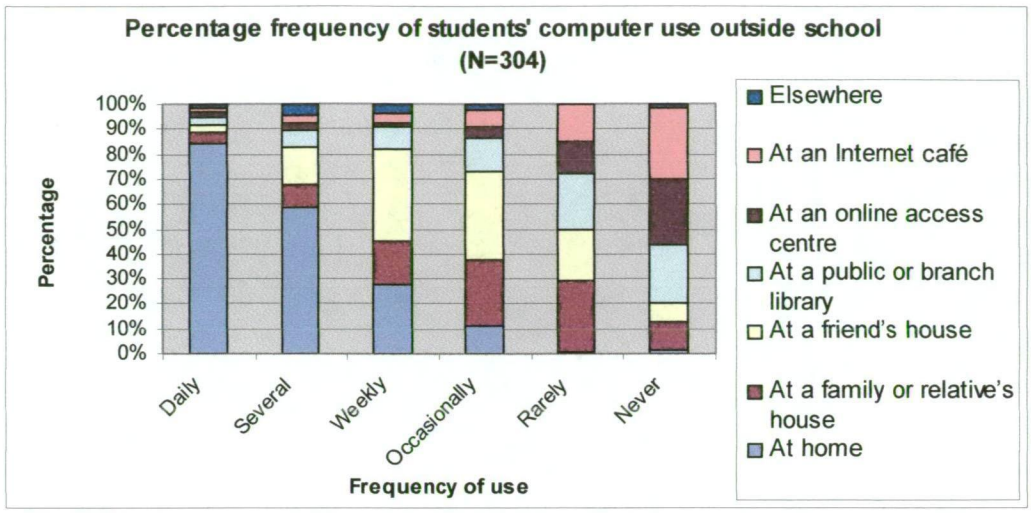


*Figure 4.4* Percentage frequency of students' computer use outside school (N=304).

***Hours per week spent using computers and other technology outside school***

Students were asked to estimate the number of hours spent each week on computer applications outside school. The applications were not ranked by competency level, skill or difficulty in Table 4.5. Proportionally and in order, they spent much more time Internet searching and browsing, using general applications software like Microsoft Word, using email, playing games, and using a chat program, playing online music, playing network games, and using the school's intranet. When other forms of ICT outside school, as reflected in Table 4.6, Table 4.7 and Figures 4.5 and 4.6 are compared, particularly television, online music and mobile phones, the percentage of students using television (39.5%) greater than seven hours a week is less than the percentage of students using Microsoft applications, such as Word (55.9%). Again, as shown in Table 4.7, a high percentage of students were using email (respectively 50.6%, 23.7%, 8.2%), internet searching and browsing (respectively 23%, 31.6%, 31.6%) as well as Microsoft applications, such as Word (respectively 25.3%, 35.9%, 25.7%) for up to seven hours per

week. Their use of these three computer applications is marginally greater than chat (respectively 19.7%, 21%, 17.8%), online music (respectively 21.1%, 15.8%, 13.9%), television (respectively 8.6%, 17.1%, 31%) and their mobile phones (respectively 25%, 16.4% 15.1%).

Table 4.5

*Number of students' hours spent per week on computer applications outside school (N=304)*

*< = less than  > = greater than*

| | Nil | < 1 hours | 1 - 2 hours | 3 - 7 hours | > 7 hours |
|---|---|---|---|---|---|
| Using email | 43 | 154 | 72 | 25 | 10 |
| Internet searching & browsing | 16 | 70 | 96 | 96 | 26 |
| Using a chat program, e.g., MSN | 69 | 60 | 74 | 54 | 47 |
| Using the School's Intranet site | 129 | 140 | 25 | 10 | 0 |
| Playing CD-ROM games | 66 | 98 | 49 | 58 | 33 |
| Playing network computer games (CD-ROM, modem or Internet) | 122 | 85 | 52 | 32 | 13 |
| Using general applications software, e.g., MS Word | 21 | 77 | 109 | 78 | 19 |
| Using graphic design and rendering programs, e.g.., Rhino | 199 | 61 | 23 | 11 | 10 |
| Using subject-based or content-based software, e.g., on CD-ROM | 162 | 97 | 36 | 3 | 6 |
| Creating web pages | 225 | 50 | 14 | 7 | 8 |
| Watching online movies | 189 | 66 | 34 | 9 | 6 |
| Playing online music | 109 | 64 | 48 | 42 | 41 |

Table 4.6

*Number of hours spent per week using other forms of ICT (Information and Communications Technology) outside school(N=304)*

*< = less than  > = greater than*

| | Nil | < 1 hour | 1 - 2 hours | 3 - 7 hours | > 7 hours |
|---|---|---|---|---|---|
| Television | 4 | 26 | 58 | 94 | 120 |
| Radio | 28 | 88 | 79 | 67 | 36 |
| CD and cassette players | 29 | 56 | 87 | 73 | 56 |
| VCR or video players | 26 | 65 | 105 | 71 | 24 |
| Mobile Phone | 74 | 76 | 50 | 46 | 45 |
| Video games | 82 | 78 | 67 | 47 | 27 |
| Handhelds or PDAs | 229 | 65 | 18 | 6 | 9 |
| Playstation or other console games | 111 | 88 | 50 | 46 | 23 |
| Fax | 256 | 68 | 5 | 4 | 3 |
| Scanner | 195 | 104 | 11 | 1 | 3 |
| Video camera | 193 | 108 | 24 | 2 | 6 |
| Calculator | 84 | 133 | 48 | 21 | 12 |
| Other? (Please list) | | | 3 | 1 | |

Table 4.7

*Percentage of students using computer applications and other technology over a week*

| | Using email | Internet searching & browsing | Chat eg MSN | School's intranet site | MS applications software eg Word | Online music | TV | Mobile phone |
|---|---|---|---|---|---|---|---|---|
| Nil | 14.1 | 5.3 | 22.7 | 42.4 | 61.8 | 55.9 | 1.3 | 24.3 |
| < 1 hour | 50.6 | 23 | 19.7 | 46 | 25.3 | 21.1 | 8.6 | 25 |
| 1 – 2 hours | 23.7 | 31.6 | 21 | 8.2 | 35.9 | 15.8 | 17.1 | 16.4 |
| 3 – 7 hours | 8.2 | 31.6 | 17.8 | 3.3 | 25.7 | 13.9 | 31 | 15.1 |
| > 7 hours | 3.3 | 8.6 | 15.5 | 0 | 55.9 | 13.5 | 39.5 | 14.9 |

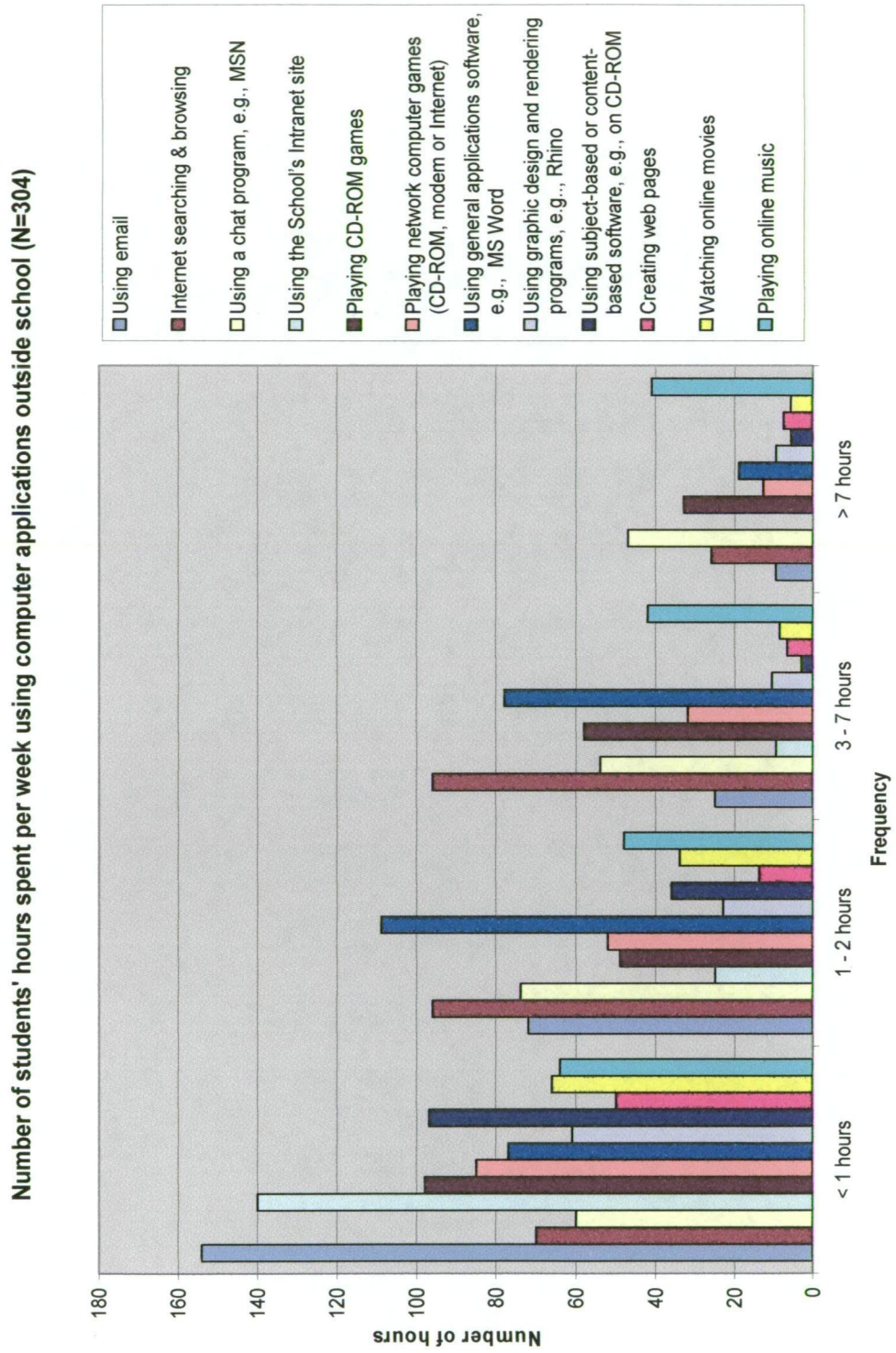


*Figure 4.5.* Number of students' hours spent per week using computer applications outside school (N=304).

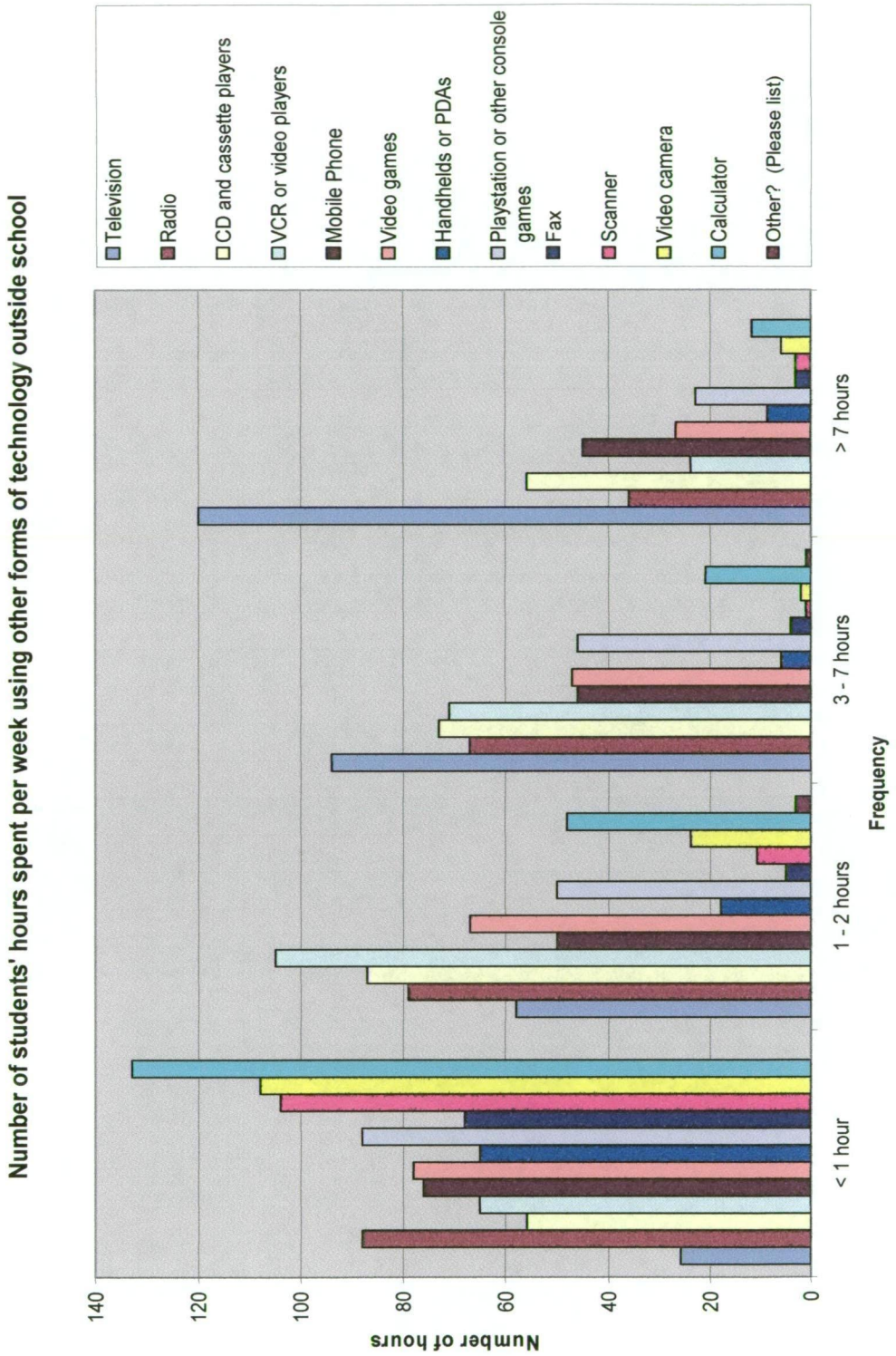


*Figure 4.6.* Number of students' hours spent per week using other forms of technology outside school (N=304).

***Homework***

In addition to the number of hours per week that students spent on computer applications and other technology generally, the students were asked to indicate how many hours per week they spent on selective homework tasks or activities outside school. As Table 4.8 indicates, the highest number of students spent time word processing assignments, doing essays, reports or experiments (96%) as well as searching and evaluating information from the Internet (92.4%). Communicating about homework with friends through email or chat (68.8%) as well as creative or design homework tasks (65%) were hours spent to a lesser extent.

Table 4.8

Number of students' hours spent on homework per week on computers outside School (N=304)

*< = less than  > = greater than*

| | nil | < 1 hour | 1 - 2 hours | 3 - 7 hours | > 7 hours | % no. of students |
|---|---|---|---|---|---|---|
| Searching, using and evaluating information from the Internet | 23 | 104 | 111 | 54 | 12 | 92.4 |
| Communicating about it with friends (email, chat, etc) | 95 | 103 | 51 | 34 | 21 | 68.8 |
| Word processing set assignments, essays, reports, or experiments | 12 | 62 | 117 | 102 | 11 | 96 |
| Creative writing, drawing or designing some homework tasks | 76 | 103 | 84 | 32 | 9 | 75 |

***Students' experiences at school***

The second part of the questionnaire explored students' computer use at school. Students were asked to estimate frequency or extent and type of computer use at school. As Table 4.9 indicates, the greatest number of students were writing or word processing assignments or projects most often, and to only a relatively lesser extent, searching and researching using the web. The most frequent use after those activities, in order were making or

playing music, communicating by email, recording data on spreadsheets and designing presentations.

Table 4.9

Frequency, extent and type of students' computer use in a typical week at school (N=304)

| | Very Often | Often | Sometimes | Rarely | Nil |
|---|---|---|---|---|---|
| Searching for resources on the Library's catalogue | 13 | 27 | 57 | 118 | 89 |
| Searching, researching or using information on the World Wide Web | 35 | 95 | 108 | 46 | 20 |
| Searching, researching or using information on a CD-ROM | 10 | 19 | 66 | 110 | 99 |
| Writing or word processing for assignments or projects | 52 | 102 | 107 | 28 | 15 |
| Recording data on spreadsheets, eg graphs | 17 | 45 | 96 | 101 | 45 |
| Designing presentations, eg slide shows | 20 | 51 | 109 | 77 | 47 |
| Web publishing | 20 | 19 | 29 | 81 | 155 |
| Design graphics | 18 | 24 | 35 | 69 | 158 |
| Programming | 13 | 18 | 18 | 53 | 202 |
| Making databases | 10 | 15 | 33 | 63 | 183 |
| Accessing online courseware [software] or digital resources | 12 | 18 | 49 | 81 | 144 |
| Accessing computer-based training or online courses | 11 | 22 | 23 | 67 | 181 |
| Communicating with friends, eg by email | 39 | 45 | 63 | 61 | 96 |
| Making or playing music | 47 | 32 | 45 | 53 | 127 |

Most often, students were working with a partner or small group whilst using computers at school rather than by themselves or with the whole class (Table 4.10) and in class time (Table 4.11 and 4.12) in a classroom or computer lab (4.12).

Table 4.10

*Frequency of type of students' computer use at school (N=304)*

| | Very Often | Often | Sometimes | Rarely |
|---|---|---|---|---|
| By yourself? | 59 | 69 | 83 | 93 |
| With a partner or small group? | 52 | 100 | 113 | 39 |
| With others in a large group? | 34 | 63 | 97 | 110 |
| With the whole class? | 77 | 49 | 67 | 111 |

Table 4.11

*Frequency of students' time spent using computers at school (N=304)*

| | Very Often | Often | Sometimes | Rarely |
|---|---|---|---|---|
| In class time | 79 | 88 | 97 | 40 |
| In your own time (e.g., lunch-time, recess) | 22 | 44 | 90 | 148 |

Table 4.12

*Frequency of students' lesson time or private study time spent using computers at school (N=304)*

| | Very Often | Often | Sometimes | Rarely |
|---|---|---|---|---|
| A routine class period in a classroom or Lab? | 83 | 66 | 91 | 64 |
| An occasional class period in the Lab? | 44 | 74 | 145 | 41 |
| A regular private study period in a Lab? | 15 | 28 | 70 | 191 |
| A regular private study period in the Library? | 18 | 30 | 81 | 175 |

Students indicated strongly that they thought it was important to be able to use a computer well and that playing or working on a computer is enjoyable, as shown in Table 4.13. Over two thirds of the students believed that playing or working on a computer is fun. Responding to the same question, students indicated strongly that they prefer digital resources to physical resources, and that they would prefer more classes online. Students believed that there were not enough computers at the school and that they did not get enough access themselves to computers at school. Reflecting three different handwriting styles, additional comments were offered on the back of a return envelope containing three surveys returned, as shown in the scanned image in Figure 4.7.

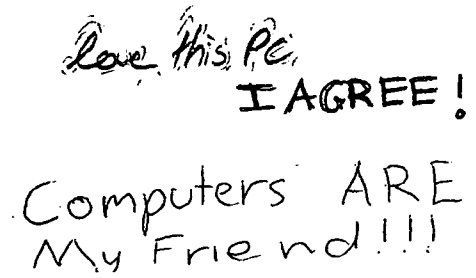


Figure 4.7 Students' comments.

Table 4.13

*Students' preferences for learning (N=304)*

| | Strongly agree | Agree | Don't care | Disagree | Strongly disagree |
|---|---|---|---|---|---|
| It is very important to be able to use a computer well | 122 | 151 | 26 | 3 | 2 |
| Playing or working on a computer is fun | 88 | 149 | 53 | 9 | 5 |
| I am very uncomfortable using computers at School | 27 | 48 | 72 | 66 | 91 |
| I forget time when I am working on a computer | 42 | 95 | 80 | 67 | 20 |
| There are not enough computers for all students at School | 69 | 95 | 62 | 55 | 23 |
| There are not enough other resources such as library books at School | 24 | 42 | 110 | 95 | 33 |
| Computers do not help me learn | 7 | 31 | 48 | 122 | 96 |
| I get enough access to computers at School | 32 | 117 | 70 | 66 | 19 |
| I find online chat with friends about doing assignments helpful | 41 | 81 | 98 | 45 | 39 |
| I interact with classmates more online than in class | 15 | 29 | 78 | 77 | 105 |
| Email from teachers is not very useful for school work | 41 | 61 | 104 | 64 | 34 |
| Online resources are hard to find | 24 | 71 | 68 | 100 | 41 |
| I use more digital resources than physical library resources | 75 | 96 | 69 | 47 | 17 |
| Given the choice, I would like more classes online | 75 | 97 | 77 | 42 | 13 |
| My subjects do not have enough lessons online | 57 | 84 | 107 | 43 | 13 |

Permission was granted by Doug Johnson on the 26th November, 1999, then at Bellingham Public Schools, Washington in the United States to adopt the Bellingham Mankato Scale for Technology Self Assessments in order to measure achievement of students' ICT skills and competencies. Figure 4.8 provides the cumulative profiles of exiting Year 8 students' Internet connectivity at home who had completed self evaluations of their ICT skills and competencies in December each year from 1999-2004. Figure 4.9 graphs the cumulative profile of the Year 8 students' self-evaluations of their ICT skills and competencies for the same period. In the Mankato self-assessment instrument, students were asked to check the highest of four levels, from level 1 [lowest] - 4 [highest] that best describes what they can do at that time. The graph shows the competency level on the horizontal axis as a percentage of students mastering levels 3 and 4 combined.

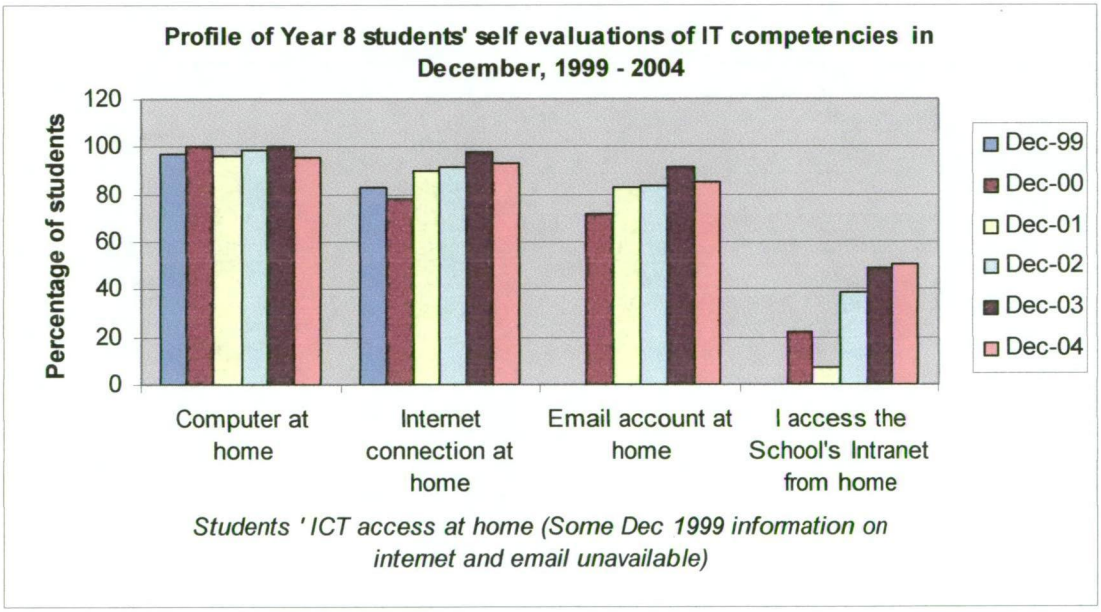


*Figure 4.8* Profile of Year 8 students' self-evaluations of ICT connectivity.

