Perceptions of E-Learning within Primary Education in Tasmania with regards to future design, direction and policies

By

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Statement

This thesis contains no material which has been accepted for the award of any other degree or diploma in any tertiary institution, and to my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made in the text of the thesis.

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Douglas Colbeck

November 2003

Abstract

"Technology asks only one thing of you: to believe. Believe that it will make the complex simple, the crooked road straight; miraculously transform information into wisdom and easy access into goodness. Believe that the past is marginally relevant, the present fleeting, and the future alone worthy of reverence."

Francis E. Kazemak, St. Cloud State University (Kazemak, 1996).

In - (Healy, 1998)

The purpose of this study was to gain insight into the perceptions of E-learning held by Primary School teachers in Tasmania. It is also a secondary aim of this research to examine any currently available research on E-learning so that matters of public policy relating to primary education may also be better informed.

This research attempts to provide innovative insight into some of the issues currently in focus within the Tasmanian Education Department. Some of the issues addressed during this research were: -

- What are the findings of the research on the effectiveness of E-learning?
- Are they valid interpretations?
- Are there any gaps in the research that require further investigation and information?
- What does the literature as well as the findings of this research suggest for the future?
- In what context can E-learning work?
- For what use is e-learning most appropriate?
- Will E-learning replace traditional leaning approaches?
- How can E-learning be designed to be effective?

These questions are becoming increasingly important as pressure (or hype?) grows, both from within the Tasmanian Education Department as well as public pressure applied through government taxpayer funded policies, to use more and more technology as a primary method for delivering education to our children.

As bandwidth and transmission speeds increase and compression technologies become more sophisticated, new opportunities are emerging for the convergence of existing and new media in the learning environment. Digital technologies are the catalyst and the means for enormous changes in the way in which learning and teaching are conducted. They affect the knowledge, the information sources, and the interactions that underpin learning and teaching. They are reshaping the time, place, and pace of education. They have the potential to increase the accessibility of education to huge numbers of people.

What will this new E-learning environment in the information society look like? Will it be characterized by diversity, complexity, and flexibility? Lifelong learning is rapidly becoming a reality rather than an aspiration. The old distinctions between distance education and classroom teaching are rapidly fading, in order to create more flexible teaching and learning arrangements that move the focus from teaching to flexible learning.

Flexible learning aims to develop students' capabilities as information-literate lifelong learners, as well as their knowledge and skills in a variety of subject areas. It uses a rich array of resource-based learning techniques and project-based pedagogy to respond flexibly, in a multi-media environment, to the increasingly diverse backgrounds and motivations that learners bring to their study.

A wide variety of reports and research indicate that flexible E-learning is now a worldwide phenomenon, with long-term implications for all types of educational institutions. Traditional school-based approaches to teaching, on their own, cannot hope to meet such a demand. Alternatives based on digital technologies are essential, not optional. In this new E-learning environment, knowledge becomes a modularised product, giving learners unprecedented control over the content, place, time, and pace of their learning (Barker and Wendel, 2001).

The innovative insight offered by this somewhat voyeuristic presentation, based on real concerns of directly involved participants, will benefit decision-making processes of those who develop, create and disseminate education-based information, as well as adding reassurance to all those caught up in the hi-tech maelstrom of this new technology – that they are not alone.

Acknowledgments

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Finally I dedicate this work to the memory of my late father, who I felt was always somewhere close by, watching, encouraging, wondering what the hell I was doing, and why - but still lending a hand in his own enigmatic way. I wish you were here to share this moment with me.

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Chapter 1: Thesis Introduction

This chapter introduces the drive and purpose of this study. Discussion as to why this research is warranted, by means of association of the benefits it explores, combined with an outline of this thesis - is also provided for the benefit of the reader.

1.1 Chapter Introduction

The purpose of this study was to entice, whilst trying to understand, the perceptions surrounding the modern E-learning phenomenon in the school environment from the perspective of those individuals actually at the proverbial coalface – the teachers.

1.2 Reasons behind the research

The compelling force behind this study was the intervention and interaction within my own children's primary schooling education that was prompting - almost forcing – new ways of approaching information transfer between sentient beings. Why do some teachers embrace computerised partnerships within their educational domain? – The classroom. Whilst others see the intrusion as sometimes obnoxious, bordering on downright offensive, to the current methods they successfully employ and utilize.

There is no doubt – reading the copious quantities of freely available literature available from all levels within the Education Department that there is a major push ensuring ever rising quantities of computer hardware appear in Tasmanian schools. This then forced me to consider – "*What is this E-learning program? Is it all just hype? Can it work? What is the best form or configuration to facilitate accurate information transfer?"*

1.2.1 Research Questions

Primary: How is a process involving theory-based formative evaluation perceived and utilised by primary education pedagogues?

Secondary: Does the current design of E-learning processes ensure generation and dissemination of information whilst providing effective knowledge transfer to learners in today's constantly changing educational environment?

A subset of questions to assist in determining a response is:

- In what context can E-learning work?
- For what use is e-learning most appropriate?
- Will E-learning replace traditional learning approaches?
- How can E-learning be designed to be effective?

1.3 Why explore the phenomenon of E-learning?

Students are different in many fundamental ways. They have different motives, they come from different backgrounds, both socially and culturally, and they all understand, think, perceive, conceptualise and comprehend differently. Attention makes us receptive to information, which we process together with prior knowledge, until we arrive at conclusions and understanding, which we then apply and test for confirmation (Education-Department, 2002).

Since most groups of students have a variety of learning styles, the information needs to be presented in a variety of ways. The use of written words, visuals, audio, live action and practice. There needs to be a mixture within every session. If that were not the case, if everyone learned the same way, we could just give everyone a book and be done with it (Davis and Keyser, 2003).

Students compare new information with their previous knowledge and experience. Teachers need to give students the chance to reflect, question, and compare. An experienced teacher builds this step into the learning program, because the learners are going to do it anyway. It also makes sense that an experienced teacher will allow students to discuss their thoughts in an open and supportive way (Education-Department, 2002, Davis and Keyser, 2003).

It is the student's job to draw conclusions for themselves about how the teaching will be used. Students have their own unique perspective, experience, and learning style, and that will affect how they finally understand the teaching material. The teacher's job is help the students move through the material in an orderly and effective way, giving them time to practice new skills, and draw their own conclusions. After school is over, with no teacher looking over their shoulder, they will experiment, test, and ultimately accept or reject what was taught to them. There is nothing the teacher can

do to stop them (Education-Department, 2002). All these points and more are taken for granted in today's still very formal classroom environment within Primary School classes across Tasmania.

The conveyance of emotions, passion and other human traits when communicating with other people is also an emergent problem with all forms of educating. Methods of information presentation to students during participation in E-learning that convey subliminal messages or emotions are a growing area of concern. How can it be done effectively? How can emotions be expressed through an inanimate machine to a human subject? (Davis and Keyser, 2003)

The learning processes worldwide are changing in an attempt to meet the new requirements of the Technical Society in which we now find our selves. How can we best meet, cope and advance in this new technical revolution. Pedagogical design of Information Communication Technology (ICT) integration and online learning is fast becoming a major sphere of research worldwide. Canada in particular has promoted and produced many studies into the full impact of "just in time" teaching methods. Canada also has several examples of up and running totally virtual classrooms and indeed totally virtual schools (Barker and Wendel, 2001).

1.3.1 Research Justification

The research will explore the perceptions that surround the onset of E-learning and their potential adoption by primary class students. This research will be significant in that it will give insight into directions that may be taken on board by future planning committees of the target audience, the Tasmanian Education Department, for instigation into process design, concept developments, or even in consideration for future design and ethics promulgations.

Both commercial and government education providers will benefit from any emergent themes or theories this research may uncover, as due to the speed of introduction of new technology, little is being done to investigate or understand the impact or effect of E-learning on the final end-users (the students) let alone the people required to promulgate new electronic learning techniques. This research is a small attempt at redressing this balance.

1.4 Chapter Summary

This chapter serves as an insight into what this research is about and why it needed to be conducted. The physical layout of this research is described in detail below.

1.4.1 Thesis outline

Chapter one outlines the purpose, drive and aims of this study by providing justification and insight into this research project.

Chapter two reviews the literature surrounding the topic of E-learning, in particular, the perceptions held by other teachers and academics within a primary school environment.

Chapter three details the research methodology as well as the approaches used by the researcher. The research was carried out with the use of nine (9) in depth interviews from selected research participants currently employed by the Tasmanian Education Department.

The selected participants were targeted from a diverse range of teaching experience backgrounds. This stance added vital input from the experienced and perhaps technically resistant educator through to the young inexperienced but technically proficient educator. Participants were made available from different managerial levels within the school environment: that is from principal to newly admitted junior level (first year) teachers.

The information gleaned from those interviews was transcribed, and the qualitative case study was allowed to develop, resulting in expanded emergent themes that were presented within the raw data. The data was then further analysed with a view to gaining insight and depth of meaning relevant to original emergent themes in an effort to analyse in detail the perceptions from the participants. All participants approached to assist in this research were informed that it was to be on a voluntary basis.

Further study should be conducted to compare the findings of this research, by selecting target participants from other Tasmanian or even Australian regional schools to add a more broad-spectrum and encompassing assemblage of findings to further validate this research's results.

Chapter 4 presents a profile of the participants interviewed to provide general background information, which may assist in understanding the discussion surrounding the core categories and sub-themes that surfaced from the data analysis process. The data analysis from the three stage coding process revealed that there were three core categories. These were as follows:

- Educator Motivation
- Time Considerations
- Educational Focus

Within these categories were sub-themes that captured the thoughts, emotions, and fears contained within incidents experienced by the participants, which go toward fully explaining their current perceptions of E-learning. The relationship between the emergent categories and prevalent sub-themes will also be described.

Chapter 5 discusses the main findings derived from the data analysis process. Discussed also are the findings which relate to the three core categories, with the aim of comparing and contrasting these findings against current literature. In doing so, the findings within this study may assist in extending the current body of knowledge regarding the perceptions of E-learning. Finally the study's main limitations are also discussed.

Chapter 6, whilst not presenting any practical suggestions for educators, provides implications for future study, as well as some reflective considerations on the subject of the pedagogic task and presents further areas for reflective consideration with the thought to expand this initial study onto a higher plane of research development.

Chapter 2: Literature Review of Related Areas

"The key question is not – What is the role of Information Technology in schools? – But rather – What is the role of schools in the age of information technologies?"

- Phillip J. Bossert, Project Director, Hawaii Education and Research Network.

2.1 Chapter Introduction

The scope of this review is limited to written and electronic material published or presented during the time period of 1977-2003, with particular attention being focused on those types of technologies currently being used by the majority of both Australian and international educational facilities.

The amount of written material devoted to E-learning is quite extensive, and includes policy papers, "how to' articles, and essays, as well as a limited though not insignificant body of original research.

For years academics have researched questions about the comparative merit of differing instructional methods. Most of these studies occur among students of education institutions and are particularly relevant to knowledge and its effective transfer within an academic environment.

2.2 Learning and the Education System

Before exploring the world of computer enhanced learning, it is necessary to first discuss and be familiar with the concept of learning per se. Over the centuries there have been many models proposed for how humans learn, the following dialogue discusses some of the concepts concerning how in fact learners – learn.

2.2.1 Traditional concepts of learning

Beliefs about how learning takes place are often articulated as metaphors. The 'tabula rasa', the image of the human mind as a blank slate to be written upon, was once the most common metaphor; this theory of learning also has been characterised as "the bucket theory of the mind" (Buchman, 1982), in which the brain is viewed as an empty vessel into which knowledge is poured.

(Shapiro, 1994) notes that "despite the fact that the 'blank slate' view of the learner is not well regarded, it is still the view underlying the practice seen most often in school settings".

Another common image is that of the learner as sponge, "soaking up" knowledge. A role that is somewhat more active than that of empty vessel, although what the learner absorbs is taken in wholesale, without filtering or processing, A metaphor often used in this era of technology is that of the brain as a computer, which processes in an orderly, systematic fashion the information that is received from outside sources. In this analogy the learner actively does something to or with the information, which can be presumed to be altered in appearance, if not in substance, from the form in which it was originally received (Carr and Kemmis, 1986).

2.2.2 The Learning Process

The learning process shown here (Figure 1: The Learning Process), outlines the tasks involved in the normal teaching and learning process. This process assumes a highly collaborative working relationship between both the teacher and the learner (Webb, 2003).

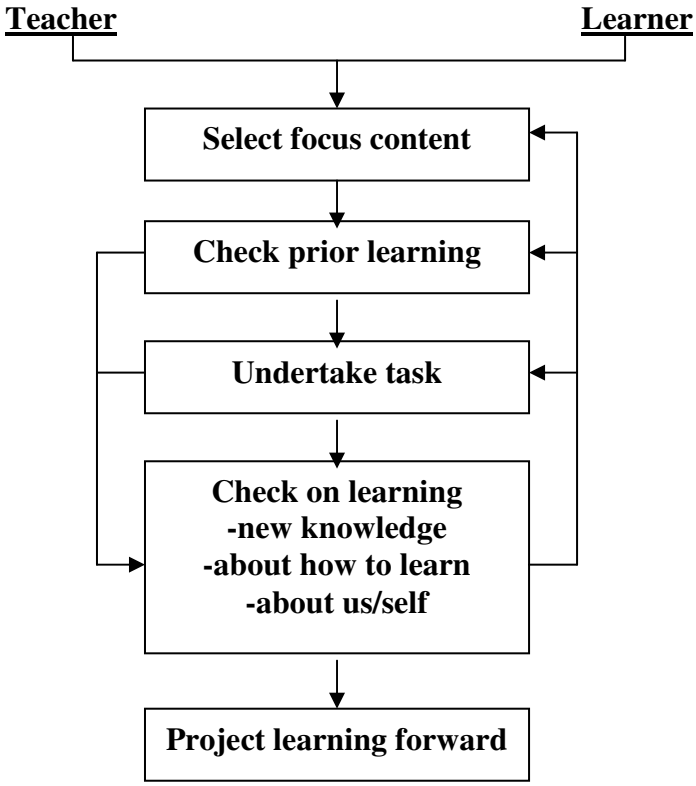

Figure 1: The Learning Process

In the sense that it is used here, the word 'learning' refers to: -

a. The process of learning as used by the learner, and

b. The learning (outcomes) achieved by the learner

In each step of the process both aspects of learning are considered within the context of a face-to-face teaching/learning situation (Webb, 2003).

It is important that the learner is aware of his/her learning achievements and the processes that he/she used in order to make these achievements. In the process of (mediated) learning the learner is the active driving force of the process (Webb, 2003).