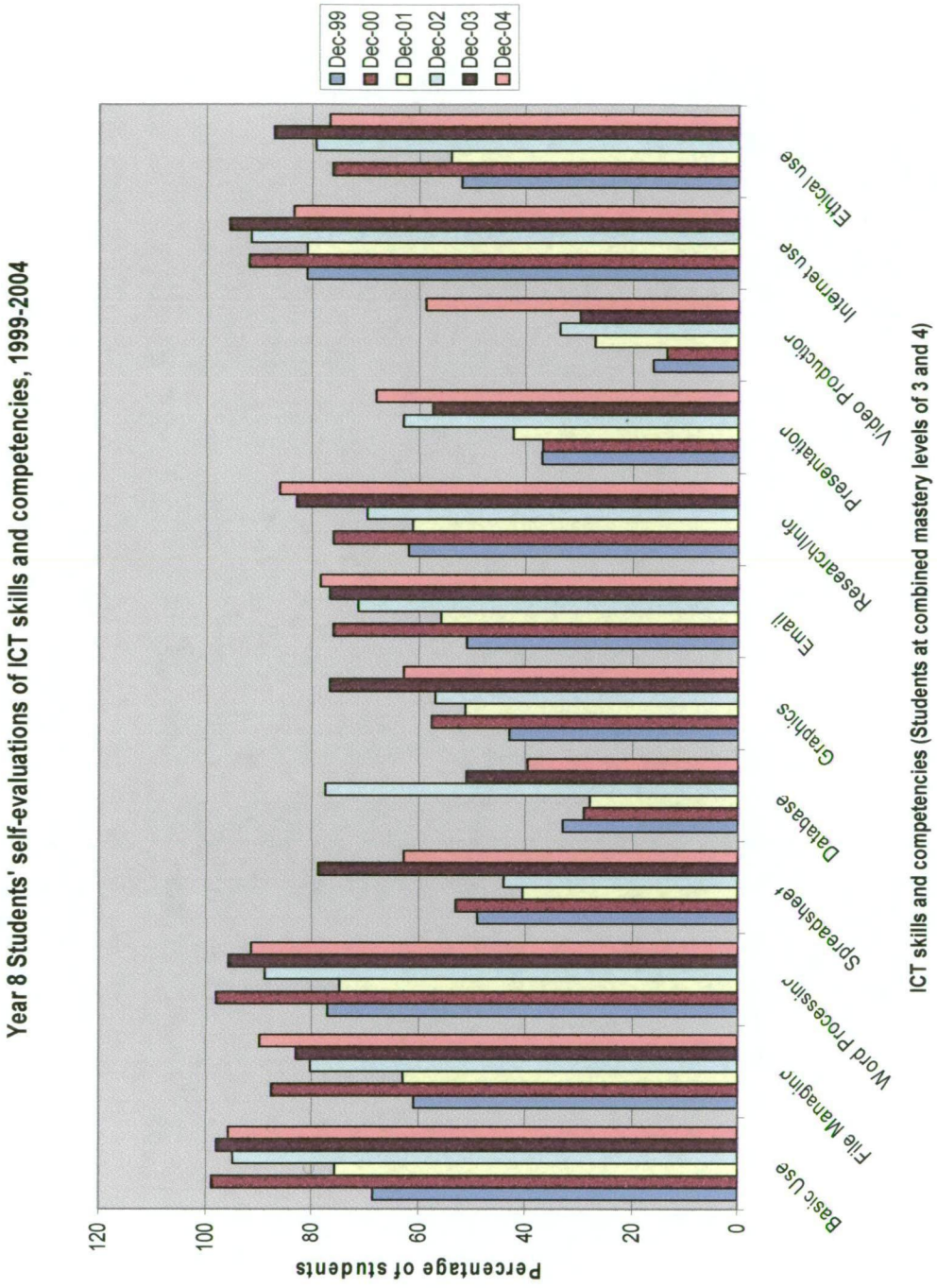


*Figure 4.9* Profile of Year 8 students' self-evaluations of ICT competencies.

## Teachers

In this section about teachers, the results are divided into four separate parts. The first part reports teachers' computer ownership and use outside school, as well as their computer based teaching. The second part reports their stages of concern in online learning. The third part presents their open-ended statements of concern. The fourth part reports their levels of use of ICT in teaching and learning. Responses to the teachers' questionnaires relate to the first and second parts, with the interviews as well as some documents, records and artefacts relating to the third and fourth parts. Prior to the provision of these results, the demographic data concerning the teachers is presented.

### *Teachers' computer use and computer based teaching*

From the total of 101 teachers surveyed in December 2003 to February 2004 in a staff group of 77 FTE, 61 questionnaires responses meant a response rate of 60.4 per cent. More male teachers (70.5%) responded to the questionnaire than female teachers, but that was loosely proportionate of the demography of the school's teaching staff. Again, typical of the entire staff, most teachers (70.5%) were aged 41 years and over. Almost half the respondents had been teaching over 20 years. Eighteen of the teachers were less than 40 years of age, whilst 22 teachers were aged 41 – 50 years, and the remaining 21 teachers were over 50 years of age. Half the respondents or 30 teachers had over 20 years teaching experience, 20 teachers had 11-20 years experience and 13 teachers had less than 10 years experience. The distribution of the teachers' age, experience and the class groups taught are represented in the pie charts in Figures 4.10 – 4.12.

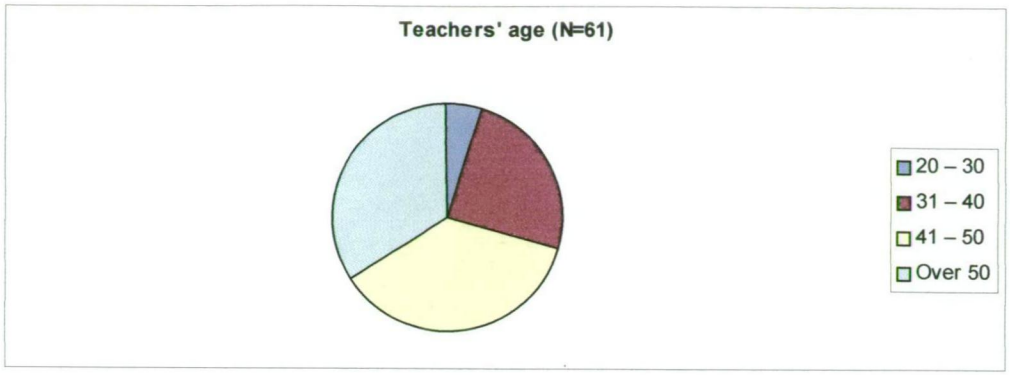


*Figure 4.10* Teachers age (N=61).

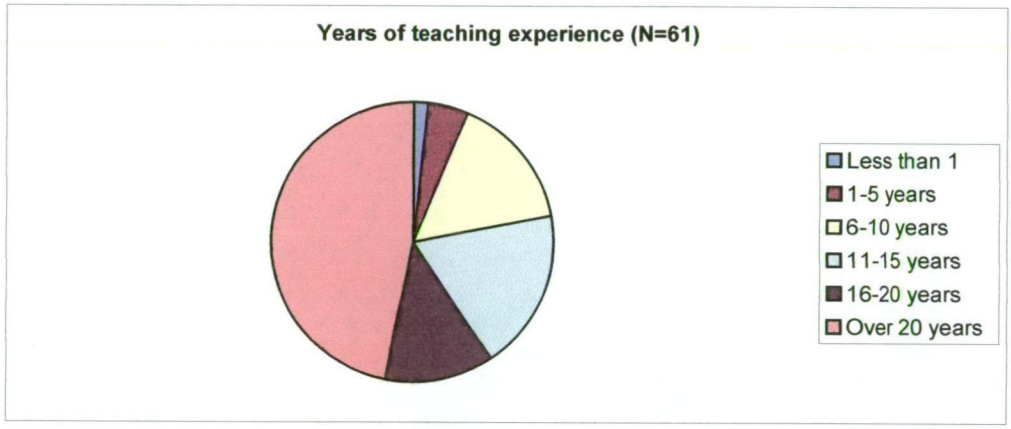


*Figure 4.11* Teachers' years of teaching experience (N=61).

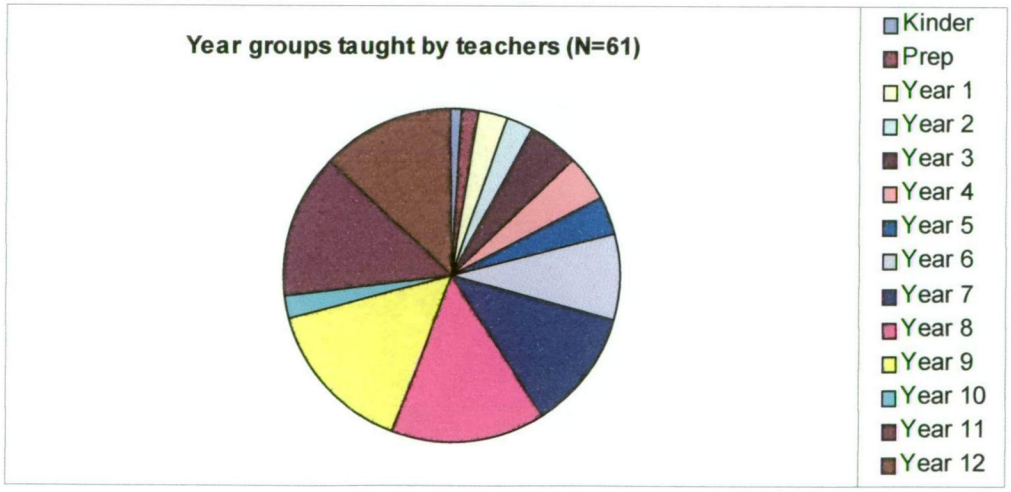


*Figure 4.12* Teachers' classes (N=61).

As indicated in Table 4.14 and Figure 4.13, more than two thirds of the teachers were using a computer at home (95.1%), connecting to the school's network to use the intranet (75%) and school email (67%). As further indicated in Figure 4.14, at least a third of the teachers often spent their own time preparing school work, and most of that time at home.

Table 4.14

*Teachers' home computers and connectivity (N=61)*

| | Yes | No | % Yes | % No |
|---|---|---|---|---|
| Have a computer? | 58 | 3 | 95.1 | 4.9 |
| Have an Internet connection? | 55 | 6 | 90.2 | 7.8 |
| Access the School's Intranet site? | 46 | 15 | 75.4 | 24.6 |
| Access your School email account? | 41 | 20 | 67.2 | 32.7 |

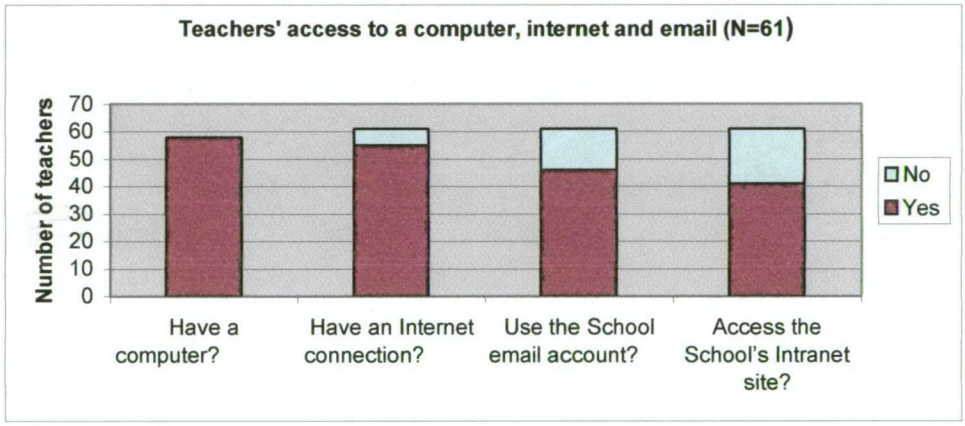


*Figure 4.13* Teachers' home access to a computer, internet and email connectivity (N=61).

In a typical week at school, teachers reported their frequency of use of computers (Table 4.15). Most teachers were using computers for school-related work in their own non-teaching time, (including lunch and recess times) rather than in class teaching time, or at home (Table 4.16). A few teachers indicated that they rarely used computers for school-related work at home. Most teachers spent time most frequent time on using email,

writing or word processing and to a lesser extent, searching or using the World Wide Web, as shown in Table 4.15. Only sometimes did approximately half of the teachers report that they did search the Library's catalogue, research with a CD-ROM, create pictures, drawings, diagrams or design presentations and access online courseware resources. Rarely were teachers involved in web-publishing, making databases, programming, designing graphics, or making and playing music.

Again, in a typical week, teachers reported how often they set class work involving some computer-based tasks for their classes (Figure 4.15). Few teachers set class work very often, and then mostly using an instructional program, (such as subject based software or simulations), taking tests or assessments online and information skills tasks, (such as using the WWW, presenting, designing a brief, mind-mapping or web-quests). Most teachers reported that they were sometimes using instructional programs, using worksheets on the Intranet courseware, getting students to log and record date (such as spreadsheeting), setting tests or assessments online and information skills tasks.

Table 4.15

*Teachers' time spent on computers in a typical week at school (N=61)*

| | Very often | Often | Sometimes | Rarely/None |
|---|---|---|---|---|
| Searching for resources on the Library's catalogue | 2 | 5 | 30 | 26 |
| Searching, researching or using information on the World Wide Web | 16 | 12 | 28 | 5 |
| Searching, researching or using information on a CD-ROM | 2 | 4 | 35 | 20 |
| Writing or word processing assignments, reports, assessment sheets, letters or programs | 41 | 17 | 3 | 0 |
| Recording data on spreadsheets, eg graphs | 3 | 14 | 25 | 19 |
| Creating pictures, drawings, diagrams or maps | 3 | 3 | 25 | 30 |
| Designing presentations, eg slide shows | 7 | 7 | 15 | 32 |
| Web publishing | 3 | 1 | 11 | 46 |
| Design graphics | 2 | 4 | 7 | 48 |
| Programming | 1 | 3 | 5 | 51 |
| Making databases | 1 | 3 | 10 | 48 |
| Accessing online courseware [software] or digital resources | 3 | 4 | 25 | 29 |
| Accessing computer-based training or online courses | 6 | 3 | 3 | 49 |
| Sending or receiving email | 50 | 7 | 2 | 2 |
| Making or playing music | 4 | 2 | 9 | 47 |
| Other? (Please list) | | | | |
| CAD | 1 | | | |
| Playing games | | | 1 | |
| Developing online activities | | 1 | | |
| Direct instruction on how to use | 1 | | | |

Table 4.16

*Frequency of teachers time spent using computers for school-related work (N=61)*

| | **Very Often** | **Often** | **Sometimes** | **Rarely/None** |
|---|---|---|---|---|
| For teaching in class | 17 | 19 | 24 | 1 |
| In your own time (e.g., non-teaching periods, lunch-time, recess) | 29 | 22 | 10 | 0 |
| At home | 15 | 18 | 21 | 7 |

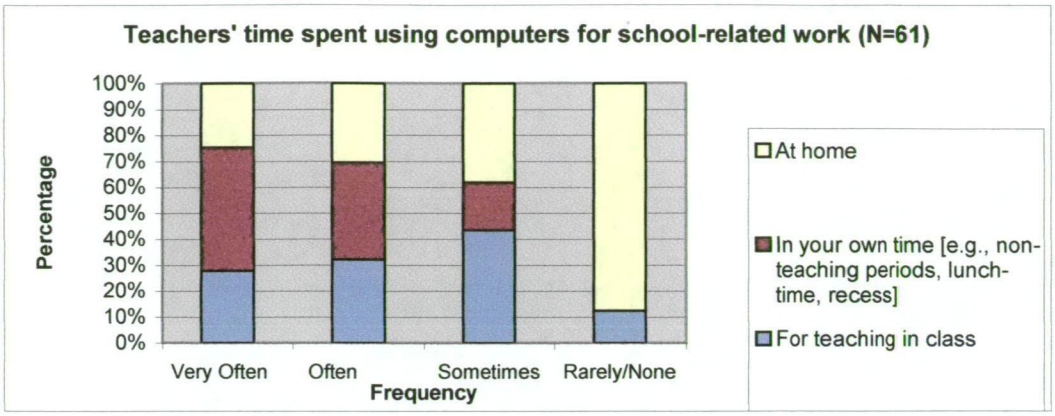


*Figure 4.14* Frequency of teachers time spent using computers for school related work (N=61).

Table 4.17

*Frequency of teachers' setting class work involving computer-based tasks. (N=61)*

| | Very Often | Often | Sometimes | Rarely/None |
|---|---|---|---|---|
| Information skills using the WWW (selecting, evaluating, analysing, presenting, designing a brief, mind-mapping, a web-quest, etc) | 4 | 13 | 34 | 10 |
| Locating information from library catalogues | 3 | 10 | 19 | 29 |
| Logging and recording data, eg spread-sheeting | 2 | 7 | 29 | 23 |
| Creative thinking & graphic or audio design | 3 | 6 | 20 | 32 |
| Communicating with peers (email, chat, forums, bulletin boards, discussion lists, etc) | 8 | 4 | 19 | 30 |
| Using an instructional program, subject-based software, simulation | 14 | 12 | 20 | 15 |
| Using online resources or your worksheets from the Intranet | 6 | 6 | 29 | 20 |
| Accessing your courses online | 3 | 6 | 25 | 27 |
| Taking tests or assessments online | 12 | 1 | 4 | 44 |

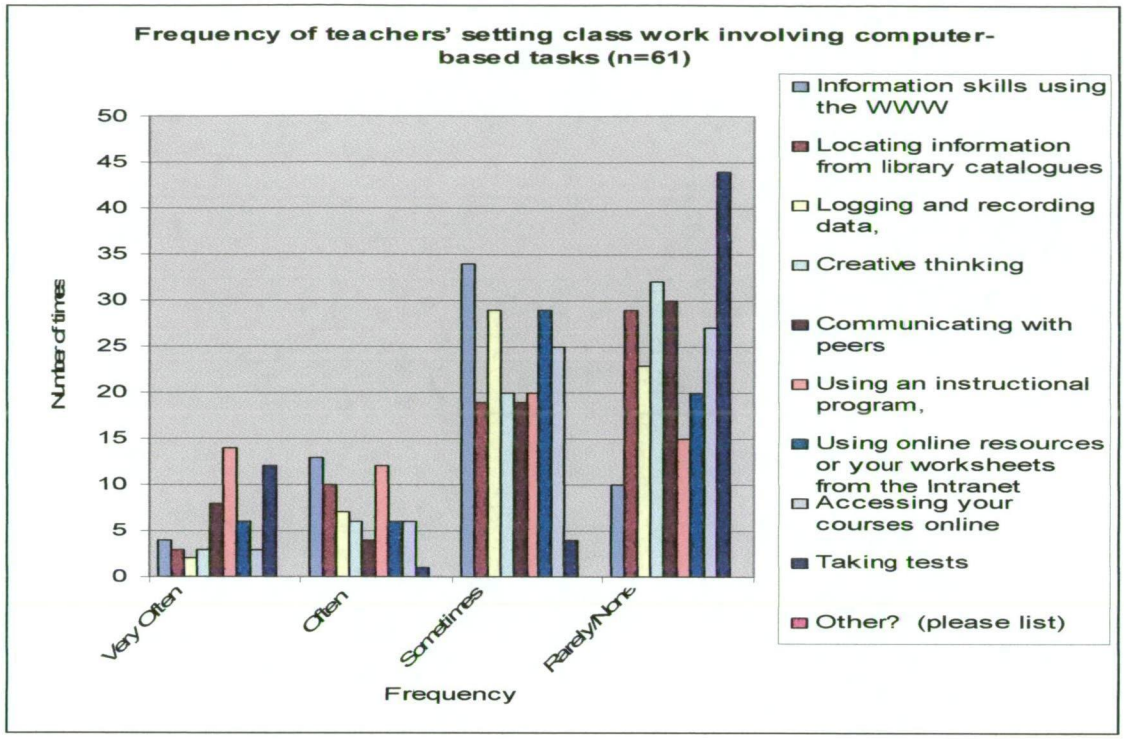


*Figure 4.15* Frequency of teachers' setting class work involving computer-based tasks. (N=61).

As displayed in Table 4.14 – Table 4.16, the majority of the teachers were connecting to the school's network from home (75.4%), using school email from home (67.2%), and using computers for school related work at home (54 out of 61 teachers). Yet, around half of the teachers were setting class work involving computer based tasks only 'sometimes' and about half were laggards, setting tasks such as accessing courses or creative thinking online rarely (Table 4.17 and Figure 4.15). It was only the early adopters who were more innovative in their behaviour and setting tasks such as taking tests or assessing online on a very frequent basis.

When teachers reported their experiences and attitudes about using a computer in their teaching (Table 4.18 and Figure 4.16), they all felt comfortable sending or receiving email

and most of them felt that it was important. Similarly, the majority felt comfortable using a presentation program such as Microsoft Office Powerpoint in delivering a lesson or speech and most of them felt it was important. Yet there were more areas where only two-thirds of the teachers felt comfortable and felt that the skill was important in relation to: Using the WWW for teaching higher order thinking skills; using a spreadsheet to create an assessment sheet; using a database program for student reports; using word processors to create student resources or worksheets. A majority of conservatives (N = 39) were not comfortable with participating in an online chat or forum, or playing music (N = 42) nor did they think participating in an online chat or forum was important (N = 47).

Table 4.18

*Teachers' experiences and attitudes about using a computer in their teaching (N=61)*

| | **Comfortable** | **Not comfortable** | **Important** | **Not important** |
|---|---|---|---|---|
| Using the WWW for teaching higher order thinking skills | 42 | 19 | 42 | 19 |
| Using a spreadsheet to create an assessment sheet | 40 | 21 | 33 | 28 |
| Using a graphics program for manipulation of digital photos | 34 | 27 | 34 | 27 |
| Using a database program for student reports | 44 | 17 | 43 | 18 |
| Sending or receiving email communications | 61 | 0 | 52 | 9 |
| Participating in online chat or forums | 22 | 39 | 14 | 47 |
| Using an instructional program, subject based software or simulation | | | | |
| Using word processors to create student resources or your worksheets from the Intranet | 40 | 21 | 43 | 18 |
| Using a presentation program, eg. Powerpoint in delivering a lesson or speech | 53 | 8 | 51 | 10 |
| Creating a website or set of web pages | 36 | 25 | 44 | 17 |
| Playing music | 19 | 42 | 38 | 23 |

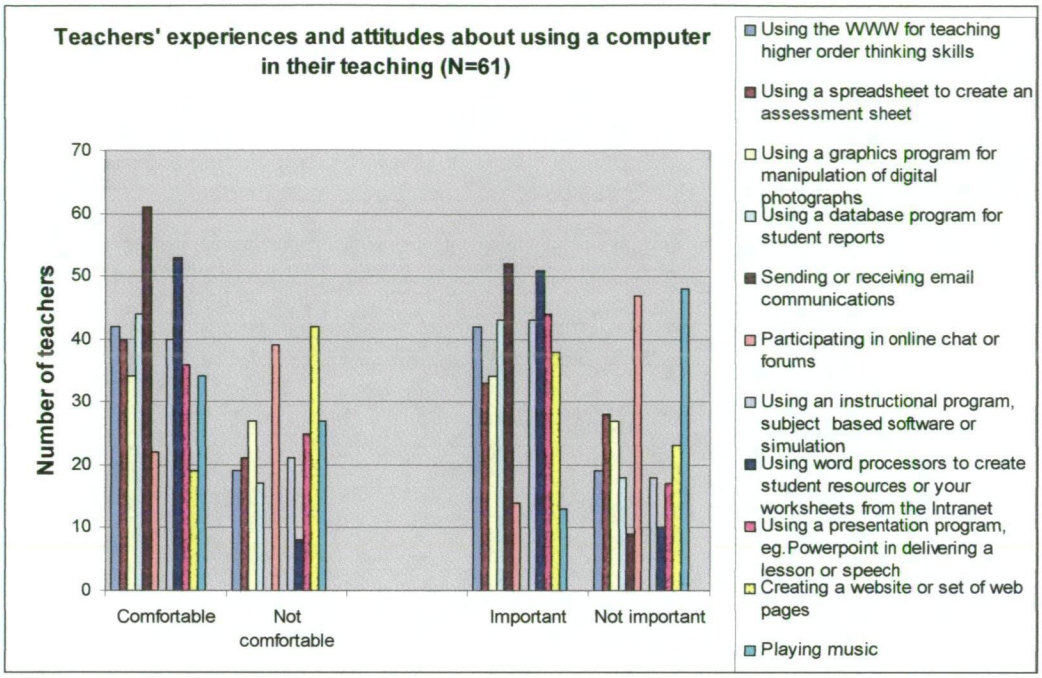


*Figure 4.16* Teachers' experiences and attitudes about using a computer in their teaching (N=61).

As Table 4.19 clearly indicates, less that two-thirds of the teachers' classes participated in online lessons, or the teachers themselves in an online lesson, course, forum or conference, or subscribed to online newsletters and discussion lists for their own professional learning.

Table 4.19

Teachers' online practice in last two years.

| | Yes | No |
|---|---|---|
| Did your classes participate in virtual lessons or in an online course? | 17 | 44 |
| Did you participate as a student or teacher in an online lesson or course, in professional forums, online conferences, chats, etc? | 21 | 40 |
| Do you subscribe to online newsletters and discussion lists for your own professional learning? | 19 | 42 |

***A school-based survey of teachers' ICT attitudes and skills***

"Where is the School in relation to the stages of development and integration of ICT?" This was the question posed in an online survey developed by staff of the Technology School of the Future, Adelaide, S.A. and made available to other schools upon request. On 2nd September, 2002, Stephens' [pseudonym] teachers were invited to participate by email. Approximately 30 % of the staff responded. All respondents believed that ICT offers support for learning and about 80% of the respondents believed that the School has a clear direction in the use of ICT as well as a clear plan for the development of student skills in using ICT. Over two thirds of the respondents use ICT regularly to support their teaching. However, for 78% of respondents, finding time was the main factor limiting the development of their own skills; 39% identifying lack of instruction or tuition, 31% finding a worthwhile purpose, 25% lack of confidence and 25% lack of funding for professional development.

### *Teachers' stages of concern in online learning and levels of use of ICT in teaching and learning*

The ***Concerns-Based Adoption Model's*** Stages of Concern (SoC) instrument was incorporated into the Teacher Questionnaire (Appendix III). The individual teacher data were aggregated to develop a composite concerns profile that is based on the mean score for each stage of the 61 individual teachers in the group. The aggregate raw scores were derived from the sum of the responses to the five questions in each stage of concern. Then the means of the raw scores for each stage were used to plot a composite concerns profile for the group of 61 staff.