In less collaborative, more controlling teaching processes there is greater separation of functions, i.e., some of the tasks will be exclusively the responsibility of one party or the other. This tends to assume that the teacher is the active driving force (contrary to most educational psychologists, including Piaget) and that the student is simply being processed in order to generate learning outcomes (Webb, 2003).

For learning to be a quality, as well as an eagerly anticipated activity, the learner must experience a sense of being be 'in control' of their learning (Webb, 2003).

2.2.3 The Current Learning Model

The model below, (Figure 2: An Educational Model – focused on quality), has been derived from Glasser's Control Theory and when read with some understanding of Feuerstein's notions about learning it may be useful in that it includes some key elements that are essential if a teacher wishes to mediate learning.

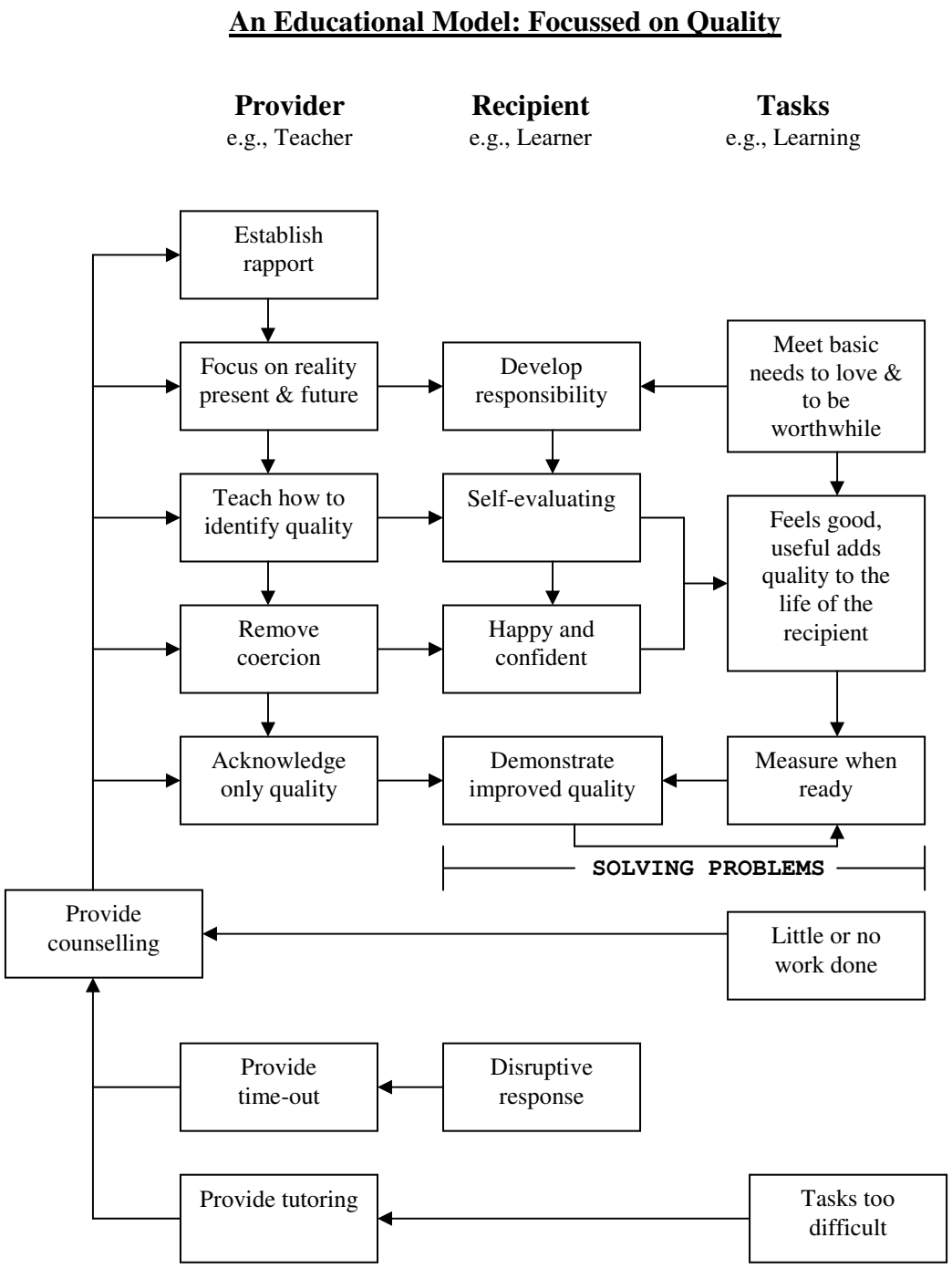

Figure 2: An Educational Model – focused on quality

2.2.4 Learning Theory

> *The recent work on social cognition . . . has shown clearly that information is processed in wondrous ways, few of which are replicative of the original information . . . The gist of this more recent work is roughly that individuals, alone or in organizations, transform and use research in highly selective and strategic ways. (Huberman, 1987)*

The perspectives on knowledge use described by Huberman draw from a learning theory known as constructivism, which has moved to the forefront of educational theory in recent years. Constructivist principles, for example, underlie many of the reform-based approaches emerging in mathematics and science education, as well as in other disciplines. Some of the basic concepts of constructivism can be found in ideas about knowledge utilization dating back to the 1970s and before; (Hutchinson, 1995) notes that:

> *"The constructivist perspective is evident in various models of knowledge utilization including social interaction, practical discourse, two communities, technocratic counsel, and theories-in-use models" (p. 92)*

According to constructivist principles, none of these metaphors adequately describes the ways in which we as learners process information. Constructivism presumes that new knowledge is filtered and shaped by the learner's pre-existing experience and understandings. Learners, from the youngest children to the oldest adults, are constantly seeking to make sense of the environment; to do so, we construct explanations that make sense based on our personal experiences. Knowing, then, "is an adaptive activity" (von Glaserfeld, 1995), concerned with reaching functional understandings about the various aspects of living:

> *Taken as the advancement of understanding, the cognitive endeavour starts from what happens to be currently adopted and proceeds to integrate and organize, weed out and supplement, not in order to arrive at truth about something already made but in order to make something right—to construct something that works cognitively, that fits together and handles new cases, that may implement further inquiry and invention. (Bauersfeld, 1995)*

As (Driver, 1995) explains,

> *"Human beings construct models of their environment, and new experiences [and information] are interpreted and understood in relation to existing mental models or schemes" (p. 386).*

The metaphors that suggest constructivist perspectives then, are those of building and shaping new structures. In writing about the impact of the learning process on the research study, (Huberman, 1990) states:

> *Prior knowledge does not operate like a sponge - sopping up new information. Rather, prior understandings are the mould into which new information is poured, such that the new understandings may not correspond to the researcher's conception of their own study. (p. 380)*

From a constructivist viewpoint, the extent to which an individual's existing understandings may be "right" or "wrong" is essentially irrelevant; what matters is how well those understandings work in helping the person make sense of her or his environment. One of the major theorists of constructivism, (von Glaserfeld, 1995) explains:

> *"To the biologist, a living organism is viable as long as it manages to survive in its environment. To the constructivist, concepts, models, theories, and so on are viable if they prove adequate in the contexts in which they were created" (pp. 7-8).*

Ackerman (1995) elaborates on this idea, explaining:

> *That "from a learner's point of view, there are no such things as misconceptions. There are only discrepancies, either between points of view or between a person's activity and some unexpected effects of this activity" (p. 342).*

What is "adequate" for one individual (or organization) may vary as well. The user's self-interest and self-image sometimes include considerations that conflict with what may, in terms of efficiency or cost benefits or effectiveness of operation, appear to be the "best" solution. Merely telling people that their ideas or practices are wrong, or ineffective, or outdated, or that a better mousetrap is available to replace the one they are currently using, is generally an inadequate approach to encouraging change (Heiskanen, 1993).

From a constructivist perspective, the task of getting learners to change their pre-existing understandings begins with helping them to recognize, and to be concerned by discrepancies within their own working knowledge base. As (Shapiro, 1994) points out: *"In order to take on a new viewpoint, one must decide to let go of an old one. There must be a reason to decide to make a shift in thinking" (p. 7).*

2.3 Knowledge in the Learning Environment

A learning environment begins now to look more like a mix between the teaching strategies based in a critical inquiry and the teaching conditions, which are thought to support the goals, which these strategies hope to achieve. While no learning environment is ever complete, therefore the sense of its completion must derive less from a necessity to deliver all that learners need and more from its ability to allow learners to integrate various models of reality in ways that enable their meaningful management (Checkland, 1991).

From the teachers' perspective, to facilitate a complete learning environment will require a continual examination and evaluation of the reciprocal relationship between the philosophy on which it rests and the teaching conditions which are thought to be in coherence with this philosophy. A complete learning environment therefore is never stable in its structure or the strategies, which it serves if only because of the diversity element which learners will bring with them. The stability of a learning environment is derived solely from the sense of reliance or trust, but not dependency that it gives to learners. This sense of reliance and trust are come from the potential of the learning environment to respond, in a supportive manner, to the continual dynamics, which emerge between learners and the world of knowledge around them (Hindle et al., 1995).

Thus while teachers must continually engage in the task of examination of the ways in which this sense of trust can be made possible, it is imperative to remember that the development of a learning environment neither begins nor stops with a single aspect of its structure. Thus it is impossible to talk about the philosophy of learning without considering its practical implications. Also, it is impossible to talk about practice (e.g. technology in learning) without considering the intellectual foundations on which these solutions are formed (Checkland, 1991).

It seems that if the task of a learning environment is to give learners an opportunity to stop, reflect, compare and (re) examine the powers of the newly established understandings, it is the task of pedagogues to ensure honesty as the founding principle of the processes thus put in place. Ultimately, the question about learning appears to be a question about the sources of interests that our educational environments serve. Thus if the task of teaching is to assist learners in the process of management of the demands and challenges that they encounter, then the task of teaching seems to be demonstrate that our teaching models do indeed allow learners to deal with problems which they experience (Checkland, 1991, Hindle et al., 1995).

The promotion of discussion and discourse into the relationship among modern and traditional knowledge transfer practices and characteristics within a Primary school classroom environment can only lead to improved, beneficial practices ending in effective and efficient knowledge transfer processes (Campbell et al., 1999).

2.3.1 What is knowledge?

Knowledge cannot be stored in computers; it can only be stored in the human brain (Davenport and Prusak, 2000). According to (Fahey and Prusak, 1998), knowledge is what a knower knows; there is no knowledge without someone knowing it. Knowledge is information combined with experience, context, interpretation, reflection, intuition and creativity. Information, which can be stored in computers, becomes knowledge once it is processed in the mind of an individual. This knowledge then becomes information again once it is articulated or communicated to others in the form of text, computer output, spoken words, or written words or other means.

Six characteristics of knowledge that distinguish it from information:

1) Knowledge is a human act
2) Knowledge is the residue of thinking
3) Knowledge is created in the present moment
4) Knowledge belongs to communities
5) Knowledge circulates through communities in many ways
6) And new knowledge is created at the boundaries of old.

Classification of an individual's knowledge into categories and dimensions has important limitations. For example, the classification into explicit and tacit knowledge may create static views of knowledge. However, knowledge development and sharing are dynamic processes, and these dynamic processes cause tacit knowledge to become explicit, and explicit knowledge to become tacit over time. Tacit and explicit knowledge depend on each other, and they influence each other. The two knowledge categories are not dichotomous states of knowledge, but mutually dependent and reinforcing qualities of knowledge: tacit knowledge forms the background necessary for assigning the structure to develop and interpret explicit knowledge (Davenport and Prusak, 2000).

With these definitions in place, knowledge acquisition must be viewed as a cyclic process where old information is taken on board, combined with new information and the users experiences to create newer updated knowledge. This then in turn reduces the old knowledge to the information level, and the previously utilised information could eventually be even further rescinded - to the data level (Colbeck, 2003).

2.4 Information Technology and KM

Information technology can play an important role in successful knowledge management initiatives. However, the concept of coding and transmitting knowledge in educational organizations is not new: training and employee development programs, organizational policies, routines, procedures, reports, and manuals have served this function for many years. What is innovative in the knowledge management area is the potential for using modern information technology (e.g. the Internet, intranets, extranets, browsers, data warehouses, data filters, software agents, expert systems) to support knowledge creation, sharing and exchange in an organization and between organizations. Modern information technology can collect, systematize, structure, store, combine, distribute and present information of value to knowledge workers (Nahapiet and Ghoshal, 1998).

According to (Davenport and Prusak, 2000), more and more organizations have instituted knowledge repositories, supporting such diverse types of knowledge as best practice, lessons learned, product development knowledge, customer knowledge, human resource management knowledge, and methods-based

knowledge. Groupware and intranet-based technologies have become standard knowledge infrastructures. A new set of professional job titles – the Chief Knowledge Manager (CKM), the knowledge coordinator, and the knowledge-network facilitator – affirms the widespread acceptability that knowledge management has earned in the corporate world (Grover and Davenport, 2001).

The low cost of computers and networks has created a potential infrastructure for knowledge sharing and has opened up important knowledge management opportunities. Computational power as such has little relevance to knowledge work, but the communication and storage capabilities of networked computers make it an important enabler of effective knowledge work. Through email, groupware, the Internet, and intranets, computers and networks can point to people with knowledge and connect people who need to share knowledge independent of time and place (Gottschalk, 2002).

2.5 Information Technology supporting KM

To understand how information technology can support knowledge management, it is necessary to understand that incremental introduction of new technology is the key to successful adoption by users within the current system. It is also imperative that the initial level of the organization be defined in terms of a specific stage as well so as to be able to develop strategies to move to a higher stage in the future (Gottschalk, 2002).

Personal observations have generally been that - the general knowledge worker is highly suspicious of BPR process involving the introduction of unfamiliar Information Technology into their organization. Organisational culture plays a primary role in acceptances of any aspect of change within an organization so the successful process of Information Technology integration into an organization that will allow a high level of acceptance by all end users (not just knowledge workers) and building a positive knowledge culture is critical (Davenport and Prusak, 2000). The four stages of this successful integration are presented as follows: -

2.5.1 Stage One - General Support

The first stage is general IT support for knowledge workers. This includes word processing, spreadsheets, and email. End-user tools are made available to knowledge workers. At the simplest stage, this means a capable networked PC on every desk or in every briefcase, with standardized personal productivity tools (word processing, presentation software) so that documents can be exchanged easily throughout an organization. More complex and functional desktop infrastructures can also be the basis for the same types of knowledge support. Stage One is recognized by widespread dissemination and use of end-user tools among knowledge workers in the company. For example, accountants in a commercial organization will at this stage use word processing, spreadsheet, databases, presentation software, and scheduling programs. This allows the end user to become familiar with technology and basic electronic knowledge use and knowledge transfer procedures (Davenport and Prusak, 2000).