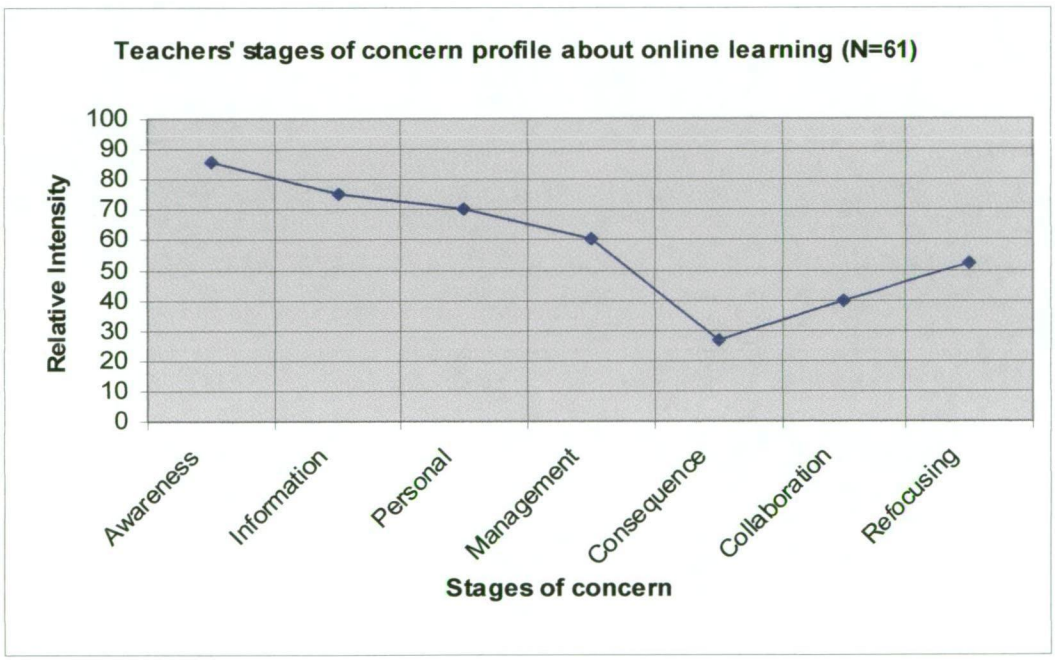


*Figure 4.17* Teachers' composite concerns profile (N=61).

As represented in Figure 4.17, and recalling the typical expressions in Table 2.4 in Chapter 2, the composite scores of self-concerns (stages 0, 1 and 2) are high and relatively close to

each other; the task concerns (stage 3) are even lower and the impact concerns (stages 4, 5 and 6). According to Hall and Hord (2001), this graphical representation is the most readily and commonly identified concerns profile, that has appeared in the research to date, and is typical of a "Nonuser SoC profile." Nonusers' concerns are normally highest on stages 0,1 and 2, and lowest on stages 4, 5 and 6. The general shape plotted is that shown in Figure 2.4 in Chapter 2. The high stage 0 (Awareness) score in this composite concerns profile indicates that there is a low interest in online learning relative to other activities. The high stage 1 (Informational) score reveals a lack of understanding of what online learning involves and the relatively high stage 2 (Personal) score gives an indication that the teachers are concerned about the impact of online learning on their duties and day-to-day activities. The slight 'tailing up' of stage 6 (Refocusing) are the indications of what is typically called a distrustful nonuser.

In the interpretation of the group data by plotting the mean for the clustered or composite concerns profile, the possibility exists that the larger the group is, the less sensitive it is to the interpretation of the individual differences. Thus, the mean percentiles for the distinct sub-groups of teachers at different stages of concern were tabulated (Table 4.20 and Figures 4.18) rather than the composite concerns profile. As predictable from the clustered or composite concern profile, the next largest group (30 out of the 61 teachers or 49.2% who responded) was the stage 0 (Awareness). The second highest sub-group (21 out of the 61 teachers or 34.4% who responded) was stage 1 (Informational). The remaining sub-groups in stages 2,3, 4, 5 and 6 were 4, 2, 1, 2 and 0 responses respectively. These results plotted in Figures 4.18 remain normal and typical of the nonuser SoC profile.

Table 4.20

*Mean Percentiles*

| Stages | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| Cluster Mean (N=61) | 86 | 75 | 70 | 60 | 27 | 40 | 52 |
| Awareness (n=30) | 91 | 69 | 59 | 56 | 21 | 28 | 38 |
| Informational (n=21) | 81 | 91 | 76 | 60 | 33 | 52 | 60 |
| Personal (n=4) | 81 | 90 | 96 | 83 | 66 | 72 | 77 |
| Management (n=2) | 77 | 84 | 59 | 94 | 9 | 25 | 42 |
| Consequence (n=1) | 66 | 96 | 55 | 27 | 27 | 22 | 81 |
| Collaboration (n=2) | 60 | 57 | 45 | 43 | 71 | 93 | 60 |
| Refocusing (n=1) | 72 | 69 | 39 | 47 | 19 | 25 | 92 |

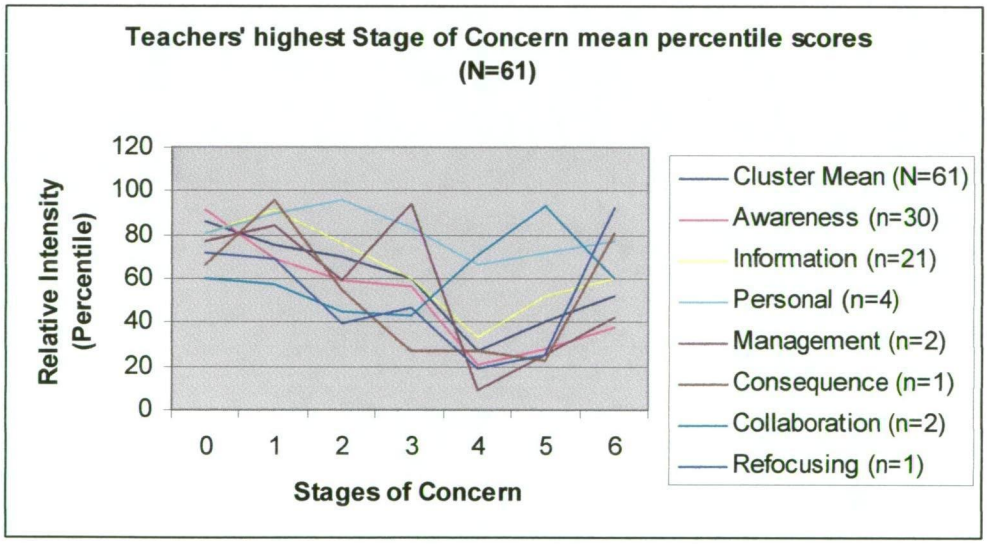


*Figure 4.18* Mean percentiles for teachers' stages of concern (N=61).

There are two additional methods for dealing with the grouped data (Hall & Hord, 2001) that are primary indicators of the interpretation of concerns. These methods are reflected in the results in Table 4.21. The first concerns the highest stage percentile score or peak score

interpretation wherein a tally is given of the number of teachers that score high on each stage, in order, to obtain the range of peak scores within a group. The higher the score, the more intense are the concerns. Each stage percentile score is listed for the 61 teacher respondents in the table in Appendix IX. From this listing the highest stage scores, for the individuals above the 95$^{th}$ percentile and the 85$^{th}$ percentile for the group can be identified, as reported in Table 4.21. In the table in Appendix IX, the highest stage score for each teacher is emphasised in bold and underscored font.

The second method of analysis on peak scores (or concerns) reported in Table 4.21 is to provide a first and second high stage score interpretation. It is a check on the sensitivity of the group data interpretation against the dominant individual high stages of concerns and individual differences. Where another stage score is high, or within one or two percentiles, the second peak scores is indicated by bold font in Appendix IX.

Table 4.21

*Frequency and percentage of highest concerns stages, for the individual teachers displayed in Appendix IX (N=61)*

| **No. of Teachers** | **Stage 0** | **Stage 1** | **Stage 2** | **Stage 3** | **Stage 4** | **Stage 5** | **Stage 6** |
|---|---|---|---|---|---|---|---|
| > 95$^{th}$ percentile | 11 | 9 | 5 | 0 | 0 | 2 | 0 |
| > 85$^{th}$ percentile | 19 | 20 | 6 | 2 | 0 | 4 | 1 |
| + second highest | 23 | 26 | 9 | 5 | 0 | 4 | 2 |
| Percentage | 86.8 | 90.1 | 32.8 | 11.5 | 0 | 16.4 | 4.9 |

From a different perspective to the tabular listing of percentile scores in Appendix IX, or the summary in Table 4.21, Figure 4.19 plots the percentage frequency of teachers with their first and second highest scores at each Stage of Concern on the graph. It shows that

86.8% of the teachers expressed their highest and second highest concerns at Stage 0. Also, 90.1% of the teachers chose Stage 1. Again it demonstrates the typical "Nonuser SoC profile." Nonusers' concerns are normally highest on stages 0,1 and 2, and lowest on stages 4, 5 and 6.

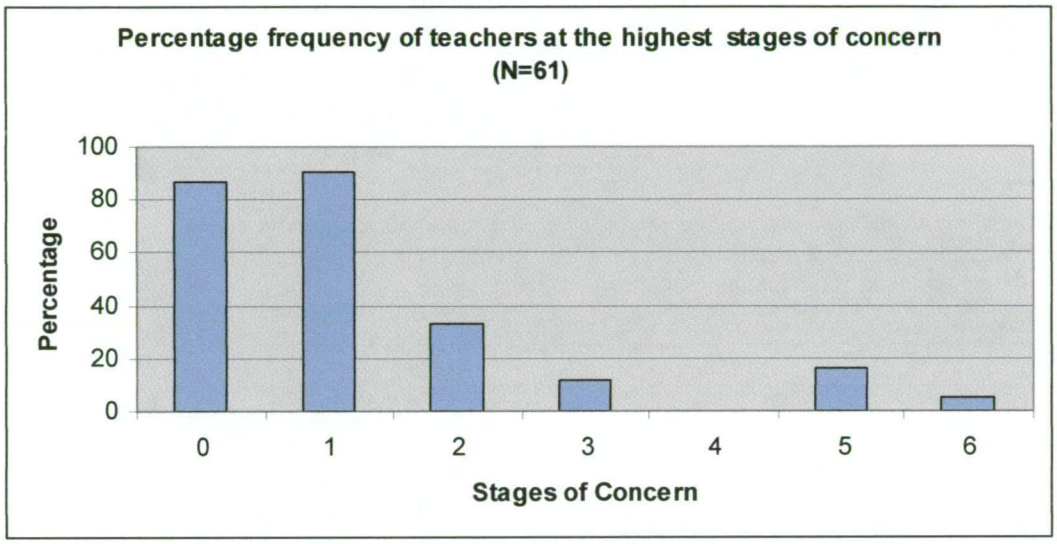


*Figure 4.19* Percentage frequency of teachers at the highest stage score (N=61).

### *Teachers' responses to open-ended statements of concern about integrating ICT and online learning into the curriculum*

A simple and straightforward approach to determining teachers' concerns is to use another CBAM instrument, the ***Open-Ended Statements of Concern about an Innovation***, originally published in 1976 by Newlove and Hall (1988). For the open-ended question, administered in a whole staff meeting on a professional development student-free day at the beginning of term, in February 2005,

> When you think about integrating ICT and online learning into the curriculum, what are you concerned about?

the papers were collected and content analysed by the researcher as described and suggested in the manual (Newlove & Hall, 1988). Table 4.22 details the teachers' concerns documented by all 55 respondents, the total number of teachers present on the professional development day in February 2005. These data were collected in February 2005, twelve months following the group of teachers surveyed for their stages of concern in December 2003 – February 2004. A single issue from each respondent was adequate, but all teachers responding gave several issues in their response. As all the teachers gave very detailed and lengthy statements, the collation of the open-ended statements involved all the multiple responses. All statements were read to determine if there were overall themes that were *unrelated, self,* (Stages 0,1 and 2) *task* (Stage 3) *or impact* (Stage 4, 5 and 6) concerns. The statements were then re-read and each dot point or sentence was assessed holistically and assigned to a stage of concern. In Table 4.22, the explanatory sentences given in italics font of the typical expressions of the stages of concern were derived from the manual (Newlove & Hall, 1988).

As tabulated in Table 4.22, the majority of the concerns were in the stage 4: *Management* area (n=70) concerning the **time** available for professional development as well as the **access** and availability of labs of computers. The second most common concerns listed were stage 1 *Informational* (n=22) revolving around need for more **training** and **professional development.** Some additional concerns listed repeatedly were personal **lack of skill and expertise** in stage 2 *Personal* (n=9) and **the impact on student learning** in stage 5 *Consequence* (n=9) Very few listed teaming outcomes with colleagues in stage 5 *Collaboration* (n=7) or other alternatives in stage 6 *Refocusing* (n=2).

Table 4.22

*Teachers' Open-Ended Statements of Concern*

| *Stage of Concern* | *Typical Expression of Concern about an Innovation*<br>**Open-Ended Statements of Concern about ICT and online learning** |
|---|---|
| *Awareness*<br>[n=0] | *Little concern or involvement with the innovation is indicated.* |
| ***Informational***<br>[n=22] | *A general awareness of the innovation and interest in learning more detail about it is indicated. The person seems to be unworried about himself/herself in relation to the innovation. She/he is interested in substantive aspects of the innovation in a selfless manner such as general characteristics, effects, and requirements for use.*<br>• Any GIS training<br>• Training for staff either in a group situation of individual help in preparing class activities, websites, presentations, etc<br>• Professional development required to learn more skills<br>• as a newcomer, need to be familiar with all the Stephens' process<br>• Information re software suitable for music programming<br>• Would like to be kept up-to-date re uses of ICT and online for 7&8 English classes<br>• Upgrading my skills – for intranet – use of sound on intranet<br>• Guided instructions on how to save work to Teachers' file – for students<br>• Not a real understanding of what online learning is! And what it entails and what are the possibilities and its ability to be used in prac subjects that rely on face to face<br>• What is the potential of ICT?<br>• Updated PD on new software<br>• Which rooms have access for laptops?<br>• Practical experience taken through applications<br>• Professional development (2)<br>• Need more info<br>• Expert assistance on 1:1 basis to do it<br>• Setting up a website<br>• Entering information into the school website<br>• Pace of change with software, new technology – need to keep up PD<br>• Learning about and using software relevant to the ELC<br>• Personal competency<br>• Personal time for developing personal pages on the online learning site. |
| ***Personal***<br>[n=9] | *Individual is uncertain about the demands of the innovation, his/her inadequacy to meet those demands, and his/her role with the innovation. This includes analysis of his/her role in relation to the reward structure of the organisation, decision making, and consideration of potential conflicts with existing structures or personal commitment. Financial or status implications of the program for self and colleagues may also be reflected.*<br>• My own inadequacies<br>• My lack of skill<br>• In my subject area, is it a useful adjunct to debate, logical analysis and the skills and protocols associated with discussion of something. Would ICT/computer use etc be better done in |

| | |
|---|---|
| | the privacy of the students' home?<br>• Not too much pressure in doing this<br>• Current level of expertise<br>• My lack of experience and knowledge of technical know-how<br>• I want to use the laptop and projector in my classroom more often<br>• A lack of knowledge in using best practice in using ICT<br>• I get overwhelmed by the amount that is available |
| ***Management]*** [n=70] | *Attention is focused on the processes and tasks of using the innovation and the best use of information and resources. Issues related to efficiency, organizing, managing, scheduling, and time demands are utmost*<br>• Access to computers for students<br>• No access to wireless network for people without new laptops, therefore restricted access to network and internet, etc<br>• Setting up information online<br>• Lack of time to change and implement<br>• Lack of software<br>• Lack of time (personal) to become familiar with the software we have<br>• Regular access to lab for continuity<br>• Access to labs for whole class use<br>• DoE Colleges have subject online resources – *[name of subject]* has this and we were notified at seminar 2004 that private schools should be able to access this<br>• Lack of appropriate software available to level<br>• Not enough labs in library. Not able to sign up for computer lab...<br>• Time. Ease of use eg updating of files on P drive versus Masterfile<br>• Easy access to appropriate software for young children that works on my computer<br>• Printers are inconsistent and annoying<br>• Time allocation to practice within small groups<br>• Computer and printer accessibility. Don't have one!<br>• Main concern: Availability of the lab<br>• Installing programs on computers<br>• Bothering IT team to set up programs<br>• Limited lab access<br>• Access to Internet in the classroom<br>• Access to software. (eg., restrictions are annoying).<br>• Staff need absolute access if requested.<br>• Limiting lab access to ELC/JS students (lessons)<br>• Finding time to put work online<br>• Planning to use IT and finding it not working<br>• Have previously found access to a scanner difficult – had to get them linked up to a computer and find one - ?<br>• Time to fit it all in<br>• Lack of time to implement<br>• Planning time taken into account and timetabled<br>• Availability of computers for classes<br>• Access to computer labs on a regular basis.<br>• Need for another computer – hard for group work with only one<br>• I have virtually no time to prepare<br>• Availability of computers<br>• Access to computers<br>• Printing students work<br>• Plagiarism |

- Efficient use of time
- Computer problems
- Printing costs
- Set up time to implement usage of ICT
- Time allocated to maintaining level of ICT
- Student misuse
- Not enough access
- Access to technology eg lab use
- Access to copyright material eg broadcasting segments of films, docos etc
- Access
- Software access
- Availability (2)
- Amount of computers
- A booking system i.e., someone booking for whole year
- Concerned that the equipment will function properly without calling for technical assistance
- Finding time to access computer lab
- Time to do it
- Just being able to book IT facilities
- Time to implement
- Access to labs
- Information relevant to my topic/level – MS English
- Availability/accessibility to resources [fair system]
- Long term bookings
- Regular access to MS lab for JS classes [or any lab would do!]
- Can year 3s get a scanner to share sometime in the future?
- Perhaps next year we could work on a more friendly acceptable use form for the start of the year?
- Finding a computer to do reports on
- Finding the time to learn new programs
- Student numbers greater than access
- Storage of info low – need more 'space'
- Easy access
- Printers that work
- Takes a lot more time, preparation, delivery
- Availability of MSITE lab for MS staff

***Consequence*** [n=9]

*Attention focuses on impact of the innovation on student in his/her immediate sphere of influence. The focus is on relevance of the innovation for students, evaluation of student outcomes, including performance and competencies, and changes needed to increase student outcomes.*

- Putting class lesson information on student access drive so they can access beyond classroom
- Learning how to use GPS for application in class
- Making sure that classroom computers, printers, scanners are functioning and that the boys can successfully log on
- Monitoring what students are reading/doing on computer
- Students inability to read for information
- Students' lack of organisation with ICT ie do not save work in 2 places
- Students' ability and knowledge
- Provide my students with online and PC experience
- Responsibility for monitoring the boys to ensure that they are using the computers safely and responsibly, they are responsible about only using the programs required for the lesson - this concern arises largely from the layout of the rooms where it is difficult to easily survey what all the boys are doing with their computers.

| | |
|---|---|
| ***Collaboration*** [n=7] | *The focus is on coordination and cooperation with others regarding use of the innovation.*<br>• Very happy with the way you have tacked MS Computer Lab booking problem – thank you<br>• Very impressed by speed and efficiency of [names] re problems as they occur<br>• Availability of the lab should be easier with the changes you have made<br>• Time to work on developing units of work with my team<br>• Time to co-ordinate a team approach within the faculty<br>• Will give help to others in integrating more into their curriculum<br>• Will need help from IMC re more interactive online stuff |
| ***Refocusing*** [n=2] | *The focus is on exploration of more universal benefits from the innovation, including the possibility of major changes or replacement with a more powerful alternative. Individual has definite ideas about alternatives to the proposed or existing form of the innovation.*<br>• Trialling something new may be a waste of time in Year 11/12classes where time is critical<br>• Technology will fail |

### *Teachers' levels of use of ICT in teaching and learning*

Known to all teaching staff for their best practice involvement in the online teacher professional development program and assisting staff and students with ICT in their teaching and learning, thirteen teachers participated in audio-taped interviews as part of the Levels of Use (LoU) construct. By definition of their selection criteria of 'best practices', as well as their own reflections on ICT practice in their conduct of professional learning programs for other teaching staff, the thirteen teachers were interpreted to be at least Level IVB (Refinement) if not Level V (Integration) on the LoU chart of scale point definitions, levels, decision points and categories (Table 4:23 and Appendix XI: LoU Rating Sheet).

The interviews began with the questions, *"Are you using online learning?"* and *"What kinds of changes are you making in your use of online learning?"* with further probes,

such as to confirm that they are at at least Level IVB (Refinement). Typically, they would be making frequent reference to student outcomes, or refinements that will benefit the students. They would be mentally assessing how well online learning and their use of it is working for their students and suggesting new ideas for changing student outcomes.

> The thing I like about it is that it takes away from totally teacher-centred learning, that it also gives, (because the students are far more IT literate than I am), them more of a say in what is happening in their lessons. For these kids in particular, it is good for their confidence, 'um' I don't think in the end that they actually learn more, but the process is healthier. Well, kids take more ownership of their own learning rather than being totally teacher-directed. They also have more overt and immediate successes, I guess, because they are dealing one to one with the machine, and they get the responses, and they find out what they want, and they feel rewarded more than they would where one child answers the question in a class.
>
> Teacher 2

> As far as me professionally as a teacher, it has helped me understand different avenues of gaining information for my own students and different approaches to using IT in teaching as a tool...When I think about all the things I did, throughout the year, I think the students got more out of that ... because we were using a different tool to get the information, rather than me just delivering it. I think they got more out of it than they did in the whole entire year. I am sure if I had approached a lot of the other topics that way, ie using the IT as a tool, then, the students would have progressed much faster and go more out of it – they were more hands on and more challenged. Right throughout the year I was trying to look for more avenues to connect the information with these kids.
>
> Teacher 3

> Yes, I have been able to get over the initial stages of grappling with the tools, ... I have been able to concentrate on the actual students using it – the instructional design of it and I am now very interested in that interface where the student actually gets engaged or becomes involved in the online learning tasks and because of that, it has led me to be interested in their culture, or how they use online learning technology. Not only how they use a computer for online learning, but they use a whole range of tools for online learning, you see them now with their mobile phones, which are becoming more versatile, with their personal digital assistants they are more versatile, with the wireless phenomenon.... I am very interested in their culture and how they use it...I am currently developing a prototype of an online e-magazine which I am going to publish. As an e-teacher, I am going to have a go at getting in touch with their culture ...
>
> Teacher 4

> Well, I haven't done any surveys of the students as to how they feel about using something like [*name of program*]. The anecdotal feedback is that some like it and some don't. It's a bit mixed. I don't know , it is hardly a scientific survey but some really do like it and some I think just don't like that self-motivated, where they have to push themselves through the program...they just like to be directed. Maybe but I don't know, so it might be worth finding that out a bit more. But I am using it a lot more. Definitely, um that's changing how I am doing things in the classroom. I've only really just started doing that. What I am trying to do more is get my notes on the computer so that I can refer, just you know click on the links so that I don't have to find it.
>
> Teacher 5

> It is developing and changing all the time, as you see something new or change or find a better way of doing or, or you might say, no I haven't got time to learn that way, I've got this set up here, its works fine here and I haven't got the resources personally to do that and so it is bit of a balancing act because there is so much out there, its like textbooks, there are so many products out there, that you

can't get the best of everything and you have to make compromises and I just found another great graphing package where they have significant ... Everything changing, that's the nature of mathematics ...and there are lots of packages out there to do algebra, but assisting students to learn algebra ...it is a bit of catch 22 in some respects and to do something decent with Excel, you have to understand what you are doing it and if you don't and just say here is a spreadsheet and do this, and then they get nothing from it – they get the numbers but don't understand the process behind it

Teacher 8

I would like to think that I integrate more of the web quest experiences for kids...Have a bit of difficulty finding the time a. to acquire the skill and b. to take the time out to actually do that, but I am hoping that I might be able to up skill some of our staff near the end and particularly MS, trying to transfer through to senior school.

Teacher 10

LoU IVB (Refinement) users are described by Hall and Hord (2001) as a 'pleasure for facilitators' and fun to work with, for they are usually excited about their work. They are making shifts and moderate changes which they like to talk about. Apart from positive reinforcement and support, the change facilitator's key intervention is putting them in contact with others to access new information (p. 93). Again, at LoU V (Integration), the user must be interacting with others to co-ordinate their use, or collaborating with colleagues, and the change facilitator is supportive with restructuring materials, schedules or space, as time for planning and joint decision-making is important.

Yes with the Finance unit, it is with all our Grade 10 classes. We are trying to get 1 lesson in 3 where we share something, one on the graphical calculator and I show the guys what I've found. There is a lot of sharing with those who want to share....there's differing opinions of technology, but you know the Internet is a classic way of sharing with kids as well. That will grow as people deal with it, get used to it, become more happy with mode of operation and move from a room with folders, to folders on the computer. I don't see much of a difference, but some, others do. I mean, I find it to be an ambition just 'to look it up', whereas I know I can get t from a shelf. Its funny, but people go on about how change is increasing, how the pace of change is increasing. I don't necessarily believe that, because it might be exponential growth, ....but you have started at a at different place on the curve. I started on computers when they were just starting and it was a huge change. Now kids have a huge change, but they don't see it as any different any bigger, its just different and the same applies to teachers of different generations. You know, they look at using the internet, "oh, don't want to do that", and they are out of their comfort zone. Having being brought up on the front of it, I am happy to go and have a play with it...I think that will be case from now on. There is also a lot more of reliance on students and technology. This is part of a trend – the computer can deal with the information, but understand what is going on, that is the power...

Teacher 8

The differentiating question at decision point F on the LoU chart was "*Are you planning on exploring or making any major modifications to replace online learning?*" Change facilitators do not direct much time at this creative users' level as the users are seeking to replace or modify the innovation which could be disruptive to the change facilitators' efforts or planned goals if they do not become a positive force in facilitating improved student outcomes themselves. Many teacher interviewee responses are worth noting at this point. Teachers 1, 2, 3, 5, 9, 10, 11, and 12 remain at an overall LoU V (Integration) at this decision point. Teachers 4, 6, 7, 8, and 13 are bound for an overall Level VI (Renewal) because of their creative ability, initiative and energy to make further adjustments, modifications and changes.

> I do assessment online, but I think still assessment is good on a one to one personal feedback. You can give marks and awards online but it seems to be fairly cut and dried for the students, but even when you try to give comments like in the paper system, it is still not the same as when you sit down and talk to them. It is different in my subject area, because I teach in a design based area so it is very subjective anyway and a lot of the time it requires discussion, but in other subject areas, I can see that online assessment should be used.
>
> Personalising online learning is like personalising anything in education. You think back to the primary school days and walk into one classroom to another. Some are very vanilla and set out in the very traditional way with magazines and charts and some you walk into are amazing with fantastic artwork on the board and it is amazing
>
> That is the same online as well – you have the standard vanilla online delivery and then you have the teachers who have a few more skills and develop their own sites and engage the students in different ways, wouldn't say better, but just say in different way.
>
> One of the biggest things for me with online learning is improving that gap between school and the parents. Parent can actually have a look and see what they are doing. I have had Middle School parents especially say to me that it is good that they can see what is happening, look up the homework, print out the forms if they lose them. They don't need to come chasing after me, they can email me.
>
> Online learning is not just about delivering curriculum, it is that communication thing, which makes learning easier, suits most people with busy schedules, eg especially with email.
>
> Teachers who are hesitant when they come, soon realise that a lot of the content can be re-badged from year to year without a lot of work and see that it can be a real plus.
>
> Teacher 4

> Yeah well the issue in [subject] is whether we incorporate it more into the curriculum that we teach, deliver, maybe even get rid of the textbook and focus on the delivery of content through the software, and, enrich it with other experiments, etc., in the classroom, where we don't necessarily need the textbook That change hasn't occurred. But this year I have been using [the software] more, I have been using the text book less in my own classroom, but used the textbook a little as well...that has been difficult to sequence, they get bored, because you don't want them down there [the lab] for days, because you have to disperse it. But that seems to have been working well, and I have been doing experimental work with the others left up here and I then swap them around – generally that's

been ...so that's one modification where things are becoming more group oriented. I think it is better than the whole group, because you know everyone goes at different speeds – that's the thing you see and some may only need to be down there for the 2 periods and they are through the whole program. Others need to be down there for 5 periods.

Teacher 5

No, I think as I am exploring or experiencing it I am problem solving as I go along to better suit me and my way of projecting it onto students. I think I do it there and then as I go along. Online learning is quite instantaneous, it changes so often. I am going to assume that anything that doesn't work is being dealt with. I just find that it is. Everything is getting better and better. We are putting far more thought into it. If we remodelled something we have learnt through practice and then we learn again. We better to make sure that they speak our language. It is just so critical. IT makes people nervous. It does. Not so the young. More so people who have been teaching 20 25 years, be careful because they are very nervous about it. Or they will just shut it out. They see the massive benefits in it but they are too nervous about it. Too nervous. They see it as too much money involved...you know...an IT person runs around and fixes this and fixes that The grade 6 team are okay. Is it a male thing, you know the males on staff seem to use it a lot more than the females too.

Jane certainly uses it a lot more now. She is still very nervous about it. Anne walks in, and says ' you are the IT man'. , "no I'm not, you actually know a fair bit about it, you just have to explore it" [he answers]

Teacher 6

Yes certainly but it is a matter of finding the time to make the complete change. I'd like to see more online but finding the time to actually teach the present curriculum at the same time – I think there has to be a balance. I don't think online learning doesn't take away from traditionally Still teach traditionally, but you might have to scale it back, even though you teach traditionally. With ICT, you really don't know what direction it is going to take and so while we are changing and yes we think that we wont to be in this position, position A by this time next year, position A may not be necessarily be where you want it to be, when you get. You might find that something else has happened and that is not where you might want to go. So it is a funny agent.

Teacher 7

No look I am quite happy with what I am using it for at this stage. At the moment I am looking at developing, or learning about web page design and publication myself and what I am doing is designing a website that is linked into the schools site for the MS particularly in my teaching area which highlights what is going on. Again that would be doubling up it will sort of be an informative website, where kids aren't necessarily following it for direction, they are just looking at what each other are doing, parents and visitors to the website can see what is going on in that particular area of the school...basically using it as a promotional package, online learning package.

Teacher 9

Ah I hope so, not quite sure how to answer that. With our year 8 SOSE for example, we are now going to offer a compulsory unit called 'linking latitudes' and I'll be wanting kids to do web-quests on Asian countries and I'll be wanting kids to communicate with kids in those countries and I hope we will be doing this later in the year. It is pretty freaky for a lot of teachers I think and you get a lot of natural resistance. You get the resistance I think because a lot of teachers are still feeling their way using email, internet, Word, - the basic applications themselves. They are not comfortable with the basic applications yet. So, there is a very limited horizon for them.. They see something 'whizz-bang', but might be happening somewhere, but to actually translate it back to their own experience in the classroom, they cant see it. I relate to that very much, because I remember when BBC's first came out and they were introduced at the school I was at, and I was absolutely timid with them. It

took at least 2 years with them and I could actually start seeing how they actually were useful. They seemed so intimidating, particularly when you have been entrenched in the old way. I don't know whether it is a bloke thing, I was very intimidated and it took me a while to make the transition.

Teacher 10

I think once someone has moved through the fear factor of using the technology for themselves, even the base level, realising that "I can actually master this, it doesn't master me' I think when they realisation. I think also that some teachers are just on the creative edge more than others and those that are on the creative edge adopt the technology more easy. I can speak about my wife actually, although she is not at this school. She was on a really big learning curve with IT and I'd adopted the basic stuff much sooner than she had. But once she went to a course and set up her won computer, she is now ahead of me. She has designed her own web-quest, she has it is really a fundamental part of her work as a year head co-ordinator. She has outstripped me and I actually pick up a few things from her. I think it is exposure, on the creative edge, um I think sometimes it is the force of change will override the inertia of the teacher if there is somebody that t is there pushing it, someone to chip away it. I reckon getting the teacher to use the internet for a research assignment, once they get comfortable with the easy stuff, they can do something which is a bit more complex.

Teacher 10

In Table 4.23, the teachers' responses on the Stages of Concern (SoC), Open-ended Statements of Concern, and the Levels of Use (LoU) are cross-referenced as far as possible by method of data collection, timing and number of teachers responding. Hall and Hord (2001) find a linear correspondence between task concerns and LoU Level III Mechanical Use, and SoC Stage 5 Collaboration and LoU Level V Integration, in the same way that a non-user is likely to have intense concerns. Hall and Hord (2001) found that using large databases of studies over a long period of time and attempting to cross-reference them had made this linear matching too simplistic. One diagnostic dimension can only be predicted from knowing the other at only the extremes. A prediction is not possible for a SoC for a person at LoU IVA Routine. Any SoC concern profile would be possible.

A review of Table 4.23 would then suggest that a hypothesis with time-series analysis would be possible, as high stages of concern at SoC 5 Collaboration when working with colleagues could drive a high LoU V Integration. Data collected over the period of time did not facilitate the identification of LoUs for the high SoCs.

Table 4.23

*Application of CBAM instruments at a glance: Stages of Concern (Hall, George, & Rutherford, 1977), Open-ended Statements (Newlove & Hall 1988) and Levels of Use (Hall, Loucks, Rutherford, & Newlove, 1975)*

| ***Stages of Concern*** <br> ***Questionnaire Oct. 03 – Dec. 04*** | **Percentage of teachers on peak scores (see Table 4.21)** <br> **(N=61)** | ***Open-ended Statements of Concern*** <br> ***Written Statements Feb. 2005*** | **Number of teachers** <br> **(N=55)** | ***Levels of Use*** <br> ***Interviews May 2004*** | **Number of teachers** <br> **(N=13)** |
|---|---|---|---|---|---|
| 0 Awareness | 86.8 | 0 Awareness | 0 | 0 Non-use | 0 |
| 1 Informational | 90.1 | 1 Informational | 22 | I Orientation | 0 |
| 2 Personal | 32.8 | 2 Personal | 9 | II Preparation | 0 |
| 3 Management | 11.5 | 3 Management | 70 | III Mechanical use | 0 |
| 4 Consequence | 0 | 4 Consequence | 9 | IVA Routine | 0 |
| 5 Collaboration | 16.4 | 5 Collaboration | 7 | IVB Refinement | 1 |
| 6 Refocusing | 4.9 | 6 Refocusing | 2 | V Integration | 8 |
| | | | | VI Renewal | 5 |

## Other documentary evidence

### *Online survey of staff attitudes*

Prior to undertaking the study in late 2002, approximately 50% of the teaching staff responded to an invitation to complete an online commercial survey of attitudes to the development and integration of ICT at the school. The online survey was prepared by the Technology School of the Future staff in Adelaide, South Australia to provide a general measure of staff perceptions of the place of ICT in the curriculum. It was made available for a defined period to any school upon request for a small fee. All respondents to the survey temporarily mounted on the schools' intranet used email daily, and more than half felt capable with ICT competencies. All believed that ICT offered support for learning;

however, just 80% believed that the school had a clear direction in the use of ICT, as well as a clear plan for the development of student skills in using ICT. Over two-thirds of the respondents used ICT regularly to support their teaching; however, for 78% of the respondents, finding time was the main factor limiting the development of their own skills. Other limiting factors were: 39% identified the lack of instruction or tuition, 31% finding a worthwhile purpose, 25% had a lack of confidence and 25% had identified a lack of funding for professional development.

***Documented information resources***

During the period of undertaking this study, published material was available for a time-series analysis of the change strategies and interventions for school improvement. The documentary evidence included documented plans, policies and Principal's correspondence enabling triangulation with these additional sources of data collected and surveys about staff attitudes. These documents were manually coded to a phrase level where they could be tabulated to facilitate evidential review as well as provide representative quotations. In Table 4.24, the documents were matched, in part, against Silins and Mulford's (2000), Mulford and Silins' (2003), and Mulford and Johns' (2004a, 2004b) leadership model for organisational learning and student outcomes (LOLSO).

***Vision and goal setting, annual ICT planning and communication***

Interventions in the form of published strategic and annual technology plans, letters to parents and articles in monthly newsletters distributed to the school community during the period of undertaking this study indicated the funding commitments, levels of accountability, program evaluations, intended outcomes and program changes to the

school community audiences. Variously titled and authored, as shown in Table 4.24, they represented a number of sequential and strategic interventions by school leadership.

Table 4.24

*Documented information*

| **Leadership variables Silins & Mulford (2000) LOLSO model** | **Documentary evidence** | **Features and themes** | **Principals' Interventions** |
|---|---|---|---|
| **Individual support** – providing moral support and appreciation, building individual and school capacity | *Learning Services!: Enhancing the school day* [school newsletter], No 72, May 2002, authored by the Director of IT | Vision and objectives | Foreshadowing Principal's advice and letter to parents |
| | Principal's letter to parents, *[no title]* 1st November, 2002 | Reviewing ICT plan National and school goals | Statement of policy for home computer use |
| | Paper delivered at The Stephens School Board of Management Strategic Planning Committee, Tuesday 13th May 2003, titled "ICT Planning and Budgeting", presented by the Principal | Goals, priorities budgeting | Funding priorities |
| | Principal's letter to parents, *Information and Communications Technology (ICT)* 5th December, 2003 | Board of Management's concerns and options. What level of technology? What are parents willing to pay? | Board of Management's action |
| | Principal's letter to parents, *Update on Information Communication Technology (ICT)* May 2005 | New technologies Initiatives Review of provision | Support for new technologies and initiatives – wireless networking and personal computing |
| **Culture** – caring and trust among staff | Principal's Welcome, November 2005. | Conveying culture and ethos of school; strengths in outstanding academic staff. | Direction of new website |
| **Structures** for participative decision-making and distributed leadership | ICT Committee and student IT Leadership | [Meeting minutes] | Promotion of student leadership, participation and engagement |
| | Letter to staff about curriculum change, November 2005 | Curriculum change for Years 7-12 and future directions | Detailed proposal of curriculum changes (goals, initiatives, risks and professional development plan) which result from consultation and discussion |

| | | | |
|---|---|---|---|
| **Vision and goals** – working toward whole staff consensus | *Technology Plan 1997: Updated 1999*, (1999) authored by the Principal | Preamble, model, plan objectives & strategies | Statements of responsibility and accountability; specific outcomes and review strategies |
| | *ICT Planning 2002-2005*, (2002) authored by the Director of Information Services & Head of IT | ICT Infrastructure and competency audits | Surveys of student competencies and staff attitudes |
| | *ICT Plan 2003 -2005* (2003), authored by the Director of IT | ICT Audit<br>Overview 1997-2000<br>2000-2002 | Priorities: setting some targets |
| | *Information Communication Technology (ICT) Plan*, authored by the Principal, for the schools' website, September, 2005, updated November, 2005 | Objectives<br>Project Management<br>Competencies<br>Priorities<br>Budget initiatives<br>Strategies | Delegation of responsibility, communication strategies, managing risks |
| | Vision, Mission statement, Aims and School Motto, February 2004 | School culture characteristics – motto, mission, practice, language, school goals | Building a school culture |
| **Performance expectations** | Staff Computer Network & Internet Services: Acceptable Use Policy | Teaching staff responsibility | Establishing policy and practice, trust |
| **Intellectual stimulation** – to staff to reflect | Website, presentations and print publication on boys' education and internationalising the school's outlook, 2004 | Professional learning community | Building networks |
| **Organisational learning:**<br>* trust and collaborative climate<br>* shared and monitored mission<br>* initiatives and risk-taking<br>* relevant professional development | Letter to staff about curriculum change, November 2005 | Curriculum change for Years 7-12 and future directions | Detailed proposal of curriculum changes (goals, initiatives, risks and professional development plan) which result from consultation and discussion |

At interview, in response to a question about what conditions are important in the school for effective implementation of online learning, the school Principal explained the style and source of some of these interventions:

> I think that the most important thing is having a Board of Management and a Principal who are dedicated to changing things and from that, I think all else flows. I think the model where the Principal doesn't really care, and there are staff who are interested and keen is probably doomed to not being very successful. Secondly, it might be a contradiction, but also, I think a bottom up model works better than a top-down, and the trick is in fact to have the top wanting to do it and then convince the bottom that they want to do it, ... and that is what works best, so I don't think that is contradictory.
>
> Principal [interview]

### *Summary*

In this chapter, results from the survey of students and teachers who completed the questionnaires, the teachers' interviews and the teachers' open-ended statements are reported. These are divided into three separate parts: Reporting the students' home computers, connectivity and use; the students' experiences at school, and their acquisition of ICT skills, competencies and understandings. The first section explores the students' responses. In the next section about teachers, the results are divided again into three separate parts: Reporting teachers' home ownership and nature of ICT use outside school; computer based teaching; and their stages of concern in online learning and levels of use of ICT in teaching and learning.

The final section in this chapter presents documentary evidence available for time-series analyses of the interventions - documented plans, policies and Principal's correspondence, and therein also, the opportunity for triangulation of the additional sources of data. The next chapter discusses the findings from these results in Chapter 4, then compares those findings and the findings of the case study on ICT implementation with the outcomes in

related studies. Following the interpretation of findings, the implications of the study are identified. The chapter concludes with recommendations for future research.

# CHAPTER 5: SUMMARY AND DISCUSSION

## Introduction

This chapter discusses the findings about students' internet connectivity, and experiences at home and school as well as teachers' stages of concern with ICT implementation and levels of use in teaching and learning. The chapter then includes a comparison of the findings of this case study on ICT implementation with the outcomes in related studies. Following an interpretation of findings, the implications of the study are identified. The chapter concludes with recommendations for future research.

## Findings

This case study had four purposes:

- to better understand students' and teachers' attitudes to, and levels of use of ICT;
- to provide insights into the conditions that assist effective implementation, particularly the issues that must be addressed when instituting any new ICT program or innovation;
- to capture the assessment of innovation and change using a 'concerns based adoption model' (CBAM) so as to describe, explain and predict probable teacher behaviours in the change process; and
- to reflect on, and to provide an understanding of how to further develop change strategies and interventions that have an impact on school improvement.

### *Students' home internet connectivity, home use and homework*

Almost all students had internet connectivity at home, using a computer daily at home; however, only little more than half of those students accessed the school's intranet site. Ninety eight percent used computers outside school, more than 50 per cent of those students used computers daily at home, 25 per cent used them several days a week and 33 percent used them occasionally at a friend's or relative's house. Seventy two per cent had rarely or never used computers at a public or branch library, 78 percent had rarely or never used them at an online access centre and 86 per cent had rarely or never used an internet café.

Related studies (Meredyth, et al., 1999) had also found that school location, sector and socio-economic background made a significant difference to the presence of computers at home and skill levels of students. The students, who used computers at home, used them frequently and well. Access to a range of other forms of technology was more prevalent in independent schools in high income and urban areas.

When students were asked to estimate the number of hours spent each week on computer applications and other forms of ICT (Information and Communications Technology) outside school, they spent more time using general applications software like Microsoft Word and Internet searching and browsing. A lesser but comparative amount of time was spent using email, using a chat program, and playing CD-ROM games, and then a smaller amount of time playing online music, and using the school's intranet.

The use of other forms of ICT outside school indicates that viewing television was more frequent than listening to radio or playing CD or video players. Mobile phones, video

games, play-station games and calculators were comparable, but used to a lesser extent. The percentage of students using television (39.5%) greater than seven hours a week was less than the percentage of students using Microsoft applications, such as Word (55.9%). Again, to a lesser extent, students were using email, internet searching and browsing as well as Microsoft applications, such as Word for up to seven hours per week. Their use of these three computer applications remained marginally greater than chat, online music, television and their mobile phones.

When they estimated the hours spent on computer applications outside school for homework, most students (96%) spent more homework hours word processing set assignments, essays, reports or experiments. It was only a small difference (92.4%) to searching and researching via the Internet rather than creative or design homework tasks (75%) or communicating via email and chat (68.8%).

### *Students' experiences at school*

At school, most students were writing or word processing for assignments or projects as well as searching or researching via the web. The most frequent use after those activities were making or playing music, communicating with email and recording data on spreadsheets or designing presentations. In order, most use was writing or word processing, research, recording data and designing presentations. Two thirds of the students were rarely or never programming or accessing online training, online courseware, web publishing, designing graphics or making databases.

Most often, students were working with a small group rather than by themselves or with a whole class group; however, more students reported using computers in class time rather

than in their own time (e.g., recess or lunch-times). Almost 50 per cent indicated that they rarely used a computer in their own time at school. The majority of the students had an occasional class period rather than a routine class period in the computer lab.

Students' preferences for learning were wide-ranging. Students indicated strongly that they thought it was important to use a computer well, with only 5 students disagreeing. Over two-thirds believed working on a computer is 'fun'. Less than a third did not care, but nearly two-thirds confirmed that they felt comfortable using computers at school, and 'forget time' when they are working on computers at school. Nearly two-thirds believed that there were not enough computers for all students at school and that they do not get enough access to computers at school. Although nearly a third of the students did not care, another third found online chat with friends about doing assignments helpful. Over two-thirds affirmed that computers do help them learn at school. Nearly half the students preferred digital to physical resources

Over six years, generally, the exiting Year 8 cohort of students had increasingly improved ICT skills and competencies at the mastery and advanced levels. The one exception year 2001 was a year when the class teaching was known to be a different program to the earlier and later years. Notably, there was a significant pattern of decreased skill and competency by the students in the specific application software areas. In 2001, the teacher was a generalist, lacking specialist ICT training. In addition, the class teacher had changed each year up until the last year where a similar level was achieved more often across the tasks.

The first purpose of the study was to better understand students' and teachers' attitudes to, and levels of use, of ICT. In summary, in the case study school, all factors including the

students' connectivity, their affirming and extensive experiences at home and school, the positive climate and mastery level exhibited in ICT skills and competencies by the majority of students, as in Table 4.9 indicated a strong degree of success for ICT implementation notwithstanding the richer understanding gained of where students were at in the use of ICT and online learning.



### *Teachers' computer use*

The majority of the teachers had a computer at home (95.1%) connected to the school's network to use the internet (90.2%); intranet (75.4%); and to a slightly less extent, they were using email (67.2%). In a typical week at school, teachers reported their frequency of use of computers. Almost all the teachers spent the most time using email, or similar to the students, writing or word processing assignments, reports, assessment sheets, letters or programs. Again similar to the students, but to a lesser extent, the teachers spent time in a typical week searching, researching or using information on the World Wide Web. Only sometimes do approximately half of the teachers report that they do search the Library's catalogue, research with a CD-ROM, create pictures, drawings, diagrams or design presentations and access online courseware resources. Rarely were teachers involved in web-publishing, making databases, programming, designing graphics, or making and playing music.

In comparison with the teachers, many students were rarely or never programming or accessing online training, online courseware, web publishing, designing graphics or making databases, but they were involved in recording data and designing presentations after word processing. As reported in related studies, (Meredyth, et al., 1999), the students are

marginally more skilled than the teachers in basic ICT competencies, but far ahead of their teachers in advanced skills, such as multimedia, and using these advanced skills at home.

More teachers were using computers for school-related work in their own non-teaching time, (including lunch and recess times) rather than in class teaching time, or at home. Only a small number of teachers indicated that they rarely used computers for school-related work at home. In this respect, the findings are related to those of Meredyth et al. (1999) for teachers in independent schools using computers often and outside school.

Again, in a typical week, teachers reported how often they set class work involving some computer-based tasks for their classes. Few teachers set class work very often, and then mostly using an instructional program, (such as subject based software or simulations), taking tests or assessments online and information skills tasks, (such as using the WWW, presenting, designing a brief, mind-mapping or web-quests). More than a third of the teachers reported that they were sometimes using instructional programs, using worksheets on the Intranet courseware, getting students to log and record data (such as spread-sheeting), setting tests or assessments online and information skills tasks.

When teachers reported their experiences and attitudes about using a computer in their teaching, they all felt comfortable sending or receiving email and most of them felt that it was important. Similarly, the majority felt comfortable using word processors to create student resources or worksheets from the Intranet, and most of them felt it was important. There were more areas where only two-thirds of the teachers felt comfortable and felt that the skill was important: using the WWW for teaching higher order thinking skills; using a

database program for student reports; and using an instructional program, subject based software or simulation.

There was marked differences, contradictions and even surprises in the use of these tools of the twenty first century teacher. Two-thirds of the teachers felt that they were comfortable using a spreadsheet to create an assessment sheet, but fewer teachers thought it was important. Less than two-thirds were comfortable using a presentation program like Microsoft Office Powerpoint software in delivering a lesson or speech, yet more than two-thirds thought it was important. Over half the teachers were not comfortable with participating in an online chat or forum, or playing music, but nearly all of the teachers did not think it was important. Less than two-thirds of the teachers' classes participated in online lessons, or the teachers themselves in an online lesson, course, forum or conference, subscribed to online newsletters, and discussion lists for their own professional learning. As in the reports of related studies (Meredyth et al., 1999), in the first part of this study, the majority of teachers were using ICT in a range of low-level information seeking, communication or design tasks, but also reported low levels of experience and interest with more advanced ICT competencies, applications software, curriculum resource production and participation in professional learning communities.

All respondents to the teachers' online survey believed that ICT offered support for learning and about 80% of the respondents believed that the School has a clear direction in the use of ICT as well as a clear plan for the development of student skills in using ICT. Over two thirds of the respondents use ICT regularly to support their teaching; however, for 78% of respondents, finding time was the main factor limiting the development of their own skills; 39% identifying lack of instruction or tuition, 31% finding a worthwhile

purpose, 25% lack of confidence and 25% lack of funding for professional development. This finding matched closely, both that of the BECTA (2003) research and Tearle's findings (2003) in regard to time for professional development. This finding from the documentary evidence of the teachers' online survey served to support the function of data triangulation in a case study with the second part of the study in the application of the CBAM diagnostic instruments.

In the case study school, the degree of success of the effective implementation of ICT for teachers' skills, competencies and attitudes was mainly positive. There were marked differences between experience and interest in their own skill levels, use of applications software, curriculum use and participation in professional learning communities.

### Comparison with findings in related studies

Beyond the findings about students' and teachers' connectivity and experiences, the main areas of focus have been three-fold: innovation, concerns-based theory, and leadership and change in education. To enable the critical reflection on the effectiveness of the ICT implementation, using the conceptual framework of the looking glass with its magnifying capacity for different but unifying views and perspectives, the literature review had enabled a specific focus in each of the three areas in order to examine the findings as well as draw out interpretations and implications of this study. This main areas of focus - innovation, concerns-based theory, leadership and change in education, with empirical research reviewed outcomes systematically against the conceptual framework of the selective models can be summarized in the Table 5.1 preceding the discussion.