2.5.2 Stage Two - Expand Accessible Information Sources

The second stage is information about knowledge sources. An information system stores information on who knows what in the organization and outside the organization. The system does not store what they actually know. A typical example is the company intranet. Information about who knows what is made available to all people in the organization and to selected outside partners. Search engines should enable work with a thesaurus, since the terminology in which expertise is sought may not always match the terms the expert uses to classify that expertise (Davenport and Prusak, 2000).

Another primary aim is to record and disclose who in the organization knows what by building knowledge directories (Davenport and Prusak, 2000). Often called 'yellow pages', the principal idea is to make sure knowledgeable people in the organization are accessible to others for advice, consultation, or knowledge exchange. Knowledge-oriented directories are not so much repositories of knowledge-based information as gateways to knowledge, and the knowledge is as likely to be tacit as explicit. Areas of expertise, projects completed and clients helped may over time expand knowledge directory (Davenport and Prusak, 2000).

2.5.3 Stage Three - Advanced Information Sources

The third stage is information representing knowledge. The system stores what knowledge workers know in terms of information. A typical example is databases such as Lotus Notes. Information from knowledge workers is stored and made available to all people in the organization and to selected outside partners. Here data mining techniques can be applied to find relevant information and combine information in data warehouses. On a broader basis, search engines are web browsers and server software that work with a thesaurus, since the terminology in which expertise is sought may not always match the terms the expert uses to classify that expertise (Davenport and Prusak, 2000, Grover and Davenport, 2001).

One starting approach at Stage three is to store project reports, notes, recommendations and letters from each knowledge worker in the organization. Over time, this material will grow fast, making it necessary for a librarian or a chief knowledge officer (CKO) to organize it. In a commercial organization, all client cases will be classified and stored in databases using software such as Lotus Notes.

2.5.4 Stage Four - Expert Systems

The final stage is information processing. An information system uses information to simulate expert opinions. A typical example is the expert system: 'Knowledger'. Information systems solving knowledge problems are made available to knowledge workers and solution seekers. Artificial intelligence is applied in these systems. For example, neural networks are statistically oriented tools that excel at using data to classify cases into one category or another. Another example is expert systems that can enable the knowledge of one or a few experts to be used by a much broader group of workers who need the knowledge (Davis and Keyser, 2003).

An Expert system is an example of knowledge management technology at Stage four. According to (Curtis and Cobham, 2002), the short answer is that an expert system is a computerized system that performs the role of an expert or carries out a task that requires expertise. In order to understand what an expert system is, then, it is worth paying attention to the role of an expert and the nature of expertise. It is then important to ascertain what types of expert and expertise there are in business and what benefits will accrue to an organization when it develops an expert system (Davenport and Prusak, 2000, Grover and Davenport, 2001).

For example, a doctor having a knowledge of diseases comes to a diagnosis of an illness by reasoning from information given by the patient's symptoms and then prescribes medication on the basis of known characteristics of available drugs together with the patient's history. The lawyer advises the client on the likely outcome of litigation based on the facts of the particular case, an expert understanding of the law and knowledge of the way the courts work and interpret this law in practice. The accountant looks at various characteristics of a company's performance and makes a judgement as to the likely state of health of that company (Curtis and Cobham, 2002).

The contingent approach implies that Stage One may be right for one organization, while Stage Four may be right for another organization. Some organizations will evolve over time from Stage One to higher stages. A commercial organization moving from Stage Two to Stage Three is illustrated in (Figure 3: The Stages of Growth Model).

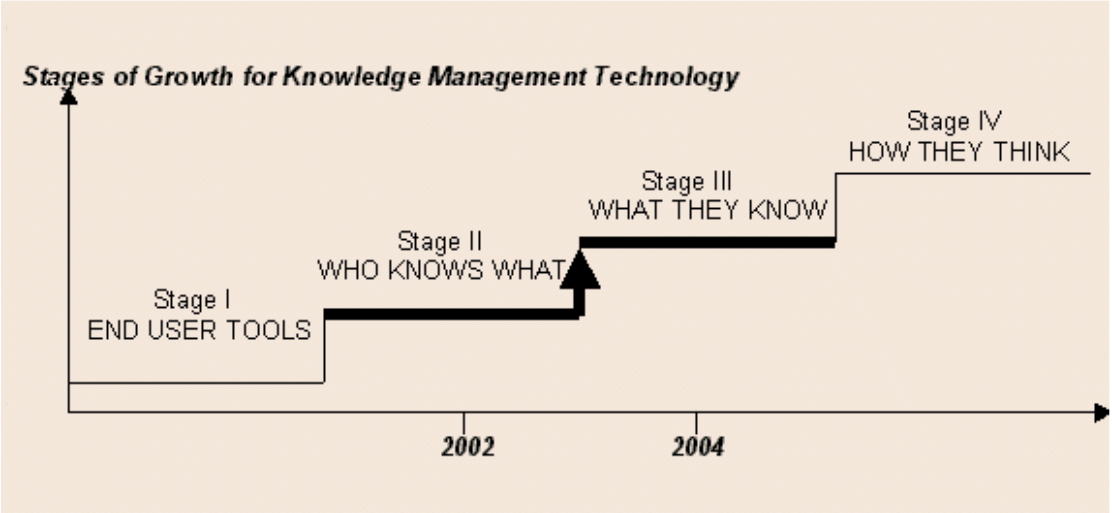

Figure 3: The Stages of Growth Model

All of these tasks involve some of the features for which computers traditionally have been noted – performing text and numeric processing quickly and efficiently – but they also involve one more ability: reasoning. Reasoning is the movement from details of a particular case and knowledge of the general subject area surrounding that case to the derivation of conclusions. Expert systems incorporate this reasoning by applying general rules in an information base to aspects of a particular case under consideration (Curtis and Cobham, 2002).

How then can this approach be all neatly contained within an E-learning framework? To fully comprehend where this all needs to go in relation to effective and successful utilization of technology – some discussion of what exactly is E-learning is considered appropriate.

2.6 What is E-learning?

E-learning is not a relatively new concept. E-learning has previously been associated with any learning that incorporated any form of technology. Today this is creating a 'new age' banner over activities that were in reality, already presently being utilised within the learning process, as aids rather than a driving technological force. This new age banner includes such activities as

- Radio/Television
- Video (1 way, as well as 2 way interactive conferencing), Dvd
- Classroom based computer mediated learning
- Online flexible computer learning
- Distance learning (i.e. – the Ad Astra program)
- Virtual classrooms

E-learning has also been used synonymously in dialogue concerning flexible distance learning. However with the recent surge to incorporate more computer technology into classrooms, at all levels within Education Departments across Australia, has caused the notion of E-learning to be re-discovered. The rapidly increasing awareness of E-learning is continually raising its profile with the general as well as parental public and in turn is creating a new 'hype' about this entire, newly labelled, 'flexible learning' phenomenon (Rosenberg, 2001).

The term E-learning used in this research is defined as all that activity utilising information transfer and knowledge utilization during the learning process with particular attention to computer-based technology involving learning activities in relation to primary school classroom environment in Tasmanian schools.

Research on E-learning has been driven by what many are calling the "Information Revolution". Advances in technology offer both the general public, as well as academic faculty, a dizzying array of challenges that are unprecedented. Technology

is having, and will continue to have, a profound impact on all levels of schooling and academia in general (Phipps, 1999).

2.7 Technology and E-learning

Whilst the new catch cry - encompassing E-learning concerns mainly computer platform based activities, several forms of technological advancement have been associated with, and found to have supported E-learning for many years. The following sections detail differing uses of those technologies utilised to perpetuate education and knowledge transfer to learners in vastly differing circumstances over the changing course of growth within our society as a whole (Boland and Schultz, 1995).

2.7.1 Radio/Television

Television and radio, in particular, have been connected to educational facilities almost from the moment of their inception. In 1944 the late Miss Adelaide Miethke made a trip to Alice Springs as a member of a delegation looking at the Royal Flying Doctor Service. The RFDS radio network provided people living in extreme isolation on vast cattle stations, hundreds of kilometres from the nearest town, with direct access to medical services. It allowed them to send and receive telegrams and, through special broadcasts such as the irreverently named "Galah session", to keep informed and in touch with one another. Miss Miethke recognised that children living in the outback were very shy and lacking in social contact and she felt that the radio could be used to provide a social aspect to the school life of bush children (ASSOA, 2002).

She saw the transceiver as a potential teaching aid which would enable the children of station families to participate in lessons conducted by trained teachers, and to communicate with fellow students. Although written correspondence had been a standard means of education since 1920, the idea of oral lessons for 'invisible' pupils, making use of airwaves, was completely original. The idea caught the imaginations of local educationalists and the South Australian Education Department (ASSOA, 2002).

By mid 1950 experimental lessons were in progress and on 8 June 1951 the Alice Springs School of the Air (ASSOA) was officially opened. There were three sessions

per week, Monday, Wednesday and Friday from 10.00am to 10.30 am and teachers from the Alice Springs School took turns in presenting sessions such as stories, word building and social studies, with the radio under the control of an RFDS operator (ASSOA, 2002).

The lessons were scripted by the teachers and "rehearsed" before they went to air. Initially they were planned for one-way transmission but they soon became two-way, incorporating ideas such as "Trouble Corner" for anyone having difficulty with their correspondence work, at the time coming from Adelaide. Students were able to call in and ask a teacher for help (ASSOA, 2002).

It wasn't long before other Schools of the Air started up, all of them, like Alice Springs, using the Flying Doctor radio to reach students in remote locations, who were working on correspondence lessons mailed from some distant city (ASSOA, 2002).

Tom Kissell was appointed head of the broadcast team in 1950 and continued in this role until 1951. Miss Molly Ferguson was the first full time teacher appointed in 1952 and continued until 1955. The school moved from its original location in a staffroom at the Alice Springs School to a bigger room at the Anzac Hill High School, and then into a building at the Flying Doctor base (ASSOA, 2002).

However, until 1973 the role of the Alice Springs School of the Air continued to be supplementary to that of the South Australian Correspondence School. All courses were produced in Adelaide, and all lessons sent back there for marking. In Alice Springs teachers simply provided a 20 minutes radio lesson to each grade, and occasionally visited 'on air' students on patrol (ASSOA, 2002).

While that educational service was certainly effective, it suffered many shortcomings. The correspondence material was impersonal and sometimes quite irrelevant and compounded feelings of isolation from the school, on the part of both students and supervisors. There were many delays in the return of corrected lessons and there was little allowance for individual differences in needs, interests or abilities (ASSOA, 2002).

In 1974 the Alice Springs School of the Air became completely autonomous and took on the role of correspondence school for the Central Australian (NT) region. Immediately the school's enrolment doubled and for the first time all students had access to a transceiver and were able to participate in radio lessons (ASSOA, 2002).

By 1975 the school had 123 students and three administration staff. A new school building was needed to accommodate them all and work began on the current premises at Head Street in 1976. In 2001 the school celebrated 50 years of providing education to students in isolated locations (ASSOA, 2002).

While this was happening in remote areas of Australia, the Australian Broadcasting Commission (ABC Radio) produced educational AM radio programs for schools within its geographically connected broadcast area. This practice of information delivery via entire classes listening to an AM radio receiver continued well into the 1970's until television was more affordable and accessible within school curriculum commitments.

ABC televised educational programs were presented at times that most teachers could utilise within the bounds of the teaching day. The usual time for most ABC educational programs was around 11.00am or 2.00pm. This did not then interfere with learner's recess or lunch breaks, and also gave teachers time to set up and introduce the topic that was to be presented during the broadcast. The advent of colour television in the early 1970's added a whole new dimension to the learning experience for the student. Suddenly the world of moving colour images and photography enhanced the whole learning process and seemed to create an enthusiasm for learning that had not previously been experienced.

2.7.2 Video/Dvd/Video Conferencing

Many educational videos have been created to meet the needs of educational areas deemed best suited for this multimedia delivery method. Content for these versatile and mobile mediums (videocassette, Dvd disk, cdrom disk) are being eagerly provided, and aggressively advertised to specific target markets, by organizations that specialise in hi-tech multimedia educational information. Culminating in the 'live-feed' video conferencing facilities that are now springing up all around

Australia. This method of real time video usage appears to have proven beneficial as well as cost effective for both educational institutions as well as the business sector.

2.7.3 Classroom based computer mediated learning

This includes such activities within the classroom that are mediated by the controlling educator, and are usually limited in scope and process application to any current task as set by the curriculum. Within the realms of Tasmanian primary school classes, there appears to be no significant application based activities that are particularly referenced to curriculum outcomes. Some Prep classes are offered spelling or early reading applications to assist pupils, but older primary students appear limited to Microsoft® Office programs such as Microsoft® Word and Microsoft® Publisher to aid and assist project and assignment compilations.

2.7.4 Online flexible computer learning

The term 'online' comes from the days of the telegraph, when messages could be tapped directly onto the line rather than prepared 'offline' on perforated tape, for sending when the machine was connected later to the telephone line. Today, 'online' covers a range of technologies. In education and training, technologies that concentrate on computer mediated communication are the most common (Salmon, 2000). Three main categories are: -

- **Informatics,** particularly involving electronic access via telecommunications to catalogues, library resources, interactive remote databases and archives including those found on the World Wide Web (WWW).

- **Computer-assisted learning (CAL)**, also known as Computer Assisted Instruction (CAI) and computer based training, which may or may not require telecommunications connections to allow for online applications.

- **Computer mediated conferencing,** which is the medium based on computers and telecommunications. Culminating in the 'live-feed' video conferencing facilities that are now springing up all around Australia. This method of real time video usage has proved beneficial as well as cost effective for both educational institutions as well as the business sector.

As the Internet and the World Wide Web have expanded, opportunities to use it for teaching and learning have expanded too — some people call this 'networked learning'. Educationists all over the world are experimenting with various forms of distance, open and flexible learning. Networked computing offers the chance to build a learning community: this can be in a university or college, in an industrial or commercial setting, or based on common interests or objectives rather than geographical location (Salmon, 2000).

Monash University case study

Monash University was one of the first in the world to explore and exploit online flexible learning, and to take seriously the training of their academic staff (appropriately called - E-moderators). They are still currently exploring the extent and potential of this venture. Sandra Luxton, Lecturer and Co-ordinator of Undergraduate Open Learning in Marketing during 2000, describes her experiences.