Table 5.1

*Summary of major findings*

| *Theoretical models reviewed in the literature* | *Major Findings* |
|---|---|
| **Case study model**<br>Yin (1994) and exploratory case study methodology | Internal validity of the case study was able to be strengthened by triangulation of divergent and documented sources of information and time-series analysis, rather than mitigated or adversely affected by a limitation of the study – researcher bias with the participant-observer role.<br><br>Generalizability to other boys' independent schools was not the main goal of the case study. |
| **Innovation models:**<br>Rogers' (1995) diffusion of innovations<br><br>• Where ICT relates to school innovation, the diffusion of the innovation follows the traditional diffusion pattern for innovations.<br>• The acquisition of ICT skills by teachers does not necessarily lead to deployment of those skills in teaching.<br>• Successful implementation of ICT depends upon a critical balance and context for teacher competence, school technological infrastructure and student ICT skills.<br>• The stages of implementation are important as the teachers become more competent in implementing ICT for their own style of teaching. | Venezky and Davis (2002) reported a critical level of IT infrastructure had to be reached before teacher ICT skills had any impact - just the acquisition of the ICT skills by teachers may not necessarily lead to the deployment and application of these skills for innovative teaching and learning.<br><br>The weakness of this traditional model for the diffusion of innovation in the current study is that it is strongly descriptive rather than predictive of outcomes.<br><br>Despite this weakness in the descriptive model, the diffusion of the innovation among the teachers is higher in the case study than the traditional model, but effective implementation in the school would mean that different strategies are required to get the few teachers who have frequent non-use as late adopters. |
| **Concerns models:**<br>Concerns Based Adoption Model (CBAM)<br><br>• The utility of the CBAM model for the change facilitator is in its capacity to identify the pre-conditions or the issues to be sensitive to, in order to understand how the change is being perceived and that some change can be anticipated.<br>• The CBAM interpretation of profiles can be an effective guide to facilitate the implementation of teacher professional development program or a change process in any particular time in the life-cycle of the implementation of an innovation.<br>• Analysis of the CBAM concerns profile that enables interventions to resolve concerns and move the individual or group to a more advanced stage in the innovation process has major implications for teacher professional | The CBAM model is useful for the change facilitator to identify the pre-conditions, or the issues to be sensitive to, in order to understand how the change is being perceived, and that some change can be anticipated (Hall & Hord, 2005).<br><br>The interpretation of the innovation configuration, concerns profiles and levels of use were effective guides to better understand students' and teachers' use, and to facilitate the implementation of more responsive professional learning.<br><br>The strength of the CBAM model lies in its application to the implementation planning of educational change – the capacity to describe, explain and predict probable teacher behaviours. |

development planning.

- A strength of the CBAM model is that it gives attention to the individual and need for information.
- Change facilitators need to consider the dimensions of the levels of use to understand where individuals and groups need appropriate interventions, both large and small to further the change process.

**Leadership and change implementation models:**

- The focus on fundamental issues of leadership and change management for such school transformation is as important as the focus on technology (and the barriers to effective implementation, such as lack of teachers' ICT skills).
- Barriers to ICT implementation are teachers' lack of confidence, time and access to quality resources, support for any recurring technical faults, and full curricula not conducive to the use of ICT.
- The enablers are highly effective leadership and planning, including a whole school vision and strategy for ICT, visible and practically demonstrable actions of the Principal, with visibility of use of ICT in the school, and leaderships' expectation and support for staff using ICT.
- Teachers who demonstrated success incorporating ICT into their class programs consistently reported having a personal professional learning support network or involvement in learning communities.
- The role of the principal is a key factor and often enables interventions that increase the potential for change or implementation success such as sufficient professional development opportunities, support, with compensated time off for training, adequate ICT infrastructure, and appropriate leadership.

The barriers to the ICT implementation are teachers' lack of confidence, time and access to quality resources, plus support for any technical problems.

The enablers are leadership and planning, including a school vision and strategy for ICT, visible and practically demonstrable actions of the Principal, with visibility of use of ICT in the school, and an expectation and support for staff using ICT.

The role of a principal is a key factor, and in particular, the interventions that increase the potential for change or implementation success, such as professional learning, adequate ICT infrastructure, and appropriate teacher leadership.

**Transformational leadership reflected through the LOLSO model:** Mulford and Silins' (2003) and Mulford and Johns' (2004a, 2004b) – Transformational school principal leadership and teacher voice: Reflection about and thematic analysis of the documentary evidence and teacher interview transcripts through the lens of the Mulford and Silins' (2003) and Mulford and Johns' (2004a, 2004b) model of six major positive processes for transformational school leadership provide a clearer view of the findings than just interventions.

In all studies (Gurr & Broadbent, 2004; Schiller, 2002; Tearle, 2003, 2004), ICT implementation can be compared to the implementation of any new educational innovation. That is, the focus on issues of leadership and change management is as important as the focus on technology.

### *Innovation models*

Over two-thirds of the teachers were connecting to the school network and communicating from home, with a dedicated third of the teachers often spending their own time, and most of that time at home, preparing school work online. Venezky and Davis (2002) in the OECD/CERI studies had found that where ICT implementation related to school innovation, the Rogers' (Rogers, 1995) model of the diffusion of the innovation followed the traditional pattern in its simplest form. In the current study, it is a similar case, as the classic model (Rogers, 1995) of the simplest form of the innovation diffusion occurred with the small group of innovators as early adopters, large groups as early and late majority users and a small group of laggards trailing.

In the interview narratives presented in Chapter 4, the teachers who are innovators or early adopters described the important stages and contexts of implementation as they became more competent in using and adapting ICT for their own style of teaching. The statements and intuitive comments in their narratives echo those findings reported by Venezky and Davis (2002). Successful implementation of ICT depended upon a critical balance between and a context for teacher competence, IT infrastructure and student ICT skills. In the studies reported by Venezky and Davis (2002), a critical level of IT infrastructure had been reached before teacher ICT skills had any impact, as just the acquisition of the ICT skills by teachers may not necessarily lead to the deployment and application of these skills for innovative teaching and learning. The weakness of this traditional model for the diffusion of innovation in the current study is that it is strongly descriptive rather than predictive of outcomes.

Despite this weakness in the descriptive model, the majority of the teachers' results for frequent use could be interpreted as early majority and the occasional 'sometimes' use interpreted as late majority or conservative use, with the laggards identified as having rare or non-use. The teachers' results for the majority categories were consistently higher percentages than the 34% traditional pattern of the Rogers' (1995) model. The diffusion of the innovation among the teachers is higher in the case study than the traditional model, but effective implementation in the school would mean that different strategies are required to get the few teachers who have frequent non-use as late adopters. One such classic strategy could be to encourage appropriate leadership and support from both the enthusiastic innovators and early adopters to work with the conservative majority of late adopters to increase the critical levels of ICT implementation.

## *CBAM models*

### *Teachers' stages of concern*

The utility of this CBAM model for the change facilitator is in its capacity to identify the pre-conditions, or the issues to be sensitive to, in order to understand how the change is being perceived, and that some change can be anticipated (Hall & Hord, 2005). The change measurement tools have proved valid and reliable in successive studies. The major finding of this part of the study was that the teachers' composite concerns and clustered concerns were typical of the CBAM model 'non-user' profile. As noted by Hall & Hord (2001), the non-user profile is characterized by the highest concerns at the first "Awareness" and "Information" stages of concern and lowest at the "Management" and "Consequence" stages of concern. In this study, the concerns profile indicated that, above all, the teachers had a need for more information about the ICT implementation and online learning.

Twelve months later, the assessment of the teachers' deeper and more subjective open-ended statements of concern were highest and clustered in the "Management" stage of concern about time for professional development and access and availability of the computer labs. Some trailing in the "Information" stage of concern revolved around the need for more training and professional development. Other concerns had progressed to the "Personal" stage of concern about lack of skill and expertise, but a few had reached the "Consequence" stages of concern about the impact on student learning. As in related studies (Hall & Hord, 2001), the CBAM interpretation of profiles are potentially an effective guide to facilitate the implementation of more responsive teacher professional learning programs or any change process in any particular time in the life-cycle of the implementation of an innovation.

Clearly matching and supporting the findings of the teachers' online survey, the majority of the teachers' concerns emanating from the request for open-ended statements, were in the stage 4 *Management* area (n=70) concerning the ***time available*** for professional development as well as the ***access and availability*** of labs of computers. After ***time,*** the second most common concerns listed were stage 1 *Informational* (n=22) revolving around need for ***more training and professional development.*** Some additional concerns listed repeatedly were personal lack of skill and expertise in stage 2 *Personal* (n=9) and the impact on student learning in stage 5 *Consequence* (n=9). Very few listed teaming outcomes with colleagues in stage 5 *Collaboration* (n=7) or other alternatives in stage 6 *Refocusing* (n=2). These findings served to triangulate the data and increase the internal validity.

### *Teachers' levels of use*

Known to all teaching staff for their best practice involvement in the online teacher professional development program and assisting staff and students with ICT in their teaching and learning, thirteen teachers were interviewed. In response to the questions, *"Are you using online learning?"* and *"What kinds of changes are you making in your use of online learning?"* with further probes, all the teachers confirmed that they were at least Level IVB (refinement) on the Hall & Hord (2001) Levels of Use chart. As in the CBAM SoC studies, they made reference to student outcomes, or refinements that will benefit the students. They would be mentally assessing how well online learning and their use of it is working for their students and suggesting new ideas for changing student outcomes. They were making shifts and moderate changes which they liked to talk about. Eight teachers remained at LoU V (Integration), where they were interacting with others to co-ordinate their use, or collaborating with colleagues. Five teachers were bound for an overall Level VI (Renewal) because of their creative ability, initiative and energy to make further adjustments, modifications and changes.

## *Leadership and change models*

As in the related studies (Gurr & Broadbent, 2004; Schiller, 2002; Tearle, 2003, 2004), ICT implementation can be compared to the implementation of any new educational innovation. That is, the focus on issues of leadership and change management is as important as the focus on technology. The barriers to the ICT implementation are teachers' lack of confidence, time and access to quality resources, plus support for any technical problems. The enablers are leadership and planning, including a school vision and strategy for ICT, visible and practically demonstrable actions of the Principal, with visibility of use of ICT in the school, and an expectation and support for staff using ICT. The role of a principal is a

key factor, and in particular, the interventions that increase the potential for change or implementation success, such as professional learning, adequate ICT infrastructure, and appropriate teacher leadership.

Interventions in the form of published strategic and annual technology plans, letters to parents and articles in monthly newsletters distributed to the school community during the period of undertaking this study indicated the funding commitments, levels of accountability, program evaluations, intended outcomes and program changes. Variously titled and authored, as shown in Table 4.24, they represented a number of sequential and strategic interventions by school leadership. Consistent with Schiller's (2002) findings, it is a principal's leadership focus which includes these interventions that helps make the difference.

***Transformational leadership reflected through the LOLSO model***

Reflection about and thematic analysis of the documentary evidence and teacher interview transcripts through the lens of the Mulford and Silins' (2003) and Mulford and Johns' (2004a, 2004b) model of processes for transformational school leadership provide a clearer view of the findings, rather than merely the impact of the interventions.

***Principal's individual support and building school capacity***

Supporting and adapting the findings of Silins and Mulford's (2000), Mulford and Silins' (2003), and Mulford and Johns' (2004a, 2004b) LOLSO model of leadership where school capacity is built through good communication and managed change in two key areas (school culture and school structure), the Principal balanced the advice about changing priorities with the consultative function, demonstrating support whilst building capacity. It

is demonstrated in all of his Principal's letters concerning ICT changes to parents as well as the paper delivered to the school Board of Management during the period of the study. For example, in a letter to parents, dated 1st November, 2002, the Principal stated that his "immediate aim has been to develop a new vision for the integration of technologies across all teaching programs and for all students, whilst evaluating the current allocation of resources." Then in the letter to parents about the Board of Management's deliberations, his advice to the Board about its options, and the likely fee rises in future years, dated 3rd December, 2003, the Principal stated,

> The Board is faced with a number of options. There are perhaps two questions: firstly, what level of technology should Stephens provide and secondly, what level of technology are parents able to afford?

***A culture of collegiality, collaboration, trust and support***

There is clear documentary evidence that the Principal has focussed on the promotion of a culture of collegiality, collaboration, trust and support among staff which is strongly linked to moral and ethical purposes of schooling, social justice values and beliefs. In November, 2005, in the *Principal's Welcome*, on the school website, he stated:

> As the Principal of Stephens School [pseudonym], I am convinced the twin strengths of this School are its boys and its outstanding academic staff. It is our teachers' ability to encourage, teach and lead the students at Stephens that makes us a really great school for boys... It is a forward-looking, innovative school ... Thank you for visiting our website. I hope it conveys the culture and ethos of this great School. Please contact us if we can be of assistance as you work towards making the very difficult decision of finding the right school for your son.

***Structures for participative decision-making and distributed leadership***

Facilitating collaborative decision making practices, the Principal has demonstrated distributive leadership to share the information, power and knowledge across middle management and the teaching teams. In a letter to all teaching staff in November, 2005, summing up future curriculum changes, the Principal wrote, in part:

> Following some seven years of consultation and discussion, I am writing to advise that the curriculum changes at Stephens are imminent. There is a need for us as a school to review, develop and rewrite some aspects of our curriculum and allocate time and funding to do this as well as continue to develop our teaching practice....As you are aware, we have been operating in a somewhat uncertain climate... [Name of the Director of Teaching and Learning] was employed to facilitate the development of curriculum and teaching and learning including guiding us through the time of education change...[names of middle managers] met to review the last seven years...we believe that it will not be possible to gain consensus from staff, ...but the divergence of views is an indication of people's willingness to state what they think and in my view an indication of a professional healthy staff. However, just because there is not consensus does not mean that nothing can happen...At this point, we propose making changes...

This letter continues with a further consultation phase and some suggested changes are outlined in his stated ongoing work to gain consensus. He concluded that further postponement of change should not happen just "because we cannot agree."

***Working towards whole staff consensus on shared school vision and goals***

The Principal builds trust by articulating his plan to work towards staff consensus on the shared school vision and by monitoring the goals, demonstrating the risk-taking and innovation as well as the encouragement of experimentation after a long discussion phase, and without fear of reprisal for those concerned or reacting to the changes. In that letter, he explained to staff, that "we are fully aware that these changes may not meet with the approval of all staff...we are happy to receive alternative models which meet the criteria...achievable and financially possible."

The Principal had worked publicly in the school community on developing the school culture through a period of consultation between staff and parents. The school's mission statement was one outcome, incorporating values such as: "Stephens is an Anglican school whose supportive, stimulating community works together to build character of boys" and "Stephens culture promotes...open and effective communication...[and] a happy environment where learning is fun."

### *Performance expectations*

The Principal's distributed leadership for high performance expectations is evident in the schools' policies and guidelines. The ICT example is the school's computer network and internet policy, the "Acceptable Use Policy" for students, wherein an explicit mention of "the teaching staff responsibility" is available to parents:

> In this partnership between parents, students and the school, the teaching staff have a responsibility to ensure that students have clearly defined tasks ... provide appropriate levels of supervision; educate students about intellectual property ... provide students with an ethical understanding .... and educate students about information handling...."

### *Intellectual stimulation*

Organisational learning within a trusted climate, a shared mission, a focus on risk taking, innovation, and initiative with relevant professional development was enhanced by the Principals' modelling on his own website exploring the education of boys and learning more about a school's culture, based upon his own empirical evidence and research outcomes from a large research project.

### *Teacher voice*

Consistent with the findings of Mulford and Silins (2003, p. 1) where "teacher voice" has greater predictive validity compared to those of the leaders who can tend to over-estimate effectiveness, the teachers' voices of this study reflect the flow-on of positive practices for changes in the school in the implementation of ICT. Evidence in the teachers' interview transcripts constituted the flow-on from change-managing leadership to these practising pedagogues onto organisational learning, and in their view, thence onto student outcomes.

Just as the Principal offers individual appreciative encouragement through *individual support and building school capacity* in a *culture of collegiality, collaboration, trust and*

*support,* the teachers' voices reflect a concern with empowering students' autonomy, engagement and high performance. The *structures for participative decision-making and distributed leadership* in such a positive culture for change are heard in the voice of Teacher 2:

> Well, kids take more ownership of their own learning rather than being totally teacher-directed (in an IT- based learning environment)... They also have more overt and immediate successes...and they find out what they want, and they feel rewarded more than they would where one child answers the question in a class.

Teacher 3 uses the inclusive pronoun to say:

> We were using a different tool to get the information, rather than me just delivering it.

The flow-on effects of a culture of mutual respect are testified to by Teacher 4 who proclaims:

> you can see them (students) with their mobile phones...personal digital assistants...wireless.. I am very interested in their culture and how they use it...As an e-teacher, I am going to have a go at getting in touch with their culture.

Again Teacher 6 uses "we" as a collective pronoun for the school leadership, teachers and students *working towards consensus on shared vision and goals*:

> Everything is getting better and better. We are putting far more thought into it.

Teacher 6 shows the flow-on of *Performance expectations* from Principal to teacher to students in saying:

> If we remodelled something we have learnt through practice and then we learn again.

Of all of these positive processes for transformational leadership identified by Mulford and Silins (2003), there are various teachers' voices in this study:

> Yes, I have been able to get over the initial stages of grappling with the tools...I have been able to concentrate on the actual students using it - the instructional design of it...and I am now very interested in that interface... (Teacher 4)

> ...so it might be worth finding out a bit more (about named software) (Teacher 5)

assisting students to learn algebra...and to do something decent with Excel, you have to understand what you are doing (Teacher 8)

integrat(ing) more of the web quest experiences for kids...finding the time... to acquire the skill (Teacher 10)

At the moment I am looking at...learning about web page design and publication myself... (Teacher 9)

you just have to explore it (Teacher 6)

realising that...I can master this, it doesn't master me.. (Teacher 10)

that clearly enunciate a thirst for *Intellectual stimulation* through management's provision and facilitation of relevant professional development identified and appreciated by the teachers themselves. The teachers were actively and collectively participating in the core work of the school, reflecting on what they are trying to achieve with students, how they were doing it, and modelling continual learning in their own practice.

## Interpretation of findings and implications of the study

In order to meet the four purposes of the study, the interpretation focuses on these tasks:

- the issues that must be addressed when instituting any new ICT program or innovation;
- to describe, explain and predict probable teacher behaviours in the change process; and
- how to develop change strategies and interventions that impact on school improvement.

Students' patient, tolerant, positive and affirming experiences with ICT at home and at school were similar to related and particular Australian research studies. The boys were more skilled than their teachers in basic ICT competencies, more advanced skills and

multimedia applications. A significant proportion of those students preferred digital resources and online environments, working and communicating with their peers rather than other forms of technology, or indeed, leisure and recreation, such as television.

### *Addressing the issues*

Consistent with findings in all related studies, the main issues that must be addressed for effective ICT implementation were teacher focused. They were also the first order barriers if not present: time for professional development; access and availability of the technology; and technical support. The literature review and the data analysis led to the emergence of these headings for discussion that were enablers or the keys to effective implementation: envisioning the future; trust; alignment; interventions; transformational leadership; and professional learning communities.

### *Predicting probable behaviours*

The strength of the CBAM model is in its application to monitor the implementation of educational change with professional development planning. The capacity to describe, explain and predict probable teacher behaviours requires attention to individual teachers' readiness and their personal need for information, assistance and support prior to the focus on the management or impact of change. This major implication for professional development planning is to give attention to the teachers' typical expressions of the stages of concern and the importance of addressing the questions teachers ask and when they ask them. Thus, the "how to" questions are not addressed before the self-concerned or "what does it mean for me" questions. It is very important *not* to be concerned with student learning or achievement prior to monitoring the teachers' own concerns regarding materials or strategies. The model implies monitored implementation over a period of time with the

patterns or trend lines of highs and lows of teachers' concerns progressing in a wave motion from left to right. Thus, their concern profiles are progressively plotted.

### *Interventions*

In a school setting, teachers are dedicated professionals, supported by their professional learning communities or learning teams. They will expect to have their concerns addressed before they attempt or attend any practical workshop. Then, interventions to resolve the concerns and move individuals or groups of teachers in a change process to a more advanced stage are possible. Similar to the researcher in this study, there is an implication for change facilitators to consider the dimensions of the levels of use to understand where individuals and groups need appropriate interventions, including principals' interventions to further the change process. Respecting the passage and sequencing of time, teachers' needs and expectations change too, and the adjustment according to the teachers' own reflections can be built into the programs of professional development planning.

### *Focus on technology or change?*

Along the continuum of models of integration of ICT skills and competencies in teaching and learning, a paradigm shift with education and technology convergence can also be identified. It involves applying systemic models of innovation and whole school change for transformative leadership and school improvement. The research findings support findings in related studies (Tearle, 2003, 2004). The major implication of this case study suggests that the effective implementation of ICT is comparable to the effective implementation of any educational innovation. Whilst the focus of ICT implementation research, to date, has been on ICT standards for IT infrastructure, ICT literacy, technical support and online learning as enablers or barriers, new attention is needed on the evidence

based research outcomes about the management of change in education and the transformative leadership role of reflective practices for school management, and teaching and learning. Teachers' voices in this study reflect the flow-on of positive practices from change-managing leadership to these practising pedagogues onto organisational learning, and in their view, thence onto student outcomes. In the same way that the Principal offers individual and appreciative encouragement in a culture of collaboration, trust and support, the teachers' voices reflect a concern with empowering students' autonomy, engagement and high performance. The structures for participative decision-making and distributed leadership in such a positive culture for change are heard in the teachers' voices.

## Conclusion

The aim of this exploratory and qualitative case study to explore, develop and apply a range of methods for evaluating the effective implementation of ICT and online learning in a school has been supported. The study was undertaken because there is a need for evidence informed policy and practice on increasing the levels of ICT and new learning infrastructures to drive school improvement and school effectiveness. The research outcomes from this single case study can assist in this regard and suggest new directions and complexities for further research.

The challenge has been met of using the case study method to provide insight into the conditions that assist effective implementation, particularly the issues that must be addressed when instituting any new ICT program or innovation. Some alternative challenges were also supported. They were to capture the assessment of innovation and change using a concerns model so as to describe, explain and predict probable teacher behaviours in the change process; and to reflect on how change strategies and interventions

have an impact on school improvement.

As discussed in Chapter 3, multiple sources of evidence, time-series analysis, triangulation of multiple data collection methods, and the reduction of rich description to quantifiable data were supported within the case study methodology. This choice of exploratory study of a large independent school can potentially provide some internal validity and some analytic generalizability.

The notion of a looking glass provides a useful metaphor to reduce the complexity of the educational scene and highlight particular features for further study. From the literature search, these directions were discernible. First, the innovations model, and specifically Rogers' (1995) "diffusion of an innovation" model, could describe, if not predict attitudes to and rates of adoption of ICT innovations. Second, the "concerns based adoption model" of the "stages of concern" and "levels of use" (CBAM, 1981) could prove a useful staff development tool for describing the effective implementation of ICT for online teaching and learning. Third, the leadership and organisational change implementation models could provide strategies for successful implementation of online learning. These directions formed the conceptual framework of this study or the clear glass in the lens of a looking glass. One of the fundamental strengths of a looking glass or a magnifying glass is its ability to provide a different, but still unified view of what it is examining. It removes data from the view that is not relevant. Yet, at the same time, the lens is sharp and cuts through the surface view and exposes deeper levels. Both the focus and the magnification can be altered dynamically at any time. The study's context, rationale and significance as well as logic for organising the analysis of data is represented in the looking glass.

Consistent with findings in all related studies, the main issues were teacher focused. They were also the first order barriers to effective ICT implementation if not present: time for professional development; access and availability of the technology; and technical support. The data analysis led to the emergence of these headings for discussion that were enablers for effective implementation: envisioning the future combined with trust; alignment; interventions; transformational leadership; and professional learning communities.

The CBAM model has the capacity to monitor the implementation of educational change with professional development planning. It can be used to describe, explain and predict probable teacher behaviours, individual teachers' readiness and their personal need for information support in the management of change. This major implication for professional development planning is to give attention to the teachers' typical expressions of concern and the importance of addressing the teachers' personal questions before the "how to" questions are addressed. In addition, it is very important *not* to be concerned with student learning or achievement before monitoring the teachers' own concerns. The model implies monitored implementation over a sustained period of time with the patterns or trend lines of highs and lows of teachers' concerns progressing in a wave motion from left to right if their concern profiles are to be progressively plotted.

Interventions to resolve the concerns and move individuals or groups of teachers in a change process to a more advanced stage are possible. An implication for change facilitators, such as curriculum consultants, is to consider the dimensions of the levels of use to understand where individuals and groups need appropriate interventions, including principals' interventions to further the change process. Respecting the passage and

sequencing of time, teachers' own reflections can be built into the programs of professional development planning.

The opening and dramatic vignettes from David Hargreaves (2004) call for radical rethinking of the introduction of ICT into schools for transformation of education. A paradigm shift with education and technology convergence can happen if systemic models of innovation and whole school change for school improvement are applied. The research findings of this case study suggest that the effective implementation of ICT is related to the effective implementation of any educational change which is not generally acceptable to the ICT research literature. Whilst the domination of the ICT implementation research has been on exacting ICT standards for IT infrastructure, ICT literacy, technical support and online learning to bring about changes in student achievement, it has missed the evidence based research outcomes on the management and leadership of change in education.

## Recommendations for future research

Across education regions and sectors, change facilitators are using curriculum reform, change processes and protocols to assist teachers in their professional learning communities. When allowing three to five years or more for implementation of change processes, policies, resources and professional learning, school leaders can use an array of diagnostic tools to collect contextual data about aspects of the implementation and organisational change. The data collected can be used to design 'intervention' strategies, evaluate the effectiveness of the implementation or sustainability off the change process in professional learning. The generic conceptual framework that has been used in this study, the *Concerns-Based Adoption Model (CBAM)* can provide school leaders with ready-made research-based tools in a case study context to facilitate their change leadership.

Although the CBAM model has evolved into a comprehensive and systemic change model that assists curriculum change consultants, facilitators and researchers to understand organisational change, it is a valid and reliable tool to assist practitioners with the effective implementation of change from the point of view of those affected by the change. It could:

- provide practitioners evidence-based outcomes and diagnostic tools to describe the current conditions (environment, organisation and change strategies) in their schools;
- provide information about those conditions that are most likely to assist the ongoing and effective implementation of curriculum reform, changing assessment practices and inclusive schooling; and
- provide information to enable them to design and evaluate effective individual professional learning plans as well as whole staff development programs.

Areas for further research using this CBAM model and outside the scope of this study are related to current trends in systemic curriculum reform and implementation. The concept of mapping the innovation configuration plan involves identifying and defining the operational components of a professional learning program, then analysing the patterns of use of the components by the teachers. The configuration is the form a process takes on during actual use, addressing both the idealised image and the quality of use of operational form that can be observed in the classrooms or the effectiveness of the implementation.

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## Appendix I: Information sheets and accompanying letters


UNIVERSITY OF TASMANIA

Bill Mulford, Professor and Director
Leadership for Learning Research Group
Faculty of Education
University of Tasmania
PMB 66 Hobart
Tasmania, Australia 7001
Phone/Fax Australia 03 6226 2523

17th October, 2003

Dear Parent/Guardian,

In a research study undertaken as part of the requirements for an Education Doctorate at the University of Tasmania's Faculty of Education, a range of methods are being explored for evaluating the effective implementation of ICT (Information and Communications Technology) for online learning. It is anticipated that the study outcomes could help describe the conditions in a school that assist effective implementation of online learning.

Part of the study involves a questionnaire that focuses on students' computer use and online learning at Stephens School *[pseudonym]*. The School Principal has given the permission and support of the School to conduct this study. You are invited to participate in the study by consenting to your son's or your sons' involvement in completing the questionnaire. However, it is voluntary and you are entitled to abstain from consenting to your son's participation in the study.

Please find enclosed the detailed information sheet, a sample of the student questionnaire and two consent forms for the research project. If you are still interested to allow and activate the participation of your son/s, could you read and sign the consent form? It can be returned in the reply paid and pre-addressed envelope enclosed with this letter. The other copy is your record to be retained for yourself.

The questionnaire is anonymous. There are 26 questions which will take approximately 10 minutes in total to complete. Your son/s will not be asked to put his/their name on the form or identify himself/themselves. Personal information that could reveal the identity of participants is not sought. The information collected will be summarised and analysed to show the conditions of effective implementation. The findings will be passed on to the Principal and made available through a report in the School publications.

It would be very much appreciated if you complete and mail the consent form. Following receipt of consent form, the questionnaire will be delivered and completed by students in pastoral meeting time at School.

Thanking you in anticipation of your help.

Yours sincerely

Professor Bill Mulford
**Chief Investigator/Supervisor:**
**Director, Leadership for Learning Research Group;**
Faculty of Education,
University of Tasmania, Hobart Campus,
Hytten Hall, PMB 66 Hobart, Tas. 7001
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Jill Abell
**Other Investigator**
Phone 62214225
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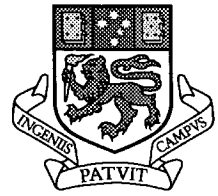
## Appendix I: Information sheets and accompanying letters

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17th October, 2003

CONSENT FORM FOR PARENTS/GUARDIANS
Effective Implementation: A Case Study of the Introduction of ICT in One School

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1. I have read and understood the 'Information Sheet' for this study.
2. The nature and possible effects of the study have been explained to me in writing.
3. I understand that the study involves the administration of a questionnaire on which will take approximately 10 minutes to complete.
4. I understand that there are no risks and minimal disruption of class time involved.
5. I understand that all research data will be securely stored at the Faculty of Education, University of Tasmania premises for a period of 5 years. The data will be destroyed at the end of 5 years.
6. Any questions that I have asked have been answered to my satisfaction.
7. I agree that research data gathered for the study may be published provided that my son/s cannot be identified as a subject.
8. I agree that my son/s can participate in this investigation and understand that I may my withdraw permission at any time without prejudice.

Name/s of students ..... Tutor.....

..... Tutor.....

9. I understand that I have the opportunity to contact the Investigators at any time.

**Chief Investigator/Supervisor:**
**Professor Bill Mulford**
Director, Leadership for Learning Research Group;
Faculty of Education, University of Tasmania
Phone/Fax 03 6226 2523
Email: Bill.Mulford@utas.edu.au

**Other Investigator/EdD Student**
**Jill Abell**
Phone: 03 6221 4225 [wk]
Email: jdabell@utas.edu.au

Name of parent/guardian .....

Signature ..... Date .....

10. I have explained this project and the implications of participation in it to this volunteer and I believe that the consent is informed and that he/she understands the implications of participation.

Name of investigator .....
Signature of investigator ..... Date .....

## Appendix I: Information sheets and accompanying letters

UNIVERSITY OF TASMANIA

# Effective Implementation: A Case Study of the Introduction of ICT in One School

## Information Sheet for Parents

This explanatory case study, is being undertaken by Jillian Abell as part of the requirements for an Education Doctorate. The aim is to explore, develop and apply a range of methods for evaluating the effective implementation of ICT and online learning in a school.

*'ICT'* is 'Information and Communications Technology' and generally refers to the hardware, software, skills and communications of using networked computers. *'Online learning'* is used in its broadest sense of resource-based learning via the Internet or an Intranet, that is, computing and communications technologies. *Innovative'* is used in terms of substantive and positive change brought about in the School.

In part, the study involves a questionnaire that focuses on students' computer use and online learning and one that focuses on the adoption of ICT and online learning for innovative teaching practices. It is not intended as an evaluation or as an audit of ICT skills and teaching practice, but as a profile of one school in a case study.

There is a need for evidence informed policy and practice on the increasing levels of ICT (Information and Communications Technology) and new learning infrastructures that are intended to drive school improvement and school effectiveness.

It is anticipated that the research outcomes could help describe the conditions (environment, organisation, and change strategies) in a school that are likely to assist the effective implementation of change and school improvement.

The purpose of this information sheet is to ask you if you are willing to give your consent for your son(s) to fill out a questionnaire that should take no longer that 10 minutes to complete. Your son(s) will not be invited to participate unless and until a signed consent form is received from you. The completion and postage of the consent form in the stamped pre-addressed envelope provided will activate the consent to participation in the research.

The Years 7-12 questionnaires are anonymous. Personal information that could reveal the identity of participants is not sought. The findings which will not allow any individual

student or teacher to be in any way identifiable will be passed on to the Principal and the results of the research reported in School publications.

Participation in the case study by your son(s) is entirely voluntary and they can abstain or withdraw at any time There is no effect, academic or otherwise, stemming from a decision not to give consent or to withdraw from participation. There are no risks in maintaining the confidentiality of the data obtained and there is minimal disruption time involved.

All research data will be securely stored at the Faculty of Education, University of Tasmania premises for a period of 5 years. The data will be destroyed at the end of the five years. Participants receive copies of the information sheet and consent form to retain.

In addition to the permission and support of the School to conduct this study from the School Principal, the research has been approved by the Southern Tasmanian Social Sciences Human Research Ethics Committee at the University of Tasmania. This ensures that the issues such as anonymity and confidentiality are maintained. Any ethical concerns or complaints about the manner in which the research is conducted can be directed to the Chair, Associate Professor Gino DalPont, (Ph 6226 2078) or the Executive Officer, Amanda McAully (Ph 6226 2763).

**Contact details for questions relating to the study:**

**Chief Investigator/Supervisor:**
**Professor Bill Mulford**
Director, Leadership for Learning Research Group;
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University of Tasmania
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Email: Bill.Mulford@utas.edu.au

---

Bill Mulford

**Other Investigator/EdD Student**
**Jillian Abell**
Phone: 03 6221 4225 [wk]
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---

Jill Abell

17th October 2003

## Appendix I: Information sheets and accompanying letters

UNIVERSITY OF TASMANIA

# Effective Implementation: A Case Study of the Introduction of ICT in One School

## Information Sheet for Students

This case study is being undertaken by Jillian Abell as part of the requirements for her Education Doctorate. The aim is to explore, develop and apply a range of methods for evaluating the effective implementation of ICT and online learning in a school.

*'ICT'* is 'Information and Communications Technology' and generally refers to the hardware, software, skills and communications of using networked computers. *'Online learning'* is used in its broadest sense of resource-based learning via the Internet or an Intranet, that is, computing and communications technologies. *Innovative'* is used in terms of substantive and positive change brought about in the School.

In part the study involves a questionnaire that focuses on students' computer use and online learning. It is not intended as an evaluation of ICT skills and teaching practice, but as a profile of one school in a case study.

There is a need for evidence informed policy and practice on the increasing levels of ICT (Information and Communications Technology) and new learning infrastructures that are intended to drive school improvement and school effectiveness. It is anticipated that the research outcomes could help describe the conditions (environment, organisation, and change strategies) in a school that are likely to assist the effective implementation of change and school improvement.

The research will involve student and teacher questionnaires that should each take no longer than 10 minutes to complete. The questionnaires are anonymous. Personal information that could reveal the identity of participants is not sought. The findings which will not allow any individual student or teacher to be in any way identifiable will be passed on to the Principal and the results of the research reported in School publications.

Participation in the case study by you is entirely voluntary and you can abstain or withdraw at any time. There is no effect, academic or otherwise, stemming from a decision not to participate.

All research data will be securely stored at the Faculty of Education, University of Tasmania premises for a period of 5 years. The data will be destroyed at the end of the five years. Participants ~~will~~ receive copies of this information sheet to retain.

In addition to the permission and support of the School to conduct this study from the School Principal, the research has been approved by the Southern Tasmanian Social Sciences Human Research Ethics Committee at the University of Tasmania. This ensures that the issues such as anonymity and confidentiality are maintained. Any ethical concerns or complaints about the manner in which the research is conducted can be directed to the Chair, Associate Professor Gino DalPont, (Ph 6226 2078) or the Executive Officer, Amanda McAully (Ph 6226 2763).

**Contact details for questions relating to the study:**

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**Professor Bill Mulford**
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Bill Mulford

**Other Investigator/EdD Student**
**Jillian Abell**
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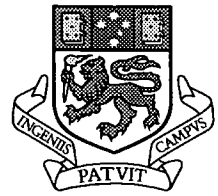
Jill Abell

17th October, 2003

## Appendix I: Information sheets and accompanying letters




UNIVERSITY OF TASMANIA

Bill Mulford, Professor and Director
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University of Tasmania
PMB 66 Hobart
Tasmania, Australia 7001
Phone/Fax Australia 03 6226 2523

30th November, 2003

Dear Teacher,

In a research study undertaken as part of the requirements for an Education Doctorate at the University of Tasmania's Faculty of Education, a range of methods are being explored for evaluating the effective implementation of ICT (Information and Communications Technology) for online learning.

This questionnaire for teachers focuses on the adoption of ICT for innovative teaching practices. It is not intended as an evaluation or as an audit of ICT skills and teaching practice, but as a profile of one school in a case study. The information collected will be summarised and analysed to show the conditions of effective implementation.

Please find enclosed the detailed information sheet, a sample of the questionnaire and two consent forms for the research project.

The School Principal has given the permission and support of the School to conduct this study. However, it is voluntary and you are entitled to abstain from completing the questionnaire.

The questionnaire is anonymous. There are 4 sections that will take approximately 10-15 minutes in total to complete. You will not being asked to put your name on the form or identify yourself. Personal information that could reveal the identity of participants is not sought.

If you are still interested in participating, it would be most appreciated if you could sign the consent form. It can be returned in the return-addressed envelope enclosed with this letter. Please retain the other copy for yourself.

Following the receipt of signed consent forms, the questionnaire will be delivered and collected via the School's internal mail.

Thanking you in anticipation of your help.

Yours sincerely

Professor Bill Mulford
**Chief Investigator/Supervisor:**
**Director, Leadership for Learning Research Group;**
Faculty of Education,
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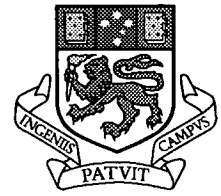
## Appendix I: Information sheets and accompanying letters

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30th November, 2003

CONSENT FORM FOR TEACHERS' QUESTIONNAIRE
Effective Implementation: A Case Study of the Introduction of ICT in One School

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1. I have read and understood the 'Information Sheet' for this study.
2. The nature and possible effects of the study have been explained to me.
3. I understand that the study involves the administration of a questionnaire on [date/time] which will take approximately 10 minutes to complete.
4. I understand that there are no risks and minimal disruption time involved:
5. I understand that all research data will be securely stored at the Faculty of Education, University of Tasmania premises for a period of 5 years. The data will be destroyed at the end of 5 years.
6. Any questions that I have asked have been answered to my satisfaction.
7. I agree that research data gathered for the study may be published provided that I cannot be identified as a subject.
8.. I agree to participate in this investigation, and understand that I can withdraw from the interview at any time.
9. I understand that I have the opportunity to contact the Investigators at any time.

**Chief Investigator/Supervisor:**
**Professor Bill Mulford**
Director, Leadership for Learning Research Group;
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Phone/Fax 03 6226 2523
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**Other Investigator/EdD Student**
**Jillian Abell**
Phone: 03 6221 4225 [wk]
Email: jdabell@utas.edu.au

Name of participant .....

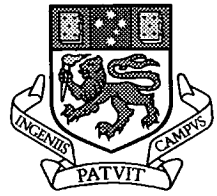
Signature of participant ..... Date .....

10. I have explained this project and the implications of participation in it to this volunteer and I believe that the consent is informed and that he/she understands the implications of participation.

Name of investigator .....

Signature of investigator ..... Date .....

## Appendix I: Information sheets and accompanying letters




UNIVERSITY OF TASMANIA

# Effective Implementation: A Case Study of the Introduction of ICT in One School

## Information Sheet for Teachers

This explanatory case study is being undertaken by Jillian Abell as part of the requirements for an Education Doctorate. The aim is to explore, develop and apply a range of methods for evaluating the effective implementation of ICT and online learning in a school. It is anticipated that the research outcomes could help describe the conditions (environment, organisation and change strategies) in a school that are likely to assist the effective implementation of change and school improvement.

*'ICT'* is 'Information and Communications Technology' and generally refers to the hardware, software, skills and communications of using networked computers. *'Online learning'* is used in its broadest sense of resource-based learning via the Internet or an Intranet, that is, computing and communications technologies. *Innovative'* is used in terms of substantive and positive change brought about in the School.

In part, the study involves a questionnaire that focuses on students' computer use and online learning and one that focuses on the adoption of ICT and online learning for innovative teaching practices. It is not intended as an evaluation or as an audit of ICT skills and teaching practice, but as a profile of one school in a case study.

There is a need for evidence informed policy and practice on the increasing levels of ICT (Information and Communications Technology) and new learning infrastructures that are intended to drive school improvement and school effectiveness.

The research will involve two forms of data collection. The study will use the student and teacher questionnaires that should each take no longer than 10 minutes to complete. In addition, a selective group of teachers will be invited to be interviewed for their known best practice and audio-taped when asked to reflect on their expertise developed over time at the School. The completion of the informed consent form and its internal School mailing in the pre-addressed envelope will activate the consent to participation in the research.

The questionnaires are anonymous. Personal information that could reveal the identity of participants is not sought. The findings which will not allow any individual student or teacher to be in any way identifiable will be passed on to the Principal as a report of the results of the research which can then be reported in School publications.

Participation in the case study by you is entirely voluntary and you can abstain or withdraw at any time. There are no risks in maintaining the confidentiality of the data obtained and there is minimal disruption time involved.

All research data will be securely stored at the Faculty of Education, University of Tasmania premises for a period of 5 years. The data will be destroyed at the end of the five years. Participants receive copies of the information sheet and consent form to retain.

In addition to the permission and support of the School to conduct this study from the School Principal, the research has been approved by the Southern Tasmanian Social Sciences Human Research Ethics Committee at the University of Tasmania. This ensures that the issues such as anonymity and confidentiality are maintained. Any ethical concerns or complaints about the manner in which the research is conducted can be directed to the Chair, Associate Professor Gino DalPont, (Ph 6226 2078) or the Executive Officer, Amanda McAully (Ph 6226 2763).

**Contact details for questions relating to the study:**

**Chief Investigator/Supervisor:**
**Professor Bill Mulford**
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University of Tasmania
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Tasmania, Australia 7001
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Bill Mulford

**Other Investigator/EdD Student**
**Jillian Abell**
Phone: 03 6221 4225 [wk]
Email: jdabell@utas.edu.au

Jill Abell

1st December, 2003

## Appendix I: Information sheets and accompanying letters


UNIVERSITY OF TASMANIA

Bill Mulford, Professor and Director
Leadership for Learning Research Group
Faculty of Education
University of Tasmania
PMB 66 Hobart
Tasmania, Australia 7001
Phone/Fax Australia 03 6226 2523

9th March, 2004

Dear Teacher,

You may recall that in this research study undertaken as part of the requirements for an Education Doctorate at the University of Tasmania's Faculty of Education, a range of methods are being explored for evaluating the effective implementation of ICT (Information and Communications Technology) for online learning.

As part of the study, it is hoped to interview a small number of teachers, known for their best practice and delivery of online professional development about their levels of use of online learning. They will be invited to reflect in the audio-taped interview on how they have developed expertise over time as part of the profile of one school in a case study. Again, it is anticipated that the interview outcomes could help describe the conditions in a school that assist effective implementation.

Please find enclosed the information sheet, the interview schedule and two informed consent forms for the research project. The School Principal has given the permission and support of the School to conduct this study. However, it is voluntary and you are entitled to abstain from consenting to be interviewed.

The interview will take approximately 20 minutes. Personal information that could reveal the identity of participants is not sought. The information collected will be summarised and analysed to show the conditions of effective implementation.

It would be most appreciated if you are interested in participating and could sign the consent form. It can be returned via internal School mail in the return-addressed envelope enclosed with this letter. Please retain the other copy for yourself.

Following the receipt of signed consent forms, the time and location of the interviews can be discussed at your convenience. Thanking you in anticipation of your help.

Yours sincerely

Professor Bill Mulford
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***Director, Leadership for Learning Research Group;***
Faculty of Education,
University of Tasmania, Hobart Campus,
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## Appendix I: Information sheets and accompanying letters


UNIVERSITY OF TASMANIA

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9th March 2004

CONSENT FORM

Effective Implementation: A Case Study of the Introduction of ICT in One School

1. I have read and understood the 'Information Sheet' for this study.
2. The nature and possible effects of the study have been explained to me.
3. I understand that the study includes administration of an audiotaped interview on [date/time] which will last for approximately 20 minutes.
4. I understand that there are no risks and minimal disruption time involved:
5. I understand that all research data will be securely stored at the Faculty of Education, University of Tasmania premises for a period of 5 years. The data will be destroyed at the end of 5 years.
6. Any questions that I have asked have been answered to my satisfaction.
7. I agree that research data gathered for the study may be published provided that I cannot be identified as a subject.
8.. I agree to participate in this investigation, and understand that I can withdraw from the interview at any time.
9. I understand that I have the opportunity to contact the Investigators at any time.

**Chief Investigator/Supervisor:**
**Professor Bill Mulford**
Director, Leadership for Learning Research Group;
Faculty of Education, University of Tasmania
Phone/Fax 03 6226 2523
Email: Bill.Mulford@utas.edu.au

**Other Investigator/EdD Student**
**Jillian Abell**
Phone: 03 6221 4225 [wk]
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Name of participant .....

Signature of participant ..... Date .....

10. I have explained this project and the implications of participation in it to this volunteer and I believe that the consent is informed and that he/she understands the implications of participation.

Name of investigator .....

Signature of investigator ..... Date .....

## Appendix II: Student Questionnaire

# Computer use and online learning

Thank you for agreeing to take part in this survey. The questionnaire has been made as short and as straightforward as possible. The term, ***online learning*** is used in its broadest sense of resource-based learning via the Internet or an Intranet, that is, computing and communications technologies.

Most of the questions require you to tick only an appropriate box or column from a list of available choices. Please complete all questions.

## *Section 1: Background information*

**Question 1: Which year group are you in this year?**

| | | | |
|---|---|---|---|
| Year 7 | ☐ | Year 8 | ☐ |
| Year 9 | ☐ | Year 10 | ☐ |
| Year 11 | ☐ | Year 12 | ☐ |

**Question 2: At home, do you**

| | | | | |
|---|---|---|---|---|
| Have a computer? | Yes | ☐ | No | ☐ |
| Have an Internet connection? | Yes | ☐ | No | ☐ |
| Use an email account? | Yes | ☐ | No | ☐ |
| Access the School's Intranet site? | Yes | ☐ | No | ☐ |
| Access your School email account? | Yes | ☐ | No | ☐ |

## *Section 2: Computer use outside School*

**Question 4: Do you use computers outside School?**

Yes ☐ No ☐

**Question 5: How often would you use computers? (Tick as many boxes as required)**

| | Daily | Several days/week | Weekly | Occasionally | Rarely | Never |
|---|---|---|---|---|---|---|
| At home | | | | | | |
| At a family or relative's house | | | | | | |
| At a friend's house | | | | | | |
| At a public or branch library | | | | | | |
| At an online access centre | | | | | | |
| At an Internet café | | | | | | |
| Elsewhere (Please list) | | | | | | |

Question 6: How many hours per week do you spend on computer applications outside School? (Tick as many boxes as required)

| | Nil | < 1 hours | 1 - 2 hours | 3 - 7 hours | > 7 hours |
|---|---|---|---|---|---|
| | < = *less than* | | | > = *greater than* | |
| Using email | | | | | |
| Internet searching & browsing | | | | | |
| Using a chat program, e.g., MSN | | | | | |
| Using the School's Intranet site | | | | | |
| Playing CD-ROM games | | | | | |
| Playing network computer games (CD-ROM, modem or Internet) | | | | | |
| Using general applications software, e.g., MS Word | | | | | |
| Using graphic design and rendering programs, e.g.., Rhino | | | | | |
| Using subject-based or content-based software, e.g., on CD-ROM | | | | | |
| Creating web pages | | | | | |
| Watching online movies | | | | | |
| Playing online music | | | | | |

Question 7: How many hours per week do you use other forms of ICT (Information and Communications Technology) outside School? (Tick as many boxes as required)

| | nil | < 1 hour | 1 - 2 hours | 3 - 7 hours | > 7 hours |
|---|---|---|---|---|---|
| | < = *less than* | | | > = *greater than* | |
| Television | | | | | |
| Radio | | | | | |
| CD and cassette players | | | | | |
| VCR or video players | | | | | |
| Mobile Phone | | | | | |
| Video games | | | | | |
| Handhelds or PDAs | | | | | |
| Playstation or other console games | | | | | |
| Fax | | | | | |
| Scanner | | | | | |
| Video camera | | | | | |
| Calculator | | | | | |
| Other? (Please list) | | | | | |

Question 8: How many hours of *homework* per week do you spend on computers outside School? (Tick as many boxes as required)

| | nil | < 1 hour | 1 - 2 hours | 3 - 7 hours | > 7 hours |
|---|---|---|---|---|---|
| | < = *less than* | | | > = *greater than* | |
| Searching, using and evaluating information from the Internet | | | | | |
| Communicating about it with friends (email, chat, etc) | | | | | |
| Word processing set assignments, essays, reports, or experiments | | | | | |
| Creative writing, drawing or designing homework tasks | | | | | |

## *Section 3: Computer use at School*

Question 9: How often in a typical week at School, do you spend time using computers for these activities?

| | Very Often | Often | Sometimes | Rarely | Nil |
|---|---|---|---|---|---|
| Searching for resources on the Library's catalogue | | | | | |
| Searching, researching or using information on the World Wide Web | | | | | |
| Searching, researching or using information on a CD-ROM | | | | | |
| Writing or word processing for assignments or projects | | | | | |
| Recording data on spreadsheets, eg graphs | | | | | |
| Designing presentations, eg slide shows | | | | | |
| Web publishing | | | | | |
| Design graphics | | | | | |
| Programming | | | | | |
| Making databases | | | | | |
| Accessing online courseware [software] or digital resources | | | | | |
| Accessing computer-based training or online courses | | | | | |
| Communicating with friends, eg by email | | | | | |
| Making or playing music | | | | | |
| Other? | | | | | |

**Question 10: When you are using a computer at School, how often are you**

| | Very Often | Often | Sometimes | Rarely |
|---|---|---|---|---|
| By yourself? | | | | |
| With a partner or small group? | | | | |
| With others in a large group? | | | | |
| With the whole class? | | | | |

**Question 11: The time you spend using computers at School is**

| | Very Often | Often | Sometimes | Rarely |
|---|---|---|---|---|
| In class time | | | | |
| In your own time [e.g., lunch-time, recess] | | | | |

**Question 12: If you spend lesson or class time using computers at School is it**

| | Very Often | Often | Sometimes | Rarely |
|---|---|---|---|---|
| A routine class period in a classroom or Lab? | | | | |
| An occasional class period in the Lab? | | | | |
| A regular private study period in a Lab? | | | | |
| A regular private study period in the Library? | | | | |

## *Section 4: Preferences for learning*

Question 13: Please indicate how much you agree with the following statements. (Tick one box per statement)

| | Strongly agree | Agree | Don't care | Disagree | Strongly disagree |
|---|---|---|---|---|---|
| It is very important to be able to use a computer well | | | | | |
| Playing or working on a computer is fun | | | | | |
| I am very uncomfortable using computers at School | | | | | |
| I forget time when I am working on a computer | | | | | |
| There are not enough computers for all students at School | | | | | |
| There are not enough other resources such as library books at School | | | | | |
| Computers do not help me learn | | | | | |
| I get enough access to computers at School | | | | | |
| I find online chat with friends about doing assignments helpful | | | | | |
| I interact with classmates more online than in class | | | | | |
| Email from teachers is not very useful for school work | | | | | |
| Online resources are hard to find | | | | | |
| I use more digital resources than physical library resources | | | | | |
| Given the choice, I would like more classes online | | | | | |
| My subjects do not have enough lessons online | | | | | |

## *Section 5: Computer skills and competencies*

*Tick one response [level] only and that which best describes what you can do at the present time*

**Question 14: In basic computer use, you can**

[ ] Level 1 - Not use the computer.
[ ] Level 2 - Log on and logoff a program on your own.
[ ] Level 3 - Open and use more than one program at the same time.
[ ] Level 4 - Learn new programs on your own.