> *"The current online curriculum at Monash closely reflects the content of the face-to-face and text-based distance education versions and uses a full range of media and computer technologies including the Internet, e-mail, bulletin boards, online library facilities, video, animations and hypertext, All subject content is provided via a Web site and all communication, including assignment submission, takes place via the Internet. The progression from print and on-campus materials to online has involved discontinuous innovation in that students 'experience and learning are different online. Instructional design has been aimed at accommodating the differences.*
>
> *E-moderating Marketing Theory and Practice Online (MTPO) is a challenging, exciting task due to the very diverse student group this core business course serves. MTPO is offered to students taking various business studies majors on-campus, by distance education and through open learning, which is an unrestricted access option. Students vary in age, language and ethnic background. The e-moderator needs to help all of them to participate fruitfully on the bulletin boards; it is here that the anonymity of electronic learning is both an asset and a hindrance.*
>
> *Recent research based on students' diary records of their thoughts and experiences, shows that some enjoy being 'faceless' and are happy to contribute to discussions, but that others just cannot bring themselves to participate. Overcoming this paradox is a key task for the e-moderator using varied strategies. To assist learners to find their confidence in communicating online on unfamiliar topics, e-moderators increase online 'comfort' by starting informal*

and non-confronting discussion, and by using existing dialogue to prompt the next communication with another question. They also establish very simple dialogue in week I by asking students just to say 'hi', or answer yes/no questions. They try to alleviate some of the students' concerns by talking to them about what to expect.

E-moderators receive an operational and instructional guide, for both the content development and expectations for online e-moderation. This helps to ensure quality and consistency of delivery.

However, within this educational framework, students digest and respond to the learning process differently Asynchronous discussion gives them time to contemplate issues before adding their own contribution. Those with English as a second language, or who need to review terminology or who have a full-time job, are less disadvantaged than in class. The e-moderator needs to be sympathetic and at all times supportive and encouraging, Just as in a face-to-face class. Our students can get up to 5 per cent added to their final grade if they participate well on the bulletin board" (Salmon, 2000).

2.8 Technologies versus Pedagogy

The function of a learning environment brings to focus another aspect of educational design, that of the difference between the Distance Education and the Face-to-Face settings. It has been often considered that to eliminate the difference between the two, Face-to-Face teaching can be replaced by the strategies used in Distance Education. The assumption is that it is not the face of the teacher that learners need, but the possibility of a collaborative exchange. Thus Face-to-Face teaching, as a form of learning which is rather difficult to support in Distance Education, is often replaced with the strategies, which are thought to encourage an exchange between students, like on-line discussions or on-line explorations (Rosenberg, 2001).

However, if the concern with the function of our learning environments were to be taken up seriously, on a second look it seems that the decision for abandoning Face-to-Face teaching is not based on the principle of critical assessment of its potentially enriching capacities. Rather, it is based in a logic, which prioritises specific channels of contact - like on-line learning - over Face-to-Face modes, which are considered redundant in the learning opportunities that they make possible. In other words, the strategy of abandoning Face-to-Face teaching is a strategy, which deprives learners

from access to learning channels only on the assumption that other channels can do the job just as well (Robinson, 1993, Rosenberg, 2001).

But, of course, Face-to-Face teaching may be of value not because it does what computers can do but because it does what computers cannot do. That is, when thinking about education and technology, the criteria applied need not always be about the kind of software and hardware that allows teachers to put all energy into overdevelopment of some communication channels at the expense of some others (Rosenberg, 2001).

Technology need not be about doing the same things now with different tools. If a learning environment is the goal and the learner as a thinking agent in this environment, then this requirement seems to oblige educational institutions to creatively explore different avenues of contact for the different forms of support that they potentially may offer to learners (Webb, 2003).

That is to say, the goal need not be to select on behalf of learners between good support channels and bad support channels, but to create conditions, which allow learners to find in different channels different forms of support. Thus if Face-to-Face teaching is considered redundant in its form, it may not be the form that is redundant but the way in which this channel is utilised by teachers (Webb, 2003).

Furthermore, creative management of Face-to-Face settings can also feed back to Distance Education settings. The possibilities that Face-to-Face teaching may open up to our learning models seem a challenge which, when abandoned, remove from learners yet another point of support otherwise facilitated through creative exploitation of the various meeting places (Webb, 2003).

2.8.1 Technology Limitations

The continual use of metaphors, which attribute to computers and technology specific support powers, inevitably blur the boundary between the technology as a tool and the purpose to which the technology can be oriented. While it is true that computers, or other technological tools, like a digital camera, or light pen enable us to do more things, or the same things but differently, the purposes to which we utilise technology did not emerge because of the computer but because of the specific cultural demands in which we function (Healy, 1998).

It is therefore most likely that technology will not liberate education or learners toward their general betterment. Rather, it is expected that technology will be used to reinforce the old systems rather than the new paths. It therefore is necessary to draw a distinction between the capacities of the technology, and specifically of the computer as a multimedia platform, and the kinds of support levels that computers have been assumed to offer (Webb, 2003).

Computers do not:

- Offer opportunities for people to communicate
- Offer exploration opportunities
- Allow for creative management of knowledge by learners or teachers

Computers do:

- Offer the possibility to connect computers together across the world. It is important to draw this distinction because the function of communication is not a function of connecting computers together. To allow people to communicate is to reflect upon the different forms that communication can take and to adjust the capacity of computers to the demands of these different forms.
- Offer the capacity to store and retrieve information at random. Again, the function of exploration cannot be equated with the function of storage and random access. Like communication, exploration is a complex activity, which is determined by the conditions around and within the learner rather than the computer alone. To allow for a genuine exploratory learning it is to inquire about, and make available, conditions which locate the purpose of exploration and its value in learners and the demands that the challenge of critical inquiry pose on them.
- Offer the capacity to organise information in many different ways. Creativity therefore is not a function of any software currently made available, or a function of teacher's appreciation of the final product. Creativity needs to be considered in the multiplicity of dimensions that contribute to one's sense of achievement. Thus for a learning environment to offer ways for creative management of information, it is necessary to make it possible for learners to approach problems and the solutions to these problems in ways that do not constrain their methods of analysis and production to a single way of doing things.

2.9 New concepts within E-learning

All E-learning has learners, content, some form of instruction and technology. These four need to be in sync to make the whole process happen effectively. Within the new structure of E-learning, the teacher is becoming more of a guidance mechanism or a facilitator rather than a knowledge transfer agent. The information that student require is now coming from the self serving requirements of the changing face of education as we know it (Galliers, 1992).

2.9.1 Flexible Learning

Research on flexible learning has been driven by what many are calling the "information revolution.' Advances in technology offer both the general public, as well as faculty, a dizzying array of challenges that are unprecedented. Technology is having, and will continue to have, a profound impact on all levels of educational academia in Australia and around the globe (Godfrey and Morgan, 1997a).

Flexible learning is becoming increasingly more visible as a part of the higher education family. But the research and literature reviewed for this study indicate that the higher education community has a lot to learn regarding how and in what ways, technology can enhance the teaching/learning process, particularly at a distance (Phipps, 1999, Godfrey and Morgan, 1997a).

There are at least three broad implications that can be derived from this review of the original research and the other literature. The first is that the notion of "access to education" in the E-learning context is unclear. Many of the advocates of E-learning tout access to education as a reason for the proliferation of flexible education (Godfrey and Morgan, 1997a), indeed, in some countries (notably Canada), public policy leaders are recommending using “virtual classroom education” in lieu of "bricks and mortar" learning (Barker and Wendel, 2001).

Of particular concern is access as it relates to the efficacy of computer-mediated learning (Godfrey and Morgan, 1997a). Unlike two-way interactive video, where students and the instructor can see and talk to each other in a conventional classroom, computer mediated learning requires special skills of students and more sophisticated technical support if students are to interact fully. Questions that need to be asked include: What is the "quality" of the access? Does the student have the necessary

skills to use the technology? What are the best ways to participate in asynchronous communication? Is there adequate technical support? Perhaps most importantly, will the cost of purchasing a computer and maintaining software be prohibitive for a substantial number of students? (Phipps, 1999)

Second, it seems clear that technology cannot replace the human factor in primary education. Faculty members involved in flexible education find themselves being a combination of content experts, learning process design experts, process implementation managers, motivators, mentors, and interpreters. In short, technology "can leverage faculty time, but it cannot replace most human contact without significant quality losses," as (Phipps, 1999) has stated.

Third, although the ostensible purpose of much of the research is to ascertain how technology affects student learning and student satisfaction, many of the results seem to indicate that technology is not nearly as important as other factors, such as learning tasks, learner characteristics, student motivation, and the instructor (Godfrey and Morgan, 1997b). The irony is that the bulk of the research on technology ends up addressing an activity that is fundamental to the academy, namely pedagogy, the art of teaching. To that extent, the research has had a salutary effect in that a rising tide lifts all boats. Any discussion about enhancing the teaching/learning process through technology also has the beneficial effect of improving how students are taught on campus (Broadbent, 2002, Phipps, 1999).

2.9.2 Virtual Schools

In this modern environment of ever increasing change and innovation, schools have begun to use Information and Communication Technologies (ICT), including the Internet. On-line schools are becoming the new frontier. Since 1995, virtual schooling experiments from Kindergarten to year 12 have sprung up across the globe. These experiments are particularly prevalent in Canada and the United States of America. These new age schools are enrolling ever-increasing numbers of new students (Barker and Wendel, 2001, Heaton, 1998).

In this context, there is a need for in-depth research examining this bold new learning adventure to discover both its potential and its pitfalls, as well as provide guidance for future developments in this field (Barker and Wendel, 2001).

Virtual Schooling Defined

A virtual school is one that offers the mandated instructional program to students through only electronic means (i.e. computer mediated and on-line via the Internet).

A virtual school is characterised by: -

- A structured learning environment wherein the program is under complete supervision by a teacher.
- Electronic delivery to students who are a home or in a physical setting other than that of the teacher.
- Instruction that may be synchronous or asynchronous.

Whereas a conventional school is characterised by face-to-face instruction, required attendance, group instruction, assignments and testing, and technology being used as an adjunct to technology (Barker and Wendel, 2001).

In reviewed papers on virtual schools, the teachers and principals were strongly supportive of the program in terms of instructional methodology and the achievement of learning outcomes. However, like parents, they felt that the interaction between students and teachers was absolutely essential to overall student achievement.

> *"We need more contact with students, more concrete methods of communication and delivery of subject matter and we need to use a more structured program on web sites" (Barker and Wendel, 2001).*

This aside, in Canada and the USA there is an increasing demand for access to virtual schooling. The reasons for such an increase in demand include, according to (Barker and Wendel, 2001), but may not be limited to the following:

- The concept of on-line learning is "sexy" – attractive because it is innovative and "futuristic".
- The increased use of distance education by adults has led those who are parents to want distance education opportunities for their children.
- More and more parents want to be involved in their children's learning and see distance education as an opportunity to do so, particularly since distance delivery inherently respects the parents' ability to teach and to learn.

- Some parents want their children removed from what they perceive to be "indoctrination" in conventional schools.
- Some parents are looking for options in light of the continuous litany of reported problems with public education and the perception that the conventional school environment does not meet their children's individual needs.
- Some parents are committed to home schooling, and on-line courses provide an effective teaching option.
- Some conventional school students are not able to get all the courses they need or want at their local school, particularly in rural and remote communities, but even in urban and private schools.
- Some students cannot attend conventional schools for geographic, health or special needs reasons, and virtual schooling is an option for them.
- Some parents and students feel that, by using Information and Communication Technologies (ICT) for education purposes, young people will have abetter access to jobs in the new economy.

Virtual School principals, state that among the key factors that increase the appeal of, and the enrolment in, virtual schools are the following:

- Flexibility and ubiquity (the delivery of the programming anywhere, any place, any time).
- Increased and individualised attention from teachers.
- Access to special education programming.
- Personal safety and comfort (i.e. no exposure to the social problems that can be found in typical schools)

E-learning appears to attract two general types of students: those who are aggressive, self-directed learners with clear expectations and goals (i.e. those who choose virtual schooling and want to condense their academic career by completing two years of

grades in one year); and those students who are under achievers in conventional schools and for whom virtual schooling may well be their last resort to achieve any academic result (Barker and Wendel, 2001, Munro et al., 1994).

E-learning is not just about introducing new technology for learning, but more about new ways to think about learning. People think and learn in many different ways, and if consideration is given to learning in new ways it will be easier to identify new options for improvement in information delivery performance (Barker and Wendel, 2001).

2.10 Distance Learning

Whilst investigating the currently available literature on distance learning utilising computers, it was found that there are several key shortcomings of the original research on the effectiveness of distance learning (Phipps, 1999). These include:

2.10.1 Control Procedures

Lack of control for extraneous variables is a major shortcoming that pertains particularly to experimental research, where the researcher attempts to compare the outcomes of a control group with the outcomes of an experimental group. Most experimental studies of distance learning are designed to measure how a specific technology—the "cause"—impacts upon some type of learning outcome or influences the attitudes of the course by students—the "'effect." To accurately assess this relationship, other potential "causes" must not influence the measured outcomes (Orlikowski, 1991, Boland, 1979).

In almost all of the experimental research reviewed, there was inadequate control of extraneous variables (Orlikowski, 1991).

2.10.2 Participant Selection

The single best way of controlling for extraneous variables is to assign students randomly to both the experimental and control groups. However, many of the published studies reviewed used intact groups for comparison purposes. As a result, these studies run the risk of having a number of variables affecting academic achievement or student satisfaction, not just the technology used to provide the educational content (Persson, 2000).

2.10.3 Reliability and Validity of the Instruments Used

An important component of good educational research relates to proper measurement of learning outcomes and/or student attitudes. In short, do the instruments—such as final examinations, quizzes, questionnaires, or attitude scales—measure what they are supposed to measure? A well-conducted study would include the validity and reliability of the instruments so that the reader can have confidence in the results. In almost all of the studies reviewed, this information was lacking (Persson, 2000).

2.10.4 Reactive Effects Control

Reactive effects are a number of factors associated with the way in which a study is conducted and the feelings and attitudes of the students involved. One reactive effect is known as the Novelty Effect, and refers to increased interest, motivation, or participation on the part of students simply because they are doing something different, not better, per se. (The Hawthorne effect)

Another, called the John Henry Effect, refers to control groups or their teachers feeling threatened or challenged by being in competition with a new program or approach and, as a result, outdoing themselves and performing well beyond what would normally be expected. In many studies, precautions were not taken in the research to guard against these effects (Persson, 2000).