**Question 15: In file management on a computer, you can**

[ ] Level 1 - Not save any documents that you created.
[ ] Level 2 - Select, open and save documents on different drives.
[ ] Level 3 - Create your own folders to keep files organized or back up your files.
[ ] Level 4 - Move files between folders and drives and back up copies of your files.

**Question 16: In word processing, you can**

[ ] Level 1 - Not use the word processor.
[ ] Level 2 - Use a word processor for basic writing tasks.
[ ] Level 3 - Use the tools of the word processor, such as spell checker and grammar check to edit your work.
[ ] Level 4 - Use the word processor to improve your previous drafts and publish a final document.

**Question 17: In using spreadsheet programs, you can**
[ ] Level 1 - Not use the spreadsheet.
[ ] Level 2 - Enter data in a spreadsheet and create charts.
[ ] Level 3 - Choose a chart which best reflects your data and apply title and labels.
[ ] Level 4 - Use formulas to help analyse data in a spreadsheet.

**Question 18: In using database programs, you can**
[ ] Level 1 - Not use the database.
[ ] Level 2 - Locate information from a pre-made database such as a Library search.
[ ] Level 3 - Create your own database and add or delete information.
[ ] Level 4 - Generate reports from a database in order to answer questions.

**Question 19: In using graphics software, you can**
[ ] Level 1 - Not use graphics with any word processing.
[ ] Level 2 - Create pictures with painting and drawing programs and use clip art
[ ] Level 3 - Edit, scan and import graphics from a variety of sources, using a graphic editor
[ ] Level 4 - Invent, create, select and use graphics in order to make an image or product.

**Question 20: In using email, you can**
[ ] Level 1 - Not use e-mail.
[ ] Level 2 - Compose and send e-mail messages.
[ ] Level 3 - Organize your mail folders to save messages and delete those no longer needed.
[ ] Level 4 - Use e-mail to request and send information for research.

**Question 21: In research and information searching, you can**
[ ] Level 1 - Not use electronic sources to find information.
[ ] Level 2 - Find information from electronic sources.
[ ] Level 3 - Select, gather, and save information from multiple electronic sources.
[ ] Level 4 - Select, analyse and evaluate the information via the Library's online catalogue or networked database resources.

**Question 22: In desktop publishing, you can**
[ ] Level 1 - Not use the publishing program
[ ] Level 2 - Use templates or wizards to create a published document
[ ] Level 3 - Create original publications from a blank page combining design elements such as columns, clip art, tables, word art, and captions,
[ ] Level 4 - Design original publications that communicate to others what you have learned.

**Question 23: In using presentation software programs, you can**
[ ] Level 1 - Not use a presentation
[ ] Level 2 - Use programs such as Powerpoint..
[ ] Level 3 - Incorporate other applications software such as wizards, templates, word processed text or spreadsheet files.
[ ] Level 4 - Design multim6dia presentations using audio, video and still graphics to share ideas.

**Question 24: In using video production equipment, you can**
[ ] Level 1 - Not use the video camera.
[ ] Level 2 - Create original videos for home or school projects.
[ ] Level 3 - Create original videos using editing equipment.
[ ] Level 4 - Use computer programs to edit video presentations.

**Question 25: When using the Internet, you can**

[ ] Level 1 - Not use the Internet.
[ ] Level 2 - Visit Internet sites and use navigation buttons to move between sites.
[ ] Level 3 - Use search engines efficiently to locate information.
[ ] Level 4 - Create your own HTML or web pages for classroom projects and home use

*Question 26: When using computers ethically, you*

[ ] Level 1 – Do not understand what 'acceptable' or responsible use means
[ ] Level 2 - Take care of the equipment and leave it ready for the next user
[ ] Level 3 - Have read and understood the Schools "Acceptable Use Policy'
[ ] Level 4 - Model responsible use, and try to show others

THANK YOU VERY MUCH FOR YOUR TIME

## Appendix III: Levels of Use (LoU) Teachers' questionnaire

# ICT in teaching practices and students' online learning

Thank you for agreeing to take part in this survey. The questionnaire has been made as short and as straightforward as possible. Throughout the survey, the term **ICT** refers to ***information and communications technology***. The term, ***online learning*** is used in its broadest sense of resource-based learning via the Internet or an Intranet, that is, computing and communications technologies.

Most of the questions require you to tick only an appropriate box or column from a list of available choices. Please complete all questions.

## *Section 1: Background information*

**Question 1: Which year groups do you teach this year?**

| | | | | | |
|---|---|---|---|---|---|
| Kinder ☐ | Prep ☐ | Year 1 ☐ | Year 2 ☐ | Year 3 ☐ | Year 4 ☐ |
| Year 5 ☐ | Year 6 ☐ | Year 7 ☐ | Year 8 ☐ | Year 9 ☐ | Year 10 ☐ |
| Year 11 ☐ | Year 12 ☐ | | | | |

**Question 2: Gender**

Male ☐ Female ☐

**Question 3: Age**

20 – 30 ☐
31 – 40 ☐
41 – 50 ☐
Over 50 ☐

**Question 4: Years of teaching experience**

Less than 1 ☐
1-5 years ☐
6-10 years ☐
11-15 years ☐
16-20 years ☐
Over 20 years ☐

**Question 5: At home, do you**

| | | | | |
|---|---|---|---|---|
| Have a computer? | Yes | ☐ | No | ☐ |
| Have an Internet connection? | Yes | ☐ | No | ☐ |
| Use the School email account? | Yes | ☐ | No | ☐ |
| Access the School's Intranet site? | Yes | ☐ | No | ☐ |

## *Section 2: Computer use in teaching*

Question 1: In a typical week at School, how often do you spend time using computers on these activities?

| | Very often | Often | Sometimes | Rarely/None |
|---|---|---|---|---|
| Searching for resources on the Library's catalogue | | | | |
| Searching, researching or using information on the World Wide Web | | | | |
| Searching, researching or using information on a CD-ROM | | | | |
| Writing or word processing assignments, reports, assessment sheets, letters or programs | | | | |
| Recording data on spreadsheets, eg graphs | | | | |
| Creating pictures, drawings, diagrams or maps | | | | |
| Designing presentations, eg slide shows | | | | |
| Web publishing | | | | |
| Design graphics | | | | |
| Programming | | | | |
| Making databases | | | | |
| Accessing online courseware [software] or digital resources | | | | |
| Accessing computer-based training or online courses | | | | |
| Sending or receiving email | | | | |
| Making or playing music | | | | |
| Other? (Please list) | | | | |

**Question 2: How often do you spend time using computers on School related work?**

| | Very Often | Often | Sometimes | Rarely/None |
|---|---|---|---|---|
| For teaching in class | | | | |
| In your own time [e.g., non-teaching periods, lunch-time, recess] | | | | |
| At home | | | | |

**Question 3: How often do you set these computer-based tasks for your classes?**

| | Very Often | Often | Sometimes | Rarely/None |
|---|---|---|---|---|
| Information skills using the WWW (selecting, evaluating, analysing, presenting, designing a brief, mind-mapping, a web-quest, etc) | | | | |
| Locating information from library catalogues | | | | |
| Logging and recording data, eg spread-sheeting | | | | |
| Creative thinking & graphic or audio design | | | | |
| Communicating with peers (email, chat, forums, bulletin boards, discussion lists, etc) | | | | |
| Using an instructional program, subject-based software, simulation | | | | |

| | Very Often | Often | Sometimes | Rarely/None |
|---|---|---|---|---|
| Using online resources or your worksheets from from the Intranet | | | | |
| Accessing your courses online | | | | |
| Taking tests or assessments online | | | | |
| Other? (please list) | | | | |

**Question 4: How <u>comfortable</u> are you using a computer to do the following tasks and how <u>important</u> are they for your teaching?**

| | Comfortable | Not comfortable | Important | Not important |
|---|---|---|---|---|
| Using the WWW for teaching higher order thinking skills | | | | |
| Using a spreadsheet to create an assessment sheet | | | | |
| Using a graphics program for manipulation of digital photographs | | | | |
| Using a database program for student reports | | | | |
| Sending or receiving email communications | | | | |
| Participating in online chat or forums | | | | |
| Using an instructional program, subject based software or simulation | | | | |
| Using word processors to create student resources or your worksheets from the Intranet | | | | |
| Using a presentation program, eg. Powerpoint in delivering a lesson or speech | | | | |
| Creating a website or set of web pages | | | | |
| Playing music | | | | |
| Other? (Please list) | | | | |

Question 5 : Based upon teaching practice in last two years, please indicate a response as 'yes' or 'no' (Tick one box per statement)

| | Yes | No |
|---|---|---|
| **Did your classes participate in virtual lessons or in an online course?** | | |
| Did you participate as a student or teacher in an online lesson or course, **in professional forums, online conferences, chats, etc?** | | |
| **Do you subscribe to online newsletters and discussion lists for your own professional learning?** | | |

Section 4: Concerns

**The purpose of these questions is to determine what people are concerned about when they are using, or thinking about using various programs, at various times during an innovation adoption process. The items were developed from typical responses of teachers, some of whom had no knowledge at all about the various programs to some who had years of experience in using them. Therefore, some of the questions may appear to be irrelevant to you at this time. Other items may represent your concerns.**

**Please respond to the items in terms of your present concerns or how you feel about your involvement with *online learning*.**

**Using the 0-7 point scale, please circle the point on the scale to show how close the item is to your thinking:**

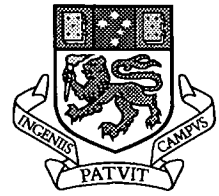
| Irrelevant | Not true of me now | Somewhat true of me now | Very true of me now |
|---|---|---|---|
| 0 | 1 2 3 4 | 5 6 | 7 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1. | I am concerned about students' attitudes to online learning. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 2 | I now know of some other approaches that may work better. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 3 | I don't even know what online learning is. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 4 | I am concerned about not having enough time to organised myself each day. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 5 | I would like to help other staff in their use of online learning. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 6 | I have a very limited knowledge about online learning. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 7 | I would like to know the effect of re-organisation on my professional status. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 8 | I am concerned about conflict between my interests and my responsibilities. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 9 | I am concerned about revising my use of the innovation. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 10 | I would like to develop working relationships with both our staff and outside staff using online learning | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 11 | I am concerned about how online learning affects students. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 12 | I am not concerned about online learning. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 13 | I would like to know who will make the decisions in the new system. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 14 | I would like to discuss the possibility of using online learning. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 15 | I would like to know what resources are available if we decide to adopt online learning. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 16 | I am concerned about my inability to manage all that online learning requires. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 17 | I would like to know how my teaching or administration is supposed to change. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 18 | I would like to familiarise other departments or staff with the progress of this new approach. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 19 | I am concerned about evaluating my impact on students. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 20 | I would like to revise the online learning instructional approach. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 21 | I am completely occupied with other things. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 22 | I would like to modify our use of online learning based on experiences of our students. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 23 | Although I don't know about online learning, I am concerned about things in the area. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 24 | I would like to excite my students about their part in this approach. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 25 | I am concerned about time spent working with non-academic problems related to online learning. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 26 | I would like to know what the use of online learning will require in the immediate future. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 27 | I would like to co-ordinate my effort with others to maximise the online learning effects. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 28 | I would like to have more information on the time and energy commitment required by online learning. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 29 | I would like to know what other staff are doing in this area. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 30 | At this time, I am not interested in learning about online learning. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 31 | I would like to determine how to supplement, enhance or replace online learning. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 32 | I would like to use feedback from students on how to change the program. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 33 | I would like to know how my role will change when I am using online learning. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 34 | Co-ordination of tasks and people is taking too much of my time. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 35 | I would like to know how online learning is better than what we have now. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

THANK YOU VERY MUCH FOR YOUR TIME

## Appendix IV: Teacher Interview Schedule

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9th March 2004

INTERVIEW SCHEDULE

Levels of Use of Online Learning

Effective Implementation: A Case Study
of the Introduction of ICT in One School

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1. Are you using online learning?

**If answer yes, go to question 2. If answer no, go to question 3**

2. What kinds of changes are you making in your use of online learning? *Go to question 5*

3. Have you decided to use it and a date to begin use?

*If answer, no go to question 4.*

4.. Are you currently looking for information about online learning?

5. Are you co-ordinating use of online learning with other users, including others not in your original group of users?

6. Are you planning on exploring making major modifications or replace the online learning

## Appendix V: Stages of Concern about the Innovation

**0 Awareness:**
Little concern or involvement with the innovation is indicated

**1 Informational:**
A general awareness of the innovation and interest in learning more detail about it is indicated. The person seems to be unworried about himself/herself in relation to the innovation. She/he is interested in substantive aspects of the innovation in a selfless manner such as general characteristics, effects, and requirements for use.

**2 Personal:**
Individual is uncertain about the demands of the innovation, his/her inadequacy to meet those demands, and his/her role with the innovation. This includes analysis of his/her role in relation to the reward structure of the organisation, decision making, and consideration of potential conflicts with existing structures or personal commitment. Financial or status implications of the program for self and colleagues may also be reflected.

**3 Management:**
Attention is focused on the processes and tasks of using the innovation and the best use of information and resources. Issues related to efficiency, organizing, managing, scheduling, and time demands are utmost.

**4 Consequence:**
Attention focuses on impact of the innovation on student in his/her immediate sphere of influence. The focus is on relevance of the innovation for students, evaluation of student outcomes, including performance and competencies, and changes needed to increase student outcomes.

**5 Collaboration:**
The focus is on coordination and cooperation with others regarding use of the innovation.

**6 Refocussing:**
The focus is on exploration of more universal benefits from the innovation, including the possibility of major changes or replacement with a more powerful alternative. Individual has definite ideas about alternatives to the proposed or existing form of the innovation.

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Hall, G. E., George, A. A. & Rutherford. W. L., (1977). *Measuring stages of concern about the innovation: a manual for the use of the SoC Questionnaire.* Austin, Texas: University of Texas Research and Development Center for Teacher Education.

Reproduced in Hall, G.E., & Hord, S. M (2001). *Implementing change: patterns, principles and potholes.* Boston, Massachusetts: Allyn and Bacon. P.63

# Appendix VI: Stages of Concern Questionnaire (SoCQ)

Name _____

Date Completed _____ _

It is very important for continuity in processing this data that we have a unique number that you can remember. Please use:

Last four digits of your Social Security No.

The purpose of this questionnaire is to determine what people who are using or thinking about using various programs are concerned about at various times during the innovation adoption process. The items were developed from typical responses of school and college teachers, who ranged from no knowledge at all about various programs to many years experience in using them. Therefore, *a good part of the items on this questionnaire may appear to be of little relevance or irrelevant to you at this time.* For the completely irrelevant items, please circle "0" on the scale. Other items will represent those concerns you *do* have, in varying degrees of intensity, and should be marked higher on the scale, according to the explanation at the top of each of the following pages.

For example:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| This statement is very true of me at this time. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| This statement is somewhat true of me now. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| This statement is not at all true of me at this time. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| This statement is irrelevant to me. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Please respond to the items in terms of *your present concerns,* or how you feel about your involvement or potential involvement with _____ . We do not hold to anyone definition of this program, so please think of it in terms of *your own perceptions* of what it involves. Since this questionnaire is used for a variety of innovations, the name _____ never appears. However, phrases such as "the innovation," "this approach," and "the new system" all refer to _____. Remember to respond to each item in terms of *your present concerns* about your involvement or potential involvement with ____

Thank you for taking time to complete this task.

## CONCERNS QUESTIONNAIRE

| | 0 Irrelevant | 1 Not true of me now | 2 | 3 Somewhat true of me now | 4 | 5 | 6 Very true of me now | 7 |
|---|---|---|---|---|---|---|---|---|

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 19. | I am concerned about evaluating my impact on students. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 20. | I would like to revise the innovation's instructional approach. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 21. | I am completely occupied with other things. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 22. | I would like to modify our use of the innovation based on the experience of our students. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 23. | Although I don't know about this innovation, I am concerned about things in the area. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 24. | I would like to excite my students about their part in this approach. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 25. | I am concerned about time spent working with nonacademic problems related in this innovation. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 26. | I would like to know what the use of the innovation will require in the immediate future. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 27. | I would like to coordinate my effort with others to maximize the innovation's effects. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 28. | I would like to have more information on time and energy commitments required by this innovation. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 29. | I would like to know what other faculty are doing in this area. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 30. | At this time, I am not interested in learning about this innovation. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 31. | I would like to determine how to supplement, enhance, or replace the innovation | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 32. | I would like to use feedback from students to change the program. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 33. | I would like to know how my role will change when I am using the innovation. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 34. | Coordination of tasks and people is taking too much of my time. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 35. | I would like to know how this innovation is better than what we have now. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

*PLEASE COMPLETE THE FOLLOWING:*

36. What other concerns, if any, do you have at this time? (Please describe them using complete sentences.)

37.Briefly describe your job function.

Reproduced from Hall, G.E., & Hord, S. M (2001). *Implementing change: patterns, principles and potholes.* Boston, Massachusetts: Allyn and Bacon. Pp. 229-232.

## Appendix VII: SoC questions grouped by Stages 0 – 6

### Stages of Concern Questionnaire questions grouped in their Stages 0 - 6

**Item Stage 0, Awareness**

3 I don't even know what the innovation is.
12 I am not concerned about this innovation.
21 I am completely occupied with other things.
23 Although I don't know about this innovation, I am concerned about things in the area.
30 At this time, I am not interested in learning about this innovation.

**Stage 1, Informational**

6 I have a very limited knowledge about the innovation.
14 I would like to discuss the possibility of using the innovation.
15 I would like to know what resources are available if we decide to adopt this innovation.
26 I would like to know what the use of the innovation will require in the immediate future.
35 I would like to know how this innovation is better that what we have now.

**Stage 2, Personal**

7 I would like to know the effect of reorganisation on my professional status.
13 I would like to know who will make the decisions in the new system.
17 I would like to know how my teaching or administration is supposed to change.
28 I would like to have more information on time and energy commitments required by this innovation.
33 I would like to know how my role will change when I am using the innovation.

**Stage 3, Management**

4 I am concerned about not having enough time to organize myself each day.
8 I am concerned about conflict between my interests and my responsibilities.
16 I am concerned about my inability to manage all the innovation requires.
25 I am concerned about the time spent working with nonacademic problems related to this innovation.
34 Coordination of tasks and people is taking too much of my time.

**Stage 4, Consequence**

1 I am concerned about students attitudes toward this innovation.
11 I am concerned about the innovation affects students.
19 I am concerned about evaluating my impact on students.
24 I would like to excite my students about their part in this approach.
32 I would like to use feedback from students to change the program.

**Stage 5, Collaboration**

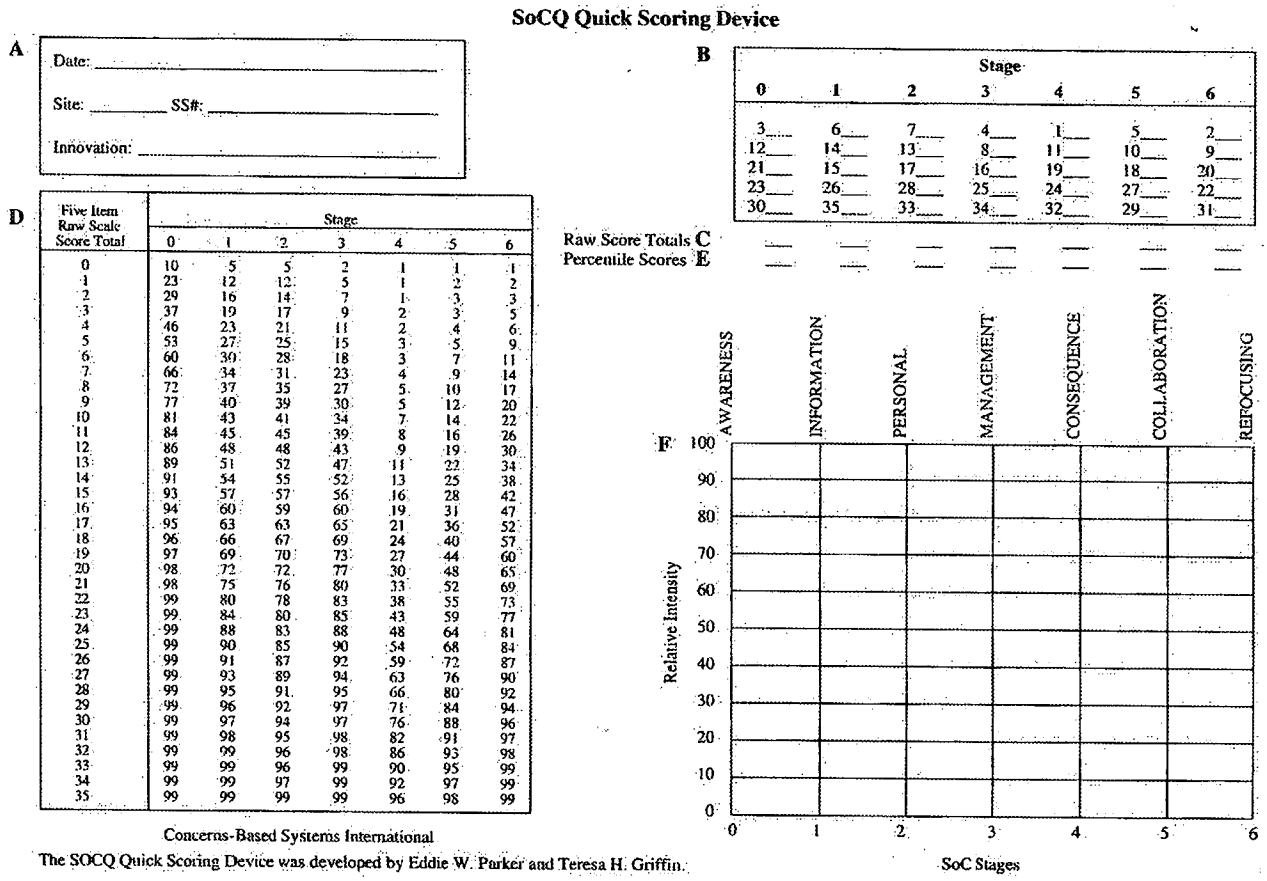
5 I would like to help other faculty in their use of this innovation.
10 I would like to develop working relationships with our faculty and outside faculty using this innovation.
18 I would like to familiarize other departments or persons with the progress of this new approach.
27 I would like to coordinate my efforts with others to maximize the innovation's effects.
29 I would like to know what other faculty are doing in this area.

**Stage 6, Refocusing**

2 I now know of some other approaches that might work better.
9 I am concerned about revising my use of the innovation.
20 I would like to revise the innovation's instructional approach.
22 I would like to modify our use of the innovation based on the experience of our students.
31 I would like to determine how to supplement, enhance, or replace the innovation.