2.10.5 Research Gaps

Notwithstanding the fact that the overall quality of the research needs improvement, there are several important issues regarding the effectiveness of distance learning that require further investigation and information (Phipps, 1999). These gaps must be filled so that public policy discussions are based on accurate and adequate information. Specific issues include:

Individual Rather than Encompassing Recommendations

The research has tended to emphasize student outcomes for individual courses rather than for a total academic program. A major gap in the research is the lack of studies dedicated to measuring the effectiveness of total academic programs taught using E-learning content. Virtually all of the comparative or descriptive studies focus upon individual courses. This raises important questions about whether a total academic program delivered by technology compares favourably with a program provided on

campus. In addition to cognitive, verbal, quantitative skills and subject matter competence - outcomes with regard to critical thinking skills, attitudes, values and moral development need to be addressed (Phipps, 1999).

No Contingencies for Differences Among Students.

A substantial portion of research on distance learning has been conducted to demonstrate no significant difference in achievement levels between groups of distance and traditional learners. However, there is wide variance of achievement and attitudes within the groups, which indicates that learners have a variety of different characteristics. The factors influencing these differences could include gender, age, educational experience, motivation, and others- Gathering samples of students and amalgamating them into averages produces an illusory "typical learner," which masks the enormous variability of the student population. Further research needs to focus on how individuals learn, rather than how groups learn (Phipps, 1999).

No Adequate Explanation of the High Dropout Rates

In a number of studies, there was evidence that a higher percentage of students participating in an E-learning learning course tended to drop out before the course was completed compared to students in a conventional classroom. The issue of student persistence is troubling because of both the negative consequences associated with dropping out, and the fact that the research could be excluding these dropouts, thereby tilting the student outcome findings toward those who are "successful" (Phipps, 1999).

Little Consideration on Different Learning Styles

Understanding of how the learner, the learning task, and a particular technology interact is limited. Learner characteristics are a major factor in the achievement and satisfaction levels of the distance learner. Information regarding a student's preferred learning style will influence how the course is designed and the type of technology to be used. Additional research could result in more information regarding why different technologies might be better suited for specific learning tasks (Phipps, 1999).

Focus on Individual Rather than Multiple Technologies

Much of the literature on distance learning focuses on one technology and either describes its effectiveness and/or compares it to the conventional classroom experience (Phipps, 1999).

Most technologies, however, are multifunctional and can be adapted to address a wide range of learning outcomes. Unfortunately, there are few studies that examine more than one technology, and the synergistic effects of certain technologies, in addressing specific educational outcomes and student groups. The few studies that are available do not provide ample grounds for generalisation because of a range of limitations, including small sample sizes and lack of sufficient explanation of the instructional treatment (Phipps, 1999).

Little Theoretical or Conceptual Framework

There is a vital need to develop a more integrated, coherent, and sophisticated program of research on distance learning that is based on theory. Theory allows researchers to build on the work of others and, therefore, increase the probability of addressing the more significant questions regarding distance learning. Using theory as a guiding framework also allows the research to be replicated and enhances its generalisation, making individual studies more meaningful (Phipps, 1999).

Effectiveness of Digital Libraries

Students participating in distance learning, particularly those in remote locations, are often introduced to a digital "library" that provides access to bibliographies, as well as full executive summary text, of a variety of resources. The library is at the core of the higher education experience and, especially at the graduate level, is an integral part of the teaching/learning process (Phipps, 1999).

Some digital libraries boast an enormous array of resources, with the implicit notion that they can provide the same service as the traditional library. But do digital libraries provide adequate services for the academic programs they are established to support? Anecdotal evidence seems to suggest that the curriculum objectives of some distance learning courses have been altered because of a limited variety of books and journals available from the digital library (Phipps, 1999).

2.11 Effectiveness of E-learning

Despite the large volume of written material available that concentrates on E-learning in some form or another, there is a relative scarceness of true, original research dedicated to explaining or predicting associated phenomena relating to E-learning (Rosenberg, 2001).

From the available research there emerges three commonly examined measures of effectiveness of E-learning. These include:

- Student outcomes, such as exam results, test results and final grades
- Student attitudes about learning using technology
- Overall student satisfaction toward E-learning

Most of these studies conclude that, regardless of the technology used, E-learning compares favourably with traditional teacher controlled classroom-based instruction and enjoy high student satisfaction. The descriptive analysis and case studies focus on student and teacher attitudes and perceptions of the technology involved in the delivery of an E-learning package. The purpose of many of these studies is to develop recommendations to improve E-learning usually by the addition of newer and more powerful technology. Therefore these studies typically conclude that students and teachers have a positive view toward E-learning (Rosenberg, 2001).

2.12 Benefits of E-Learning

"The biggest growth in the Internet, and the area that will prove to be one of the biggest agents of change, will be in e-learning."

John Chambers, CEO, Cisco Systems

E-learning on the whole, appears to offer many improvements, both in the tangible as well as the intangible world. Some of these are shown in (Table 1: Benefits of E-learning).

Benefits of E-learning	
Information is consistent or customized, depending on need	Everyone gets the same content, presented in the same way. Yet the programs can also be customized for different learning needs or different groups of people
Content is more timely and dependable	Because it is web-enabled, E-learning can be updated instantaneously, making the information more accurate and useful for a longer period of time. The ability to upgrade e-learning content easily and quickly, and then immediately distribute the new information to users is extremely time efficient.
Learning is 24/7	Students can access e-learning anywhere and at any time of the day. It's "just in time – any time' approach makes the learning process ubiquitous.
Universality	E-learning is web-enabled and takes advantage of the universal Internet protocols and browsers. Concern over differences in platforms and operating systems is rapidly fading. Everyone on the Web can receive virtually the same material in virtually the same time.
Scalability	E-learning solutions are highly scalable. Programs can move 10 participants to 100 or even more participants with little effort or incremental cost (as long as the infrastructure is in place).
Builds communities	The Web enables students to build enduring communities of practice where they can come together to share knowledge and insight. This can be a tremendous motivator for learning.
E-learning lowers costs	Despite outward appearances, e-learning is often the most cost effective way to deliver instruction or information. It cuts travel expenses; it can also reduce teaching time, and significantly reduces the need for a classroom/teacher infrastructure.
Source: (Rosenberg, 2001)	

Table 1: Benefits of E-learning

What is beginning to develop about E-learning is its growth and diversity, beyond courseware and instruction, to generating and disseminating information and directly supporting learner performance. Providing access to information that contains the collective wisdom of many other minds can be a powerful adjunct to teaching (Campbell et al., 1999, Rosenberg, 2001).

2.13 Chapter summary

A closer look at the literature however reveals that it may not be prudent to accept all these findings at face value. Several problems with the conclusions reached through research findings are apparent. A significant problem is that the overall quality of the original research is questionable and thereby renders many of the findings inconclusive (Phipps, 1999).

The findings of the original research must be read with some caution. Assessing the quality of the original research requires a determination that the studies adhered to commonly accepted principles of good research. The analysis is much more than an academic exercise. These principles are essential if the results of the studies are to be considered valid and applicable to more general situations. If a study does not abide by these principles, the results can be erroneous or misleading, and therefore lead to conclusions that may result in poor public policy (Barry, 1995).

As (Marcelle, 2000) explains,

> *The information and technology (ICT) field is the fastest growing sector and one that has limited experience in terms of policy development. Perhaps the most distinguishing feature or characteristic that is particular to this sector is the speed at which technological innovations are produced, promoted and implemented and which have an impact on so many different sectors.*
>
> *As a result of the rapid diffusion of ICT's, the sector has grown in size, scale and importance...The ICT sector forms part of what is referred to as the knowledge sector, which is the fastest growing area of the global economy. Between 1980 and 1994, the share of high technology products in international trade doubled, from 12% to 24% (Marcelle, 2000).*

National governments and policymakers are struggling to keep up with the pace of change in order to develop policies and regulations regarding ICT products and services among other things. Moreover, as (Marcelle, 2000) points out, policy development in this sector is further complicated by the fact that, "ICT firms and the formal institutions that set policies, standards and regulations for them are regarded as technical and professional bodies that give little thought to social considerations and political processes" (Marcelle, 2000)

She goes on to say that,

> *The sector's decision-makers tend to hold technologically deterministic view of development. They see the diffusion of their products and services as automatically leading to outcomes that are benign and universally beneficial and fail to incorporate in their operations, processes for evaluation, assessment and reviews of purposes, meanings and results. Their policies and practices are defined by a single interest group and there are few opportunities for other standpoints to compensate for that group's blind spots and shortcomings (Marcelle, 2000).*

Others argue, however, that new policy fields provide 'windows of opportunity' for research to influence policy that might not otherwise exist. Anecdotal evidence offered by the International Development Research Centre in Canada, which is heavily involved in ICT programming areas, suggests that researchers are being called on more and more by national governments to assist with policy formulation and development. This suggests that past policy experience, or existing policies in similar sectors, has not provided policymakers with the knowledge or resources they need to produce satisfactory policies (Phipps, 1999).

Future endeavours involving more study, combined with a closer working arrangement between researchers and policy makers should develop mutually beneficial learner oriented policies that will allow advancement rather than the introduction of simply more constrictive and red-tape based conditions that will reduce E-learning to nothing more than a tool that everyone knows is there, but are reluctant to use (Godfrey and Morgan, 1997a).

In a sense, this discussion has come full circle. The research on flexible E-learning has a long way to go, and much of it is inconclusive, On the other hand, technology has helped academia to continue its focus on the essential goals of teaching and learning. As a result, either implicitly or explicitly, there emerges a key question that needs to be asked:

Does the current design of E-learning processes ensure generation and dissemination of information whilst providing effective knowledge transfer to learners in today's constantly changing educational environment?

Chapter 3: Methodology

"Research is not used as a can opener is used."

- (Huberman, 1987)

The purpose of this study was to discover the perceptions of E-learning held by Primary School teachers in Tasmania. This chapter outlines the nature of research ontology, epistemology and research methodology. In addition, the distinction between quantitative and qualitative methodologies and their appropriateness for this particular research project is discussed. During the course of this discussion, the ontological (subjective view), epistemological (interpretive view) and methodological approach (qualitative case-study method using grounded analysis) of the research will be justified.

3.1 Chapter introduction

Within the case study method, semi-structured interviews were utilized to gain an in depth understanding of teachers' current perceptions of E-learning and how they see E-learning affecting future academic and educational work. The semi structured interview technique is discussed in detail as well as the modes of data analysis. Validity within the research, both internal and external, is essential so therefore this chapter will also briefly outline how this was achieved. This chapter concludes with a brief discussion on the limitations faced during the course of the research as well as the boundaries within this research that may be applied to similar real world applications.

3.2 Quantitative versus Qualitative

The ongoing argument over relative merits of what are generally referred to, as quantitative and qualitative research methods are somewhat driven by the researchers ontological and epistemic approach to their research topic and the results they wish to show from their research.

Where quantitative researchers seek causal determination, prediction, and generalization of findings, qualitative researchers seek, instead, illumination, understanding, and extrapolation to similar situations. Qualitative analysis results in a different type of knowledge than does quantitative inquiry. (Ragin, 1987) points

out that all knowledge, including that gained through quantitative research, is referenced in qualities, and that there are many ways to represent our understanding of the world.

Styles of differing researchers basing their work on either quantitative or qualitative methodology will contain traits common to both. Design issues between the two approaches, however, usually differ (Neuman, 2003). (See Table 2: Methodology design comparison, Neuman, 2003: 145)

Quantitative Research	Qualitative Research
Test Hypothesis that the researcher begins with	Capture and discover meaning once the researcher becomes immersed in the data
Concepts are in the form of distinct variables	Concepts are in the form of themes, motifs, generalizations, and taxonomies
Measures are systematically created before data collection, and are standardised	Measures are created in an ad hoc manner and are often more specific to the individual setting or researcher
Data are in the form of numbers from precise measurement	Data are in the form of words and images from documents, observations, and transcripts
Theory is largely causal and is deductive	Theory can be causal or non-causal and is often inductive
Procedures are standard, and replication is assumed	Research procedures are particular, and replication is rare
Analysis proceeds by using statistics, tables, or charts and discussing how what they show relates to hypotheses	Analysis proceeds by extracting themes or generalizations from evidence and organising data to present a coherent, consistent picture
Source: Neuman, 2003	

Table 2: Methodology design comparison

Because of this tendency of overlapping areas within both methodologies, some discussion on both the Quantitative and Qualitative methodology is necessary to understand the reasons and decisions behind the selected approaches taken by this researcher and how the research, whilst sharing common traits with both methodologies is nonetheless particularly suited to the Qualitative approach.

3.2.1 Quantitative Research Method

> *"The variable is a central idea in quantitative research. Simply defined, a variable is a concept that varies. Quantitative research uses a language of variables and relationships among variables."(Neuman, 2003)*

Briefly - Quantitative research is primarily ontologically objectively based with an epistemologically positivist stance toward how the research is to be conducted (Neuman, 2003, Dick, 1998, Ragin, 1987).

Quantitative research is also based around the appropriation and empirical study of 'hard data', that is – data that is confined to numerical in nature, or can be reduced to a numerical form so that it is value free. The data collected is typically from experimental studies or calibrated surveys, which do not allow the researcher to enter the lives of the participants nor does it allow any room for interpretation by the researcher.

This research method was therefore not considered appropriate given the interpretive nature combining cases study analysis with a personal open interview approach (interpreted by the researcher into 'soft data' and observation of any themes emergent from this data), as this lacked a foundation of empirical quantifiable data necessary to successfully apply accepted Quantitative techniques.

3.2.2 Qualitative Research Method

Qualitative research, broadly defined, means any kind of research that produces findings not arrived at by means of statistical procedures or other means of quantification (Strauss and Corbin, 1990).

The underlying ideology of the Qualitative approach is that behaviour can be explained only by the perceptions, perspectives and highly subjective constructions of a participant, and not by any "objective truth". The methods of Qualitative research address the important issue of access to personal views (perceptions), attitudes and information.

For most individuals, personal views, attitudes and information are restricted to psychosocial and cultural filters, which determine what information can be exposed to public scrutiny, what information is communicable, and indeed by the very

awareness of such information. The model proposed by (Cooper and Branthwaite, 1977) is very useful for understanding these filters.