(Hall, George, and Rutherford, 1986, p. 25)

# Appendix VIII: SoCQ Quick Scoring Device



**SoCQ Quick Scoring Device**

A

Date: _____

Site: _____ SS#: _____

Innovation: _____

B

| Stage 0 | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| 3___ | 6___ | 7___ | 4___ | 1___ | 5___ | 2___ |
| 12___ | 14___ | 13___ | 8___ | 11___ | 10___ | 9___ |
| 21___ | 15___ | 17___ | 16___ | 19___ | 18___ | 20___ |
| 23___ | 26___ | 28___ | 25___ | 24___ | 27___ | 22___ |
| 30___ | 35___ | 33___ | 34___ | 32___ | 29___ | 31___ |

Raw Score Totals C ___ ___ ___ ___ ___ ___ ___

Percentile Scores E ___ ___ ___ ___ ___ ___ ___

D

| Five Item Raw Scale Score Total | Stage 0 | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| 0 | 10 | 5 | 5 | 2 | 1 | 1 | 1 |
| 1 | 23 | 12 | 12 | 5 | 1 | 2 | 2 |
| 2 | 29 | 16 | 14 | 7 | 1 | 3 | 3 |
| 3 | 37 | 19 | 17 | 9 | 2 | 3 | 5 |
| 4 | 46 | 23 | 21 | 11 | 2 | 4 | 6 |
| 5 | 53 | 27 | 25 | 15 | 3 | 5 | 9 |
| 6 | 60 | 30 | 28 | 18 | 3 | 7 | 11 |
| 7 | 66 | 34 | 31 | 23 | 4 | 9 | 14 |
| 8 | 72 | 37 | 35 | 27 | 5 | 10 | 17 |
| 9 | 77 | 40 | 39 | 30 | 5 | 12 | 20 |
| 10 | 81 | 43 | 41 | 34 | 7 | 14 | 22 |
| 11 | 84 | 45 | 45 | 39 | 8 | 16 | 26 |
| 12 | 86 | 48 | 48 | 43 | 9 | 19 | 30 |
| 13 | 89 | 51 | 52 | 47 | 11 | 22 | 34 |
| 14 | 91 | 54 | 55 | 52 | 13 | 25 | 38 |
| 15 | 93 | 57 | 57 | 56 | 16 | 28 | 42 |
| 16 | 94 | 60 | 59 | 60 | 19 | 31 | 47 |
| 17 | 95 | 63 | 63 | 65 | 21 | 36 | 52 |
| 18 | 96 | 66 | 67 | 69 | 24 | 40 | 57 |
| 19 | 97 | 69 | 70 | 73 | 27 | 44 | 60 |
| 20 | 98 | 72 | 72 | 77 | 30 | 48 | 65 |
| 21 | 98 | 75 | 76 | 80 | 33 | 52 | 69 |
| 22 | 99 | 80 | 78 | 83 | 38 | 55 | 73 |
| 23 | 99 | 84 | 80 | 85 | 43 | 59 | 77 |
| 24 | 99 | 88 | 83 | 88 | 48 | 64 | 81 |
| 25 | 99 | 90 | 85 | 90 | 54 | 68 | 84 |
| 26 | 99 | 91 | 87 | 92 | 59 | 72 | 87 |
| 27 | 99 | 93 | 89 | 94 | 63 | 76 | 90 |
| 28 | 99 | 95 | 91 | 95 | 66 | 80 | 92 |
| 29 | 99 | 96 | 92 | 97 | 71 | 84 | 94 |
| 30 | 99 | 97 | 94 | 97 | 76 | 88 | 96 |
| 31 | 99 | 98 | 95 | 98 | 82 | 91 | 97 |
| 32 | 99 | 99 | 96 | 98 | 86 | 93 | 98 |
| 33 | 99 | 99 | 96 | 99 | 90 | 95 | 99 |
| 34 | 99 | 99 | 97 | 99 | 92 | 97 | 99 |
| 35 | 99 | 99 | 99 | 99 | 96 | 98 | 99 |

F



Concerns-Based Systems International

The SOCQ Quick Scoring Device was developed by Eddie W. Parker and Teresa H. Griffin.

Scanned image of CBAM SoC quick scoring instrument for calculating percentile scores (see table in Appendix IX) reproduced from Hall, G.E., & Hord, S. M (2001). *Implementing change: patterns, principles and potholes.* Boston, Massachusetts: Allyn and Bacon. P. 234.

## Appendix IX: Teachers' percentile scores for the SoCQ

### SoCQ Raw and Percentile Scores for Highest Stages 0-6 (N=61)

| | Raw Scores | | | | | | | Percentile Scores | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Teacher No. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | 23 | 28 | 21 | 24 | 19 | 17 | 22 | 99 | 95 | 76 | 88 | 27 | 36 | 73 |
| 2 | 7 | 9 | 9 | 13 | 14 | 7 | 14 | 66 | 40 | 39 | 45 | 13 | 9 | 38 |
| 3 | 9 | 24 | 17 | 26 | 6 | 12 | 14 | 77 | 88 | 63 | 92 | 3 | 19 | 38 |
| 4 | 11 | 20 | 23 | 18 | 19 | 19 | 15 | 84 | 72 | 80 | 69 | 27 | 44 | 62 |
| 5 | 8 | 29 | 19 | 1 | 15 | 32 | 13 | 72 | 96 | 70 | 5 | 16 | 93 | 34 |
| 6 | 16 | 24 | 25 | 21 | 15 | 15 | 19 | 94 | 88 | 83 | 80 | 16 | 28 | 60 |
| 7 | 10 | 8 | 14 | 10 | 29 | 34 | 20 | 81 | 37 | 55 | 34 | 71 | 97 | 65 |
| 8 | 10 | 25 | 29 | 19 | 18 | 17 | 12 | 81 | 90 | 92 | 73 | 24 | 36 | 30 |
| 9 | 8 | 19 | 9 | 13 | 16 | 14 | 28 | 72 | 69 | 39 | 45 | 19 | 25 | 92 |
| 10 | 17 | 25 | 35 | 27 | 31 | 30 | 28 | 95 | 90 | 99 | 94 | 82 | 88 | 92 |
| 11 | 8 | 33 | 35 | 27 | 30 | 32 | 22 | 72 | 99 | 99 | 94 | 76 | 93 | 73 |
| 12 | 6 | 32 | 35 | 17 | 26 | 35 | 20 | 60 | 99 | 99 | 65 | 99 | 98 | 65 |
| 13 | 21 | 18 | 17 | 12 | 11 | 9 | 12 | 98 | 66 | 63 | 43 | 8 | 12 | 30 |
| 14 | 11 | 16 | 20 | 11 | 17 | 17 | 12 | 84 | 60 | 72 | 39 | 21 | 36 | 30 |
| 15 | 5 | 22 | 17 | 7 | 16 | 21 | 18 | 53 | 80 | 63 | 23 | 19 | 52 | 57 |
| 16 | 7 | 27 | 19 | 21 | 27 | 23 | 13 | 66 | 93 | 70 | 80 | 63 | 59 | 34 |
| 17 | 20 | 14 | 0 | 1 | 8 | 4 | 2 | 98 | 54 | 5 | 5 | 5 | 4 | 2 |
| 18 | 10 | 16 | 9 | 13 | 16 | 7 | 18 | 81 | 60 | 39 | 45 | 19 | 9 | 57 |
| 19 | 14 | 20 | 15 | 12 | 18 | 18 | 14 | 91 | 72 | 57 | 43 | 24 | 40 | 38 |
| 20 | 7 | 14 | 5 | 11 | 20 | 17 | 16 | 66 | 54 | 25 | 39 | 30 | 36 | 47 |
| 21 | 8 | 22 | 18 | 12 | 20 | 19 | 19 | 72 | 80 | 63 | 43 | 30 | 44 | 60 |
| 22 | 13 | 22 | 20 | 11 | 20 | 16 | 14 | 89 | 80 | 72 | 39 | 30 | 31 | 38 |
| 23 | 18 | 23 | 26 | 16 | 18 | 9 | 17 | 96 | 84 | 87 | 60 | 24 | 12 | 52 |
| 24 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 5 | 5 | 2 | 1 | 1 | 1 |
| 25 | 21 | 25 | 23 | 25 | 22 | 18 | 20 | 98 | 90 | 80 | 90 | 38 | 40 | 65 |
| 26 | 10 | 15 | 5 | 17 | 10 | 12 | 9 | 81 | 57 | 25 | 65 | 7 | 19 | 20 |
| 27 | 9 | 16 | 11 | 9 | 8 | 9 | 10 | 77 | 60 | 45 | 30 | 5 | 12 | 65 |
| 28 | 6 | 30 | 35 | 19 | 35 | 35 | 25 | 60 | 97 | 99 | 73 | 96 | 98 | 84 |
| 29 | 27 | 20 | 27 | 25 | 19 | 12 | 18 | 99 | 72 | 89 | 90 | 27 | 19 | 57 |
| 30 | 18 | 25 | 26 | 16 | 17 | 24 | 13 | 96 | 90 | 87 | 68 | 21 | 64 | 34 |
| 31 | 12 | 28 | 23 | 15 | 21 | 27 | 20 | 86 | 95 | 80 | 56 | 33 | 76 | 65 |
| 32 | 11 | 21 | 11 | 15 | 27 | 15 | 17 | 66 | 96 | 55 | 27 | 27 | 22 | 81 |
| 33 | 2 | 22 | 8 | 14 | 28 | 31 | 19 | 29 | 80 | 35 | 52 | 66 | 91 | 60 |
| 34 | 4 | 25 | 18 | 23 | 30 | 23 | 21 | 46 | 90 | 67 | 85 | 76 | 59 | 69 |
| 35 | 19 | 26 | 19 | 18 | 11 | 11 | 8 | 97 | 91 | 70 | 69 | 8 | 16 | 17 |
| 36 | 13 | 29 | 28 | 16 | 24 | 26 | 25 | 89 | 96 | 91 | 60 | 48 | 72 | 84 |
| 37 | 13 | 29 | 20 | 10 | 8 | 18 | 7 | 89 | 96 | 72 | 34 | 5 | 40 | 14 |
| 38 | 11 | 20 | 17 | 15 | 26 | 28 | 17 | 84 | 72 | 63 | 56 | 59 | 80 | 32 |
| 39 | 10 | 25 | 21 | 24 | 21 | 17 | 20 | 81 | 90 | 76 | 88 | 33 | 36 | 65 |
| 40 | 7 | 29 | 14 | 8 | 19 | 13 | 24 | 66 | 96 | 55 | 27 | 27 | 22 | 81 |
| 41 | 7 | 29 | 14 | 8 | 19 | 13 | 24 | 10 | 19 | 39 | 52 | 76 | 68 | 52 |
| 42 | 0 | 3 | 9 | 14 | 30 | 25 | 17 | 84 | 75 | 45 | 56 | 63 | 28 | 52 |
| 43 | 11 | 27 | 28 | 20 | 25 | 25 | 24 | 84 | 93 | 91 | 77 | 54 | 68 | 81 |
| 44 | 11 | 24 | 24 | 18 | 18 | 21 | 22 | 84 | 88 | 83 | 69 | 24 | 52 | 65 |
| 45 | 16 | 15 | 22 | 26 | 22 | 24 | 25 | 94 | 57 | 76 | 92 | 38 | 64 | 84 |

| Teacher No. | 0 | 1 | 2 | 3 | 4 | 5 | 6 | *0* | *1* | *2* | *3* | *4* | *5* | *6* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **46** | 9 | 21 | 15 | 27 | 17 | 16 | 16 | *77* | *75* | *57* | ***94*** | *21* | *31* | *47* |
| **47** | 10 | 20 | 32 | 24 | 29 | 23 | 29 | *81* | *72* | ***96*** | *88* | *71* | *59* | ***94*** |
| **48** | 6 | 23 | 24 | 19 | 15 | 16 | 16 | *60* | ***84*** | *83* | *73* | *16* | *31* | *47* |
| **49** | 17 | 16 | 4 | 13 | 12 | 6 | 16 | ***95*** | *60* | *21* | *45* | *9* | *7* | *47* |
| **50** | 9 | 22 | 5 | 8 | 18 | 21 | 18 | *77* | *80* | *25* | *27* | *24* | *52* | *57* |
| **51** | 9 | 21 | 15 | 10 | 18 | 16 | 9 | *77* | *75* | *57* | *34* | *24* | *31* | *20* |
| **52** | 23 | 15 | 13 | 15 | 8 | 6 | 13 | ***99*** | *57* | *52* | *56* | *5* | *7* | *34* |
| **53** | 18 | 30 | 17 | 20 | 20 | 14 | 23 | ***96*** | ***99*** | *63* | *77* | *30* | *23* | *77* |
| **54** | 15 | 20 | 23 | 14 | 21 | 26 | 19 | ***93*** | *72* | *80* | *52* | *33* | *72* | *80* |
| **55** | 15 | 15 | 17 | 16 | 13 | 10 | 14 | ***93*** | *57* | *63* | *60* | *11* | *14* | *38* |
| **56** | 18 | 18 | 17 | 9 | 13 | 11 | 11 | ***96*** | *66* | *63* | *30* | *11* | *16* | *26* |
| **57** | 23 | 28 | 21 | 24 | 19 | 17 | 22 | ***99*** | ***95*** | *76* | *88* | *27* | *36* | *73* |
| **58** | 19 | 26 | 19 | 18 | 11 | 11 | 8 | ***97*** | ***91*** | *70* | *68* | *8* | *16* | *17* |
| **59** | 10 | 25 | 21 | 24 | 21 | 17 | 20 | *81* | ***90*** | *76* | *88* | *33* | *36* | *65* |
| **60** | 4 | 25 | 18 | 23 | 30 | 23 | 21 | *46* | ***90*** | *61* | *85* | *76* | *59* | *69* |
| **61** | 13 | 29 | 28 | 16 | 24 | 26 | 25 | ***89*** | ***96*** | *91* | *60* | *48* | *68* | *81* |
| **Total raw scores** | **723** | **1327** | **1129** | **978** | **1158** | **1110** | **1047** | | | | | | | |
| **Means** | **12** | **21** | **19** | **16** | **19** | **18** | **17** | | | | | | | |
| **Percentile scores** | **86** | **75** | **70** | **60** | **27** | **40** | **52** | | | | | | | |

## Appendix X: Format for the LoU Branching Interview

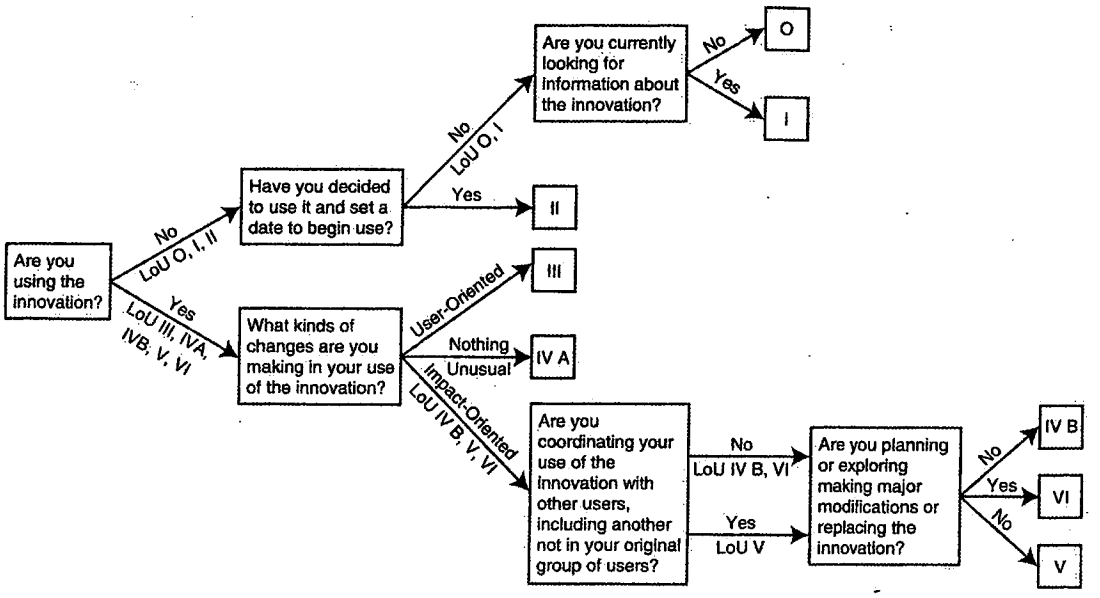


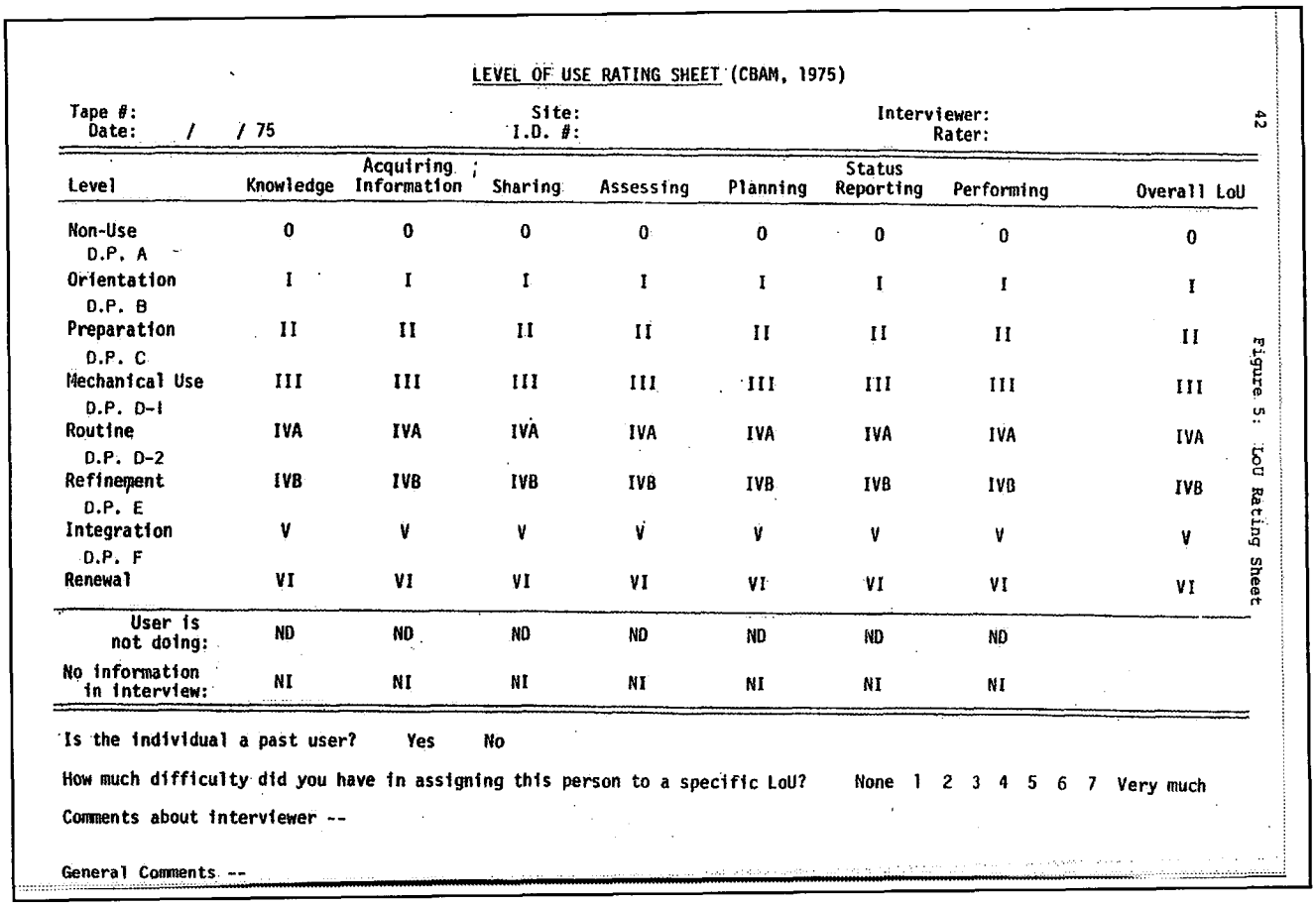

FIGURE 5.3 Format for the LoU Branching Interview

From *Measuring Levels of Use of the Innovation: A Manual for Trainers, Interviewers, and Raters* (p. 22) by S. F. Loucks, B. W. Newlove, and G. E. Hall, 1975: Austin: The University of Texas at Austin, Research and Development Center for Teacher Education.



Hall, G.E., & Hord, S. M (2001). *Implementing change: patterns, principles and potholes*. Boston, Massachusetts: Allyn and Bacon, p. 89.

## Appendix XI: LoU Rating Sheet



LEVEL OF USE RATING SHEET (CBAM, 1975)

Tape #: Site: Interviewer:
Date: / / 75 I.D. #: Rater:

| Level | Knowledge | Acquiring Information | Sharing | Assessing | Planning | Status Reporting | Performing | Overall LoU |
|---|---|---|---|---|---|---|---|---|
| Non-Use D.P. A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Orientation D.P. B | I | I | I | I | I | I | I | I |
| Preparation D.P. C | II | II | II | II | II | II | II | II |
| Mechanical Use D.P. D-1 | III | III | III | III | III | III | III | III |
| Routine D.P. D-2 | IVA | IVA | IVA | IVA | IVA | IVA | IVA | IVA |
| Refinement D.P. E | IVB | IVB | IVB | IVB | IVB | IVB | IVB | IVB |
| Integration D.P. F | V | V | V | V | V | V | V | V |
| Renewal | VI | VI | VI | VI | VI | VI | VI | VI |
| User is not doing: | ND | ND | ND | ND | ND | ND | ND | |
| No information in interview: | NI | NI | NI | NI | NI | NI | NI | |

Is the individual a past user? Yes No

How much difficulty did you have in assigning this person to a specific LoU? None 1 2 3 4 5 6 7 Very much

Comments about interviewer --

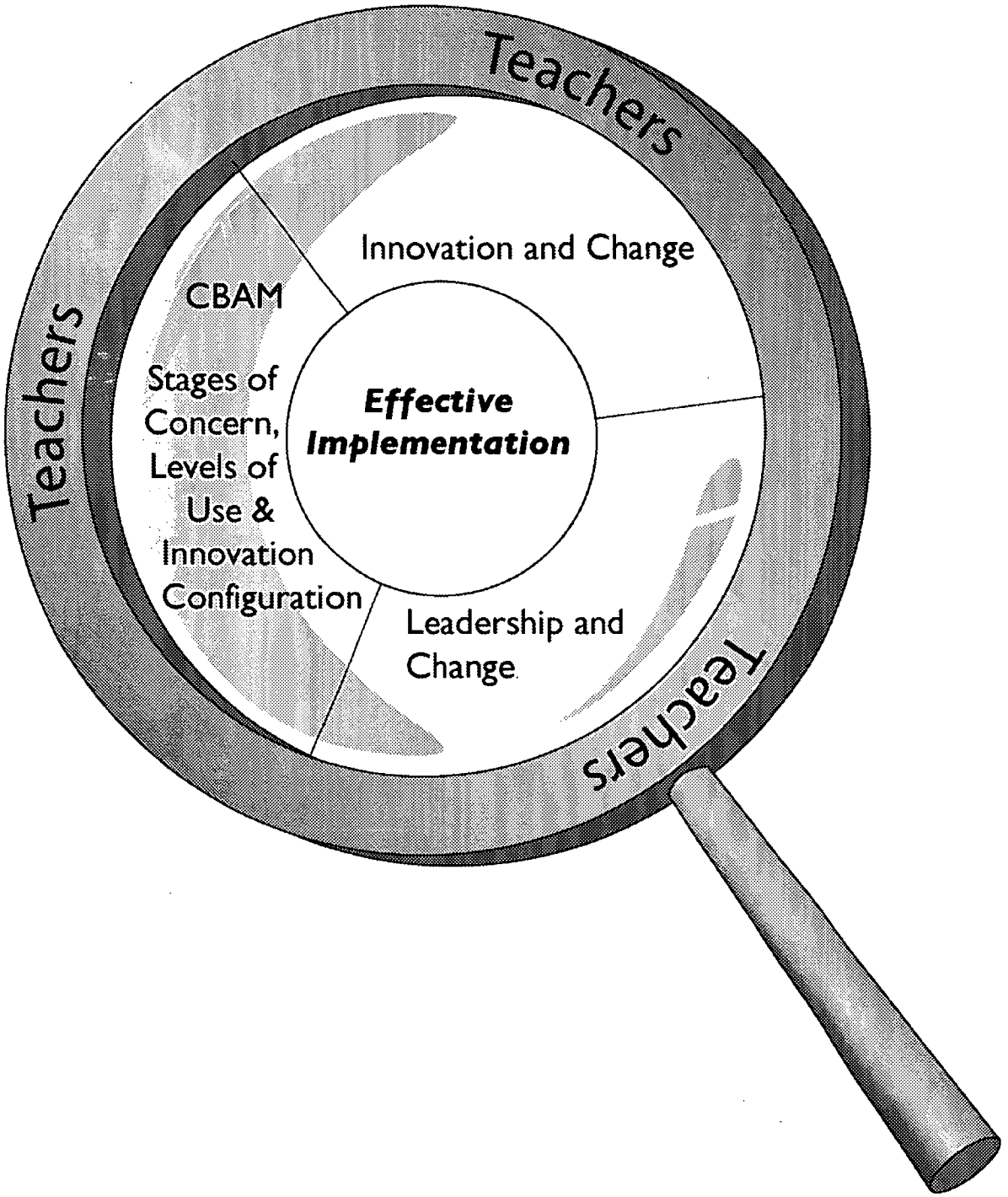
General Comments --

42

Figure 5: LoU Rating Sheet

Reproduced from Loucks, S. F., Newlove, B. W., & Hall, G. E., (1988). *Measuring levels of use of the innovation: a manual for trainers, interviewers and raters.* Austin, Texas: Southwest Educational Development Laboratory, p.42

**Appendix XII: Conceptual Framework**




*[Graphic created by Mik O"Leary, Hobart, January, 2006]*