<table>
<tr><th colspan="3">Accessibility</th><th>Layers of Response</th><th>Responses by structured interviewing</th></tr>
<tr><td rowspan="2">Public</td><td rowspan="2">Communicable</td><td rowspan="2">Aware</td><td>Spontaneous, Reasoned, Conventional</td><td rowspan="4">Relative Ease</td></tr>
<tr><td rowspan="3">Private</td><td>Concealed, Personal</td></tr>
<tr><td rowspan="2">Non Communicable</td><td>Intuitive, Imaginative</td></tr>
<tr><td>Unaware</td><td>Unconscious, Repressed</td><td>Relative Difficulty</td></tr>
<tr><td colspan="5">Source: Cooper and Branthwaite, (1977) Qualitative Technology: New Perspectives on measurement and meaning through Qualitative Research</td></tr>
</table>

Table 3: Cooper and Branthwaite Model

Table 3: Cooper and Branthwaite Model clearly shows the limitations of the structured questionnaire, which is amenable to quantification and statistical analysis. However, although Qualitative Research is impressionistic, as opposed to, conclusive it can provide unique insights from its preoccupation with probing and understanding rather than counting and collating (Mani, 1999).

3.3 Qualitative Research Approaches

This project is a phenomenological case study using qualitative research methods to gain an understanding of the perceptions of Primary School teachers in relation to E-learning. The study utilises semi-structured interviews based in grounded analysis to gather rich, quality data. The number and diversity of the participants also increased the potential for validity and reliability.

Qualitative Research methods were developed in the social sciences to enable researchers to study social and cultural phenomena; these methods include Action Research, Case Study Research, Grounded Theory and Ethnography.

Qualitative Methodologies			
Approach	**Brief Description**	**Timescales needed**	**Previous use in IS research**
Action Research	Problem solving approach. Suitable for projects that requires specific knowledge. Produces definitive results.	Long	No
Ethnography	Researcher immerses him/herself in field of study. Researcher observes study from "inside out".	Long	Yes
Grounded Theory	Theory is developed during research through continuous interplay between analysis and data collection. Requires high theoretical sensitivity for success.	Short-Long	Some
Case Study	Used to investigate interaction between factors and events. An empirical approach to research.	Short	Yes

Table 4: Approaches to Qualitative Analysis

Some of the important techniques subsumed by the term Qualitative are:

- Observations and Participant Observation
- Depth Interviews and Questionnaires
- Focus Group Discussions
- Case Studies, Documents and Text

In all these techniques, the emphasis is on probing, to understand cause-effect relationships. Depth Interviewing is normally with individuals, while both Focus Group Discussions and Case Studies may look at group perceptions and be guided by group dynamics (Myers, 1997b, Mani, 1999).

3.3.1 Action Research

Action research is a practical, problem-solving approach to research, which is carried out over long periods of time (Bell, 1992). Action research is useful for projects that require specific knowledge for a specific problem within a specific situation and is often used as part of a problem solving strategy along-side research (Silverman, 1993). Traditionally it has been used within organisational development or educational research rather than within an information systems domain (Myers, 1997b). Given that there was neither a clear problem to be solved nor a definitive hypothesis to be tested and time scales were limited, selecting this methodology was deemed inappropriate for the research involved.

3.3.2 Ethnography

Social and cultural anthropologists wishing to study some aspect of society or culture in depth originally developed the ethnographic approach to research. Using participant observation the researcher would attempt integration with the unit by immersing themself in the field under study to research the phenomenon within its context (Silverman, 1998). This approach is now no longer restricted to anthropological studies and is used within other fields including the information systems domain (Myers, 1997a). This approach was not selected for two reasons.

Firstly, the ethnographic approach is not particularly suitable for the area under study due to the interpretive and reflective nature of the data.

Secondly, the information required for this work could be collated without the need for close and in depth observation of teachers. Even if this approach was suitable for the needs of this study, the financial costs and time allocation that would be needed exceeded the resources available.

3.3.3 Grounded Theory

In 1967, two academic sociologists, Barney Glaser & Anselm Strauss at UC-San Francisco put forth Grounded Theory Development as a systematic approach to generating new conceptualisations of what is going on in newly emerging areas of study. Their seminal work, "The Development of Grounded Theory" (1967), moved researchers past the hypothesis-testing uses of raw data into the hypothesis-generating potential of their observations. The approach has been steadily expanding its reach within academia - through sociology and social anthropology and, more recently into applied disciplines like educational research.

Grounded theory is a research method that seeks to develop theory that is grounded in data systematically gathered and analysed. Grounded theory is an inductive, theory discovery methodology that allows a researcher to develop a theoretical account of the general features of the topic while simultaneously grounding an account in empirical observations or data (Myers, 2003, Myers, 1997b). Grounded theory approaches are becoming increasingly common in Information Systems Research because the method is extremely useful in developing context-based, process-orientated descriptions and explanations of an observed phenomenon (Myers, 2003, Myers and Avison, 2002).

Grounded analysis is a technique for finding out how people perceive complex stimuli, which has been refined over many years. Grounded analysis is an especially powerful tool for developing new-concepts, profiling market segments and generating creative guidelines (Rust, 2003).

This approach was considered appropriate for the study as it would enhance and enrich the data by using an iterative re-use of the captured information enabling a greater clarity and depth to the research.

3.3.4 Case Study Methodology

The primary analytical method and approach selected for this study was the case study approach identified by (Benbasat et al., 1987). This approach is the most commonly used qualitative method for research in information systems (Myers and Avison, 2002).

3.3.5 Justification for using Case Study Methodology

(Benbasat et al., 1987) state that case research is suitable for studies that are in early or formative stages or where the experiences of the subjects are important and the context within which they operate is vital. This corresponds to the area under investigation: this research was conducted in an attempt to gain insight into the perceptions of the participants (the teachers) within their context (the school environment) with regards to E-learning concepts. With little formal research conducted in this area, the case study approach was helpful in identifying and exploring areas for further research and aiding hypothesis generation (Carroll et al., 1998).

(Benbasat et al., 1987) list eleven key characteristics of case studies, which are shown in Table 5: The table lists these key characteristics with the corresponding aspects relating to this study, demonstrating the suitability of the case study approach for this project.

Further to this, (Benbasat et al., 1987) provide three reasons to suggest why the case study approach is suitable for Information Systems research strategy, all of which were appropriate to this study:

1. The researcher can study the information system in a natural setting
2. The researcher can answer "how?" and "why?" questions
3. It is suitable for studies in which little formal research has been previously conducted

Given that the time scales for this research were restricted, the case study approach is appropriate for researchers who wish to investigate a particular phenomenon to some depth in a short time frame. The results from this research were not expected to provide specific answers, it was anticipated, rather, that the outcomes of this study should add insight to any further research. This was a key-supporting factor for the selection of the case study methodology.

Nine participants were involved in the case study and were subsequently interviewed during the course of the project.

	Key Characteristics of Case Studies	Application to this Research Study
1	Phenomenon is examined in a natural setting	Observation and interview with teachers in their school surroundings
2	Data are collected by multiple means	Data collected by interviews and observation
3	One or few entities (person, group or organization) are examined	Research concerned itself with the perceptions held by the teachers
4	The complexity of the unit is studied intensively	The focus was on the relationship between teachers and E-learning as an educational tool
5	Case studies more suitable for exploration, classification and hypothesis development stages of the knowledge building process	No definitive hypothesis was tested as such, the approach was more exploratory Outcomes can be used as a building process for further research to be conducted
6	No experimental controls or manipulation are involved	No experimental controls or manipulations were involved
7	The investigator may not specify the set of independent and dependent variables in advance	Independent or dependent variables were not identified in advance
8	The results derived depend heavily on the integrative powers of the investigator	The results from the study were drawn from the observations and interviews. Great care was observed in the construction and planning of interviews and observation techniques with regard to reliability and validity
9	Changes in site selection and data collection methods could take place as the investigator develops new hypotheses	Site selection and appropriateness of the E-learning environment changed during the planning stages as the aim of study was clarified and expanded
10	Case research is useful in the study of "why?" and "how?" questions because these deal with operational links	The type of data collected was "how?" and "why?" questions
11	The focus is on contemporary events	Research area is contemporary and current, and expected to grow rapidly
Source: (Benbasat et al., 1987)		

Table 5: Key characteristics of the case study methodology

3.4 Ontology

/ɒn'tɒlədʒi/ *noun* the science of being, as such. [New Latin, from Greek]

--**ontological** /ɒntə'lɒdʒɪkəl/, *adjective*
--**ontologist**, *noun*

The Macquarie Concise Dictionary defines Ontology as: -

Figure 4: Definition of Ontology

An Ontology is a specification of a conceptualisation pertaining to the art and science of what is (Gruber, 1993, Gruber, 1992). The purpose of Ontology is to examine into the fundamental nature of the Being of anything. There are two fundamentally opposite positions on the beliefs of objects in the real world, these being Objective and Subjective (Neuman, 2003).

3.4.1 Objective

The Objective stance is composed of three main beliefs.

- That observation of tangible phenomena should be external in nature, factual, precise and conducted logically. The researcher must be logical in their approach to investigating the phenomena, and enter the research as a whole without any preconceived personal decisions in the direction of the research (Neuman, 2003).

- The personal prejudices and cultural values of the researcher must remain segregated from the phenomena to allow value free, amoral and neutral observations of the phenomena to be conducted (Neuman, 2003).

- The data collated from the phenomena must be free of non-random errors and unbiased in nature to ensure the validity both internally and externally of the research. This procedure requires that the researcher be devoid of their own personal opinion, only accept supported views about the phenomena, and reporting techniques and technical correctness must be assured (Neuman, 2003).

3.4.2 Subjective

The subjective stance holds the view that the researcher is intimately involved with the phenomena and cannot conduct observations of the participants if detached from the phenomena under investigation. Subjectivity guides everything from the choice of the topic that the researcher is studying, to formulating hypothesis, to selecting methodologies, and interpreting data (Ratner, 2002). Past experiences, current viewpoints and cultural convictions can all have influence on how the researcher perceives the phenomena (Ratner, 2002, Neuman, 2003).

Objectivism integrates subjectivity and objectivity because it argues that objective knowledge requires active, sophisticated subjective processes – such as perception, analytical reasoning, synthetic reasoning, logical deduction and the distinction of essences from appearances. Conversely, subjective processes can enhance objective comprehension of the world (Ratner, 2002).

3.4.3 Research Ontology

This research aims to gain insight and empathy into the current perceptions of teachers regarding their current level of exposure to, combined with both their pleasant and unpleasant past experiences with utilisation of, E-learning. Recognising the fact that schools are of a social construct nature, this researcher needed to become subjective in any successful approach to observe this phenomenon (Silverman, 1998).

3.5 Epistemology

The Macquarie Concise Dictionary defines Epistemology as: -

/əpɪstə'mɒlədʒi/ *noun* the branch of philosophy that deals with the origin, nature, methods, and limits of human knowledge. [Greek: knowledge]

--**epistemological** /əpɪstəmə'lɒdʒɪkəl/, *adjective*

--**epistemologically** /əpɪstəmə'lɒdʒɪkli/, *adverb*
--**epistemologist**, *noun*

Figure 5: Definition of Epistemology

Epistemology is study of theories of knowledge or ways of knowing, particularly in the context of the limits or validity and how we come to understand the various ways of knowing and learning.

The definition of the term "learning" in this study is situated within the human and social constructivist paradigms (Mintzes et al., 2000, Mintzes, 2003). From these perspectives it is considered that learners build knowledge and understanding for themselves through their personal, social and culturally mediated experiences (Bransford et al., 1999). Learning is viewed as both a process and a product that encompasses several dimensions including, socio-cultural, cognitive, aesthetic, motivational, and collaborative (Bransford et al., 1999, Mintzes, 2003).

Learning is often gradual, incremental, and assimilative in nature where changes in knowledge and understanding are produced through exposure to successive experiences, which are interpreted in the light of prior understanding (Woo, 2001). A person's knowledge and understanding is thus dynamic and in a continual state of construction as new experiences are encountered and interpreted by the learner.

As (Anderson and Piscitelli, 2002) explain

> *"To these ends we see learning as any change that occurs in the person's knowledge, understanding, and/or disposition."*

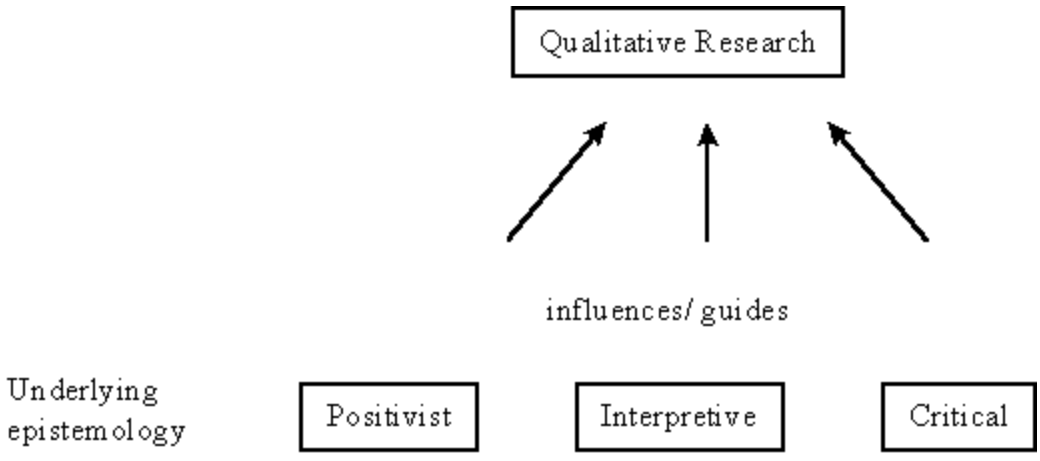

Figure 6: Epistemological Relationships

The three main epistemological positions in Information Systems research, as shown in Figure 6: Epistemological Relationships, are discussed below.

3.5.1 Positivism

Positivism is a position that holds that the goal of knowledge is simply to describe the phenomena that we experience. The purpose of science is simply to stick to what can be observed and measured. Knowledge of anything beyond that, a positivist would hold, is impossible (Trochim, 2002).

Positivists also generally assume that reality is objectively given and can be described by measurable properties, which are independent of the observer (researcher) and their instruments. Positivist studies generally attempt to test theory, in an attempt to increase the predictive understanding of phenomena.

In a positivist view of the world, science is seen as the way to get at truth, to understand the world well enough so that people might predict and control it. The world and the universe are considered deterministic; they both operate by laws of cause and effect that could be discerned if the unique approach of the scientific method is applied (Trochim, 2002).

Deductive reasoning can be used to postulate theories that can be tested. Based on the results of studies, it may well be conceivable that a proposed theory doesn't fit the facts well and so needs to be revised to better predict reality. Positivists also believe in empiricism, the idea that observation and measurement is the core of the scientific endeavour. The key approach of the scientific method is the experiment, the attempt to discern natural laws through direct manipulation and observation in an attempt to predict the future (Hammersley, 1999, Trochim, 2002).

3.5.2 Interpretivism

Interpretive researchers start out with the assumption that access to reality is only through social constructs such as language, consciousness and shared meanings. The philosophical base of interpretive research is hermeneutics and phenomenology (Boland and Day, 1991, Neuman, 2003, Bleicher, 1980).

Interpretive studies generally attempt to understand phenomena through the meanings that people assign to them. This view is directly opposite to the Positivist stance in which science must be objective, by claiming that all observations are

affected by a large array of higher involving issues such as personal viewpoints and past experiences of the researcher (Darke and Shanks, 1997, Wood-Harper, 1992).

Interpretive researchers also recognise and support that language and semantics may contain different meanings for each unique individual and only by a deep understanding of the phenomena holistically can insightful knowledge be gained (Myers, 1997b, Myers and Walsham, 1998).

Consequently, unlike Positivist research activities, the results of Interpretive research are not generally repeatable, nor or they generally applicable to a wide range of situations and scenarios. Nevertheless the results are extremely significant for the related scenario and participants as well as the researcher, and can be influential in similar situations that closely resemble the original research (Myers, 1997b, Bernstein, 1983, Butler, 1998).

3.5.3 Critical Social Science

Critical social science is defined by (Fay, 1987) as practical social science that inspires people to become socially active to correct their socio-economic and political circumstances so that they might have their express unmet needs satisfied. Fay discusses three core ideas of critical social science: enlightenment, empowerment and emancipation.

Enlightenment

Enlightenment educates people about their particular problematic situation and their potential capacity to change their situation in order to satisfy their unmet needs. Enlightenment is achieved through reflection, discussion (communication) and determination of the "quasi-causes" of their problematic social condition (Fay, 1984, Fay, 1987, Klein and Myers, 1999).

Unrestrained communication must be allowed and fostered by the social and political institutions of the society to ensure a true dialogue. There must also be an agreement among participants of the dialogue on the meaning of the words, gestures and symbols used in the dialogue and communications process. True communication is based on a shared understanding of the language used to convey messages (Klein and Myers, 1999).

Empowerment

Empowerment is considered as a practical force which stimulates a people to take action, which is meant to improve their social condition (Fay, 1987). The recipients of an expected positive result take the social actions. It is not the "expert" who decides the action to be taken to improve others' quality of life. It is the recipient of the service that makes the determination (Susman, 1983, Fay, 1987).

Emancipation

Emancipation is liberation resulting from social action. That is, a people become emancipated, through their reflection and their own social action, from an oppressive, problematic, social situation (Bernstein, 1983, Habermas, 1984).

Critical researchers assume that social reality is historically constituted and that it is produced and reproduced by people. Although people can consciously act to change their social and economic circumstances, critical researchers recognize that their ability to do so is constrained by various forms of social, cultural and political domination (Fay, 1987).

The main task of critical research is seen as being one of social critique, whereby the restrictive and alienating conditions of the status quo are brought to light. Critical research focuses on the oppositions, conflicts and contradictions in contemporary society, whilst also agreeing with the Interpretivism stance that the examination of Social Science phenomena should not be objective (Neuman, 2003, Hirschheim and Klein, 1994, Ngwenyama, 1991, Klein and Myers, 1999).

3.5.4 Research Epistemology

The research focuses upon the perceptions of a group of primary school pedagogues and their experiences with E-learning within their own classroom environments. Furthermore this research endeavours to understand projected future scenarios in education as envisaged by the participants.

Critical Social Science epistemology is viewed as inappropriate as the researcher is has not been inserted into the school environment to alter or make any differences, merely observe and understand the data as it emerges from the interview process.

The aims of this research are mainly subjective, so an interpretivist epistemology is regarded as being the most appropriate approach for this study. Within the selected group of participants there are differing cultural and ethnic backgrounds, this combined with their differing levels of experience and seniority whilst with the Tasmanian Education Department will give credence, depth and validity to the research by the rich, insightful, and often shared knowledge provided by the research participants.

3.6 Methodological Conclusion

By using an overall qualitative methodological approach, incorporating both grounded analysis (thus allowing the data, through an iterative analysis approach, to fully propagate any emergent themes or ideas that are present in the data) and case study analysis techniques (because of the organisational and not technical issues involved), would best enable this research to produce a rich picture of the perceptions of Primary School teachers in relation to E-learning while also acquiring a detailed conceptual database of information for any future research.

3.7 Sampling Techniques

(Miles and Huberman, 1997) State that sampling is crucial for later analysis. A qualitative researcher rarely has the luxury of, or the time to draw on, a large sample base for intense analysis. Unlike the quantitative researcher who uses a pre-planned approach based on mathematical theory, a qualitative researcher selects cases gradually, with the specific content of a case determining whether it is chosen or not (Neuman, 2003).

3.7.1 Purposive Judgemental Sampling

Qualitative samples tend to be purposive, rather than random. Sampling in qualitative research usually requires the setting of boundaries to define aspects of the case, as well as linking the study directly to the research question. Qualitative sampling is often theory-driven, initially by the demands of the research, or progressively as in a grounded theory mode (Miles and Huberman, 1997).

No.	Type of Sample	Principle
1	Haphazard	Get any cases in any manner that is convenient
2	Quota	Get a preset number of cases in each of several predetermined categories that will reflect the diversity of the population, using haphazard methods
3	Purposive	Get all possible cases that fit particular criteria, using various methods
4	Snowball	Get cases using referrals from one or a few cases, and then referrals from those cases, and so forth
5	Deviant Case	Get cases that substantially differ from the dominant pattern (a special type of purposive sample)
6	Sequential	Get cases until there is no additional information or new characteristics (often used with other sampling methods)
7	Theoretical	Get cases that will help reveal features that are theoretically important about a particular setting/topic
Source: (Neuman, 2003)		

Table 6: Types of Non-probability Sample Methods

There are seven differing principle non-probability sampling types available to the qualitative researcher (See Table 6: Types of Non-probability Sample Methods). (Neuman, 2003) describes purposive sampling as being acceptable when a researcher wants to identify particular types of cases for in-depth investigation. In this case, the selection of unique individuals within an established cultural environment that would prove especially informative due to the nature of their personal experiences and thoughts.

Type of Sampling	Purpose
Maximum Variation	Documents diverse variations and identifies important common patterns
Homogenous	Focuses, reduces, simplifies, facilitates group interviewing
Critical case	Permits logical generalisation and maximum application of information to other cases
Theory based	Finding examples of a theoretical construct and thereby elaborate and examine it
Confirming and disconfirming cases	Elaborating initial analysis, seeking exceptions, looking for variations
Snowball or chain	Identifies cases of interest from people who know people who know what cases are information rich
Extreme or deviant case	Learning from highly unusual manifestations of the phenomena of interest
Typical case	Highlights what is normal or average
Intensity	Information-rich cases that manifest the phenomenon intensely, but not extremely
Politically important cases	Attracts desired attention or avoids attracting undesired attention
Random purposeful	Adds credibility to a sample when potential purposeful strategy is too large
Stratified purposeful	Illustrates subgroups; facilitates comparisons
Criterion	All cases that meet some criterion; useful for quality assurance
Opportunistic	Following new leads; taking advantage of the unexpected
Combination or mixed	Triangulation, flexibility, meets multiple interests and needs
Convenience	Saves time, money and effort, but at the expense of information and credibility
Source: (Miles and Huberman, 1997)	

Table 7: Types Qualitative Sampling Strategies

A stratified convenience approach was used in this study, purely based on the geographical closeness of public primary schools to the researcher, to select appropriate schools that would be then approached to participate in the research.

This differs from the simple random sampling approach, in which the total numbers of samples are randomly distributed over the entire sample population, in that more samples will tend to be focused in areas of higher availability and access. By allocating samples to strata according to the local variability, the overall effectiveness of the sampling strategy is increased.

Using this stratified sampling strategy; the population (teachers) was divided into several sub-areas, called strata (schools that operated within the Launceston city boundary and came under the auspices of the Tasmanian Public Education System). These strata were then divided into further sub-strata (newly appointed limited experience, experienced, grade taught, etc) on the basis of supplementary information (Neuman, 2003). The researcher then selected the required sample from each sub-stratum. For this research both subject and site selection were chosen using purposive judgemental stratified sampling techniques.

3.7.2 Selected Participatory Subjects

A conscientious effort was made to include a diverse range of participants in the interviewing process. Subjects selected for this research were Primary School teaching staff that had experienced diverse degrees of contact within a level of an E-learning environment. Participants were also selected based on their employment category, from newly appointed graduate teacher through to experienced senior school management staff. Some had little or no experience in the environment while others actively supported and participated in the environment. All were able to answer questions regarding their perceptions on E-learning. A multiple case study approach was used, allowing patterns of similarities and disparities to be identified.

3.7.3 Selected Participatory Sites

(Yin, 1994) although being primarily a Positivist researcher, presents criteria that can be also be adopted by Interpretivist research, and was found useful in selecting potential participatory research sites:

1. Literal replications

2. Theoretical replications

Literal replications are sites where similar results are predicted to occur. Theoretical sites are locations that are chosen where contradictory results are predicted to occur. Using careful site selection (Benbasat et al., 1987) note that the researcher can extend the initial objectives of the study if required. The subjects and sites selected were all actively involved the teaching of Primary School students and contracted to the Tasmanian Education Department. From this perspective, there was potential for both literal and theoretical replication sites. This allowed a framework for comparative/contrast work to be constructed from the data collected.

For this research both subject and site selection were chosen through purposive judgemental sampling (Neuman, 2003).

3.7.4 Participant Selection Limitations

In other research the sample used for this project would almost certainly raise issues of sample bias and would therefore question the reliability and validity of the data collected. However, in this study the interest lay mainly in understanding and discovering the experiences relating to the perceptions of the teachers and only generalising, not applying, these findings to a larger sample.

3.7.5 Adopted Research Strategy

Combining the purposive judgemental method, with a stratified purposeful sampling strategy was considered the most effective way to overlay the larger sample population of all teachers with the selected sample of teachers for this study.

Due to the scope and nature of the study, it was decided that a purposive judgemental sampling process with a stratified purposeful approach be adopted.

3.8 Participant Selection Process

An introductory letter was sent to the Principals of the selected schools explaining the object of the research study. An informal face-to-face discussion with selected school principals identified suitable, as well as research desirable, staff for the interview process.

3.8.1 Interview Information Letters

Once the school principals consented to assist with the study, and participants were identified, information letters (Appendix A: Participant Information Letter) were distributed to those selected teaching staff asking them to consider assisting the project.

3.8.2 Interview Schedules

Once acceptances were received, participants were contacted, and an interview time scheduled. Participation was on a purely voluntary basis with appointments set at a mutually convenient time for both the researcher and the participant.

3.8.3 Outcomes of Selection of Participants

From those respondents agreeing to assist the study, detailed demographic information was ascertained, which assisted in providing extra detail and clarity to the study. This information is presented in chapter 4.

3.9 Data collection methods

The data collected was of a qualitative nature. The information of most relevance to the research was that which enabled a picture to be built up identifying the perceptions of interaction and levels of involvement between the teachers and the E-learning environment. Brainstorming generated questions related to this area and a mind map was drawn up, using multi-nodal links a wide variety of topics and questions of interest were produced. These topics were then "siphoned" off into relevant categories for question generation.

3.9.1 Semi Structured Interviews

Each participant was asked to schedule an interview of forty minutes, up to one hour in duration. Interviews were scheduled to take place at the school whenever possible

to allow for increased comfort on the part of the participants. Interview questions - content and justification - are covered later in this section.

Interview Process

The use of interviews as a data collection method within the case study approach is also widely documented. Both (Yin, 1981) and (Benbasat et al., 1987) recognise the use of interviews as valid data collection techniques. The use of semi-structured open interviews allows the interviewer to probe for more information on certain topics.

Despite the benefits of using interview techniques there are possible limitations caused by interviewer bias. Misdirected prompting, problems with question wording and assumptions that reciprocal understanding is in place can influence and possibly distort the data collected (Yin, 1994).

The method of interviewing loosely drew on the concepts of the three interview approach outlined by (Seidman, 1998). Seidman developed an in-depth phenomenological interviewing method, usually used when there are a limited number of participants interviewed. The method consists of three separate interviews of ninety minutes each where the researcher asks about the participant's thinking prior to an experience, then asks what the actual experience was like, and concludes by asking for reflective thinking about the experience. According to Seidman:

> *"The first interview establishes the context of the participant's experience. The second allows participants to reconstruct the details of the experience within the context in which it occurs. And the third encourages the participants to reflect on the meaning their experience holds for them" (Seidman, 1998).*

The nature of this research study did not require the three interviews. Because several participants were interviewed, rather than a limited number, and the study was designed to investigate any emergent themes rather than apply any final recommendations, this research condensed the approach into one interview.

Ethics Procedures and Participant Consent

The first step of each interview included a review of the consent form. This written document was developed according to the requirements of both the Northern Tasmania Social Sciences Human Research Ethics Committee, and the Tasmanian

Department of Education's School for Improvement Review and Performance Measurement, Office for Educational Review.

The consent form included information about the use of data, the participant's right to withdraw, the participant's right to review the written documentation, confidentiality, and also the legal status of the data. Answers were provided when participants had questions. The participants were asked to sign the document and received a copy of it (Appendix B: Participant Consent Form). Participants were asked for their permission to digitally record the interview. Confidentiality and a code of ethics to maintain privacy were emphasised.

Basic demographics were incorporated into the initial question set posed by the researcher – so no supplementary information concerning the participants was captured outside the official interview. To maintain confidentiality, names were never used and all data was maintained in a locked cabinet in the researchers office.

Follow up E-mails

Data was also collected through the use of e-mail after interviews took place. This had its advantages in several scenarios: once the interviews were transcribed, follow-up work was conducted through the use of e-mail to clarify details and misunderstandings where necessary; once themes from the interviews became apparent it was possible to ask questions omitted in face-to-face interviews. As newer literature became available follow-up questions on the applicability of certain scenarios was possible.

3.9.2 Interview Framework and Question Topics

The interview process was fragmented in seven topical sub categories of interest, each with a small range of pertinent questions designed to facilitate as much rich detail from the interviewee as possible (Appendix C: Interview Question Format).

Personal Issues

The first part of the interview is designed to uncover whether or not the participant is comfortable with the concept of E-learning, computers in general and any experience they may have had with technologies in general. This will also aid in breaking the

ice, so to speak, as well as providing some background information about the participant, as the questions are designed to be general in their nature.

Teacher's process of maintaining and improving skills

These questions in the second part of the interview schedule are designed to facilitate further knowledge on whether or not an educator is required to maintain and upgrade their personal skills, how often, to what degree, and by whom.

Teacher's personal comfort with current technologies

The third area of data collection is designed to ascertain what levels of personal control the participant may apply on the technological advancement into their comfort-controlled domain of the classroom environment.

Belief of student's comfort with current technologies

Some basic information is required at this point to assist in applying rigour and depth to the interview by providing some related background information as to the perceived level of acceptance by students of E-learning in general.

Educator's preferences for activities using E-Learning

In this section of the interview the educator will offer insight into, as well as highlight their preferences as to what, in-class activities will benefit from the introduction of E-learning as a tool. The term E-learning used during the course of the rest of the interview is used in application to both full on-line E-learning experiences as well as in-classroom teacher assisted tasks.

Traditional versus new age technology

This portion of the interview is attempting to ascertain if the educator is comfortable with the potential concept of technology progressively taking over an educator's traditional role.

Future uses of computer technologies

Futuristic visions of technology no matter how imaginative can, at some point, be interpreted to have potential for addition to teaching processes. That is, those who develop and create information and how it is to be disseminated to learners will use

technology in imaginative ways. This section of the interview is an attempt to attract such imaginative information from the participants.

3.9.3 Observations

The use of observation as a method of data collection is well documented (Bell, 1992, Benbasat et al., 1987, Neuman, 2003). It works well in case research and is appropriate for this area of research. There are however several limitations and potential problems that have been identified. Potential recorder bias, obtrusive influence and language assumptions can all affect the reliability and validity of the data collected.

The use of observations in this study were limited by both ethical and confidentiality demands and are therefore limited to only adding detail to the interview information gathered – in an effort to input further rich information into the case study.

3.9.4 Completion of Interviews

At the completion of the interview, the interviewee was given the opportunity to clarify any point they had made, and also allowed to ask questions of the researcher. All interviewees were thanked for their participation, and permission was sought from them to allow the researcher to contact them at a later stage in the project if it was felt any issues or comments needed further clarification.

3.9.5 Use of Digital Recorders/Transcribers as a Medium

All interviews were digitally recorded for transcription purposes. There is much written in the literature concerning the reliability of working with recordings and transcripts. (Peraklya, 1997) states that using recordings and transcripts eliminates many of the problems associated with the recording of qualitative information, specifically field notes and the limited public access to them. (Peraklya, 1997) also warns researchers of several important factors affecting the reliability of tape recordings and transcripts. These include:

- The decision of how much to record
- The technical quality of the recordings
- The adequacy of transcripts
- The inclusion of vocal expression in initial transcripts

These issues were considered and because only nine interviews were recorded the decision was taken to record and transcribe all interviews completely thus providing a wide scope and full database of information from which to extract information. Each interview was fully transcribed in detail, noting and including the many aspects of vocal expression of the interviewees.

> *A rich transcript is a resource of analysis: at the time of transcribing, the researcher cannot know which of the details will turn out to be important for the analysis (Peraklya, 1997).*

3.10 Pilot Interview

Research into teacher's perceptions is exploratory by its very nature; because of this, a researcher cannot fully understand issues of dynamics within the complex social situation within a school environment or the wording of pertinent questions until after familiarisation with the collected data. Therefore testing of the interview process was deemed necessary (Miles and Huberman, 1997).

3.10.1 Interview Motivation

Being a parent of Primary School aged children does not necessarily mean that the researcher has a full understanding of the social interaction between children and their teachers, or a conceptual grasp of teaching methods and their implementations. To fully comprehend these processes would indeed take some time to become conversant with the concepts involved. This then became the motivational factor in conducting a pilot interview.

3.10.2 Pilot Participant Selection

The pilot participant selected was known to not be currently connected to, or employed by, a Tasmanian primary school, but had held a senior position within the Tasmanian Education Department for some years previously. As this participant was also engaged in similar research activities, although at a higher level, they were considered a most appropriate choice to assist ironing any problems within the interview process. This assisted in testing most of the topics of interest and general questions outlined in section 3.9.2 (Interview Framework and Topics of Interest).

This also provided the researcher with a practice run, which outlined the difficulties using different styles of interviewing and how the questions were posed. This practice run also refined the questions content and general flow. Dubious and

irrelevant questions were identified, discarded or amended and examined again to ensure that the correct context was contained by each enquiry. This also assisted in ensuring that the likelihood of the questions asked during the actual data gathering interviews would be understood by the participants, enhancing the possibility of producing more meaningful data (Miles and Huberman, 1997).

The pilot participant approached to assist in this important task was informed of the increased role of advising the researcher on the content and context of the suggested format of the interview questions. Given the extensive, multifaceted and knowledgeable history of the selected participant to assist in this arduous task indeed proved extremely valuable in confirming the final format of the interview questions.

3.10.3 Identified Problematical Areas

The pilot interview identified a number of minor problems within the interview structure. Mainly in conjunction with correct teaching environment terminology, and general hints on how to approach someone within the teaching profession to ensure the participants enjoyed a non-threatening environment whilst being interviewed and also hopefully leaving them with the feeling that their time had been useful in assisting this research.

3.11 Data Analysis

A quantitative researcher codes after all the data has been collected. The researcher arranges measures of variables, which are in the form of numbers, into a machine-readable form for statistical analysis. Coding has different meaning in qualitative research. The raw data is organised into conceptual categories and create themes or concepts. Qualitative coding is formulated by conducting two simultaneous activities, mechanical data reduction and analytic categorisation of the data into themes (Neuman, 2003).

(Strauss and Corbin, 1997) defines three different kinds of qualitative data coding: open coding, axial coding and selective coding. The researcher reviews the data a minimum of three times using a different coding process each time thus coding the raw data (Neuman, 2003). The iterative nature of interpretive analysis may however require that the data be treated several times within each process before the researcher achieves an acceptable level of interpretation.

The basic idea of the grounded theory approach is to read (and re-read) a textual database (such as the research field notes and interview transcriptions) and "discover" or label variables (called categories, concepts and properties) and their interrelationships. The ability to perceive variables and relationships is termed "theoretical sensitivity" and is affected by a number of things including the researcher's reading of the literature and the researcher's use of techniques designed to enhance sensitivity (Glaser, 1978).

3.11.1 Open Coding

Open coding is the part of the analysis concerned with identifying, naming, categorizing and describing phenomena found in the text. Essentially, each line, sentence, paragraph etc. is read in search of the answer to the repeated question "what is this about? What is being referenced here?" (Strauss and Corbin, 1990)

These labels refer to things like schools, information meeting, friendship, etc. They are the nouns and verbs of a conceptual world. Part of the analytic process is to identify the more general categories that these things are instances of, such as institutions, work activities, social relations, social outcomes, etc.

The researcher is also trying to seek out the adjectives and adverbs - the properties of these categories. For example, about a friendship we might ask about its duration, and its closeness, and its importance to each party. Whether these properties or dimensions come from the data itself, from respondents, or from the mind of the researcher depends on the goals of the research (Strauss and Corbin, 1997).

The process of naming or labelling things, categories, and properties is known as open coding. Open coding can be done very formally and systematically or quite informally. In grounded analysis, it is normally done quite informally. In addition, as codes are developed, they can be used to write memos known as code notes that discuss the codes. These memos become essential information for later development into project reports.

3.11.2 Axial Coding

Axial coding is the process of relating codes (categories and properties) to each other, via a combination of inductive and deductive thinking. To simplify this process, rather than look for any and all kind of relations, grounded theorists

emphasize causal relationships, and fit things into a basic frame of generic relationships. The frame consists of the following elements:

Element	Description
Phenomenon	This is what in schema theory might be called the name of the schema or frame. It is the concept that holds the bits together. In grounded theory it is sometimes the outcome of interest, or it can be the subject.
Causal conditions	These are the events or variables that lead to the occurrence or development of the phenomenon. It is a set of causes and their properties.
Context	Hard to distinguish from the causal conditions. It is the specific locations (values) of background variables. A set of conditions influencing the action/strategy. Researchers often make a quaint distinction between active variables (causes) and background variables (context). It has more to do with what the researcher finds interesting (causes) and less interesting (context) than with distinctions out in nature.
Intervening conditions	Similar to context. If we like, we can identify context with *moderating* variables and intervening conditions with *mediating* variables. But it is not clear that grounded theorists cleanly distinguish between these two.
Action strategies	The purposeful, goal-oriented activities that agents perform in response to the phenomenon and intervening conditions.
Consequences	These are the consequences of the action strategies, intended and unintended.
Source: (Glaser, 1992)	

Table 8: Basic Frame of Generic Relationships

It should be noted again that a fallacy of some grounded theory work is that they take the respondent's understanding of what causes what as truth. That is, they see the informant as an insider expert, and the model they create is really the informant's folk model.

This has created some controversy over the past few years with the separation of Glaser and Straus (Smit, 1999). (Glaser, 1992) now argues that this is a preconception on the part of the researcher and has no place in grounded analysis.

> *In grounded theory the analyst humbly allows the data to control him as much as humanly possible, by writing a theory for only what emerges through his skilled induction (Glaser, 1992).*

During the course of this study the researcher attempted to obtain and maintain a stance of not having speculative preconceptions or formulated theories, but simply to observe the data and allow it to develop and emerge into only those theories that were presented by the participants.

3.11.3 Selective Coding

Selective coding is the process of choosing one category to be the core category, and relating all other categories to that category. The essential idea is to develop a single storyline around which everything else is connected (Borgatti, 2003, Dey, 1999).

3.12 Reliability and Validity

Reliability is the extent to which a procedure will produce the same results under constant conditions (Bell, 1992, Neuman, 2003). In the case of this study, the reliability of the research results entailed whether or not the same findings would occur if the study were repeated in the same manner. There were however, difficulties in assessing and testing this stipulation because of the qualitative nature of the information collected and rapid change in the area under investigation.

3.12.1 Reliability

Great care was taken at the planning, implementing and analysis stages to ensure reliability was taken into consideration. (Benbasat et al., 1987) states that a clear description of the data sources and the manner in which they contribute to the overall findings of a study is an important aspect to the reliability and validity of the results. For this reason, a clear description of the data sources and methods used to gather those sources have been provided. Data collected using interviews were open to problems such as interview bias, misdirected prompting and issues of question wording. These issues were noted during the interview process and attempts were made to minimise these effects, although it is unlikely that interference was eradicated completely.

With regard to the results from observation techniques, the issues of reliability are somewhat easier to assess than data collected via interviews. Because much of what was observed was inanimate and static (such as technological deployments, computer and information systems, intranet solutions) the issues that typically affect the reliability of observation results such as potential recorder bias and obtrusive influence did not apply. Subsequently, these observations have high reliability.

3.12.2 Validity

Validity describes whether an item measures or describes what it is supposed to measure or describe (Bell, 1992). It is a much more complex concept than reliability

and there are many variations and sub-divisions to which researchers can investigate in attempts at ensuring validity of their results. (Bell, 1992) states that researchers involved with smaller projects without complex testing or measurements need not investigate the concept of validity too thoroughly but should examine results and methods critically. Noting this, a brief dialogue of the aspects of validity is discussed.

Face Validity

The easiest aspect to achieve, and the most basic kind of validity is face validity. Face validity is a judgement by the scientific community as to whether or not the indicator really measures the construct (Neuman, 2003). This aspect relies on the fact that readers will accept the definition and measurement fit of the instrument presented.

Content Validity

Content validity addresses whether or not a definition is represented within a measure. A conceptional definition contains a 'space' for thoughts and ideas that the researcher put forward that surround and pertain to the construct. An example in this research would be the measure of perception of the level of satisfaction that students may have concerning E-learning that is held by the teacher. How valid is the definition of student satisfaction? Are the views expressed indicative of the thoughts of the students? Does the definition of student satisfaction need to be expanded or narrowed in an attempt to fulfil the requirements of the research and thus be eligible for inclusion in the study?

Criterion Validity

This form of validity uses a set standard or criterion, cross referenced to the construct, to indicate the level of validity that may be compared to a similar construct that has been known to be acceptable. A concurrent validity indicates that the construct agrees with pre-existing values confirming its validity, where predictive validity conforms to logically construed future values or events relative to the construct.

Construct Validity

Validity means truthful. It refers to the bridge between construct and the data. Qualitative researchers are more interested in authenticity than validity (Neuman, 2003). However, (Peraklya, 1997) argues that construct validity is central to the overall validity of research. Construct validity is concerned with the relationship between a theoretical model and the observations made by the researcher. This is particularly relevant in this research, where the discussion of theoretical models and themes identified from interviews form the main part of the results. If the discussion of these theoretical concepts bears little relevance to the factual realities observed in the field, the findings of the research will be invalid and void.

To increase validity and to ensure accuracy, follow-up e-mails were used to discuss and clarify topics of discussion. Where relevant, portions of the research that discussed systems and observations were sent using e-mail to the respective interviewees for their confirmation that analysis and descriptions of observed models were correct. This ensured that what was stated in the research was factual and accurate.

3.12.3 Validity and the Generalisation of Findings

Another facet of validity relates to the generalisation of research findings. This topic has already been discussed with regards to sampling methods. The result of this research was produced from a relatively small sample population.

Within the research, the data has been kept as pure and free of bias as possible. Definitions of measures used in the interpretive analysis stages have been done from a neutral stance as possible to ensure no bias from the researchers viewpoints or previous life experiences. Any interpreted qualification of data is therefore based on observed and implied information from participants involved with the study and should be recognisable as being both conceivable and verifiable by readers of the research.

However, as previously stated, the intention of this research was not to produce definitive results that could be generalised and applied elsewhere. Therefore it is suggested that the findings presented are valid within the context discussed.

3.13 Research Limitations

Noting the limited scope of this study with regard to available time frame and sample size it would be interesting to expand this research to corporate several levels of schools (primary, secondary and tertiary) selected from the Tasmanian Education Department region of control. A wide spread study over a longer period of time using a larger sample size and a methodology that ensured stronger reliability and validity measurements would make an interesting contribution to the information management literature and the direction of Education Departmental awareness.

3.14 Chapter Summary

This was a phenomenological case study. As a result of interviewing teachers and observing their classroom environment, several themes emerged that provided new understandings of teacher's perceptions of E-learning. What it means to them, how it is being used and how it could be best utilised, particularly within a primary school education setting. These findings are presented in Chapter 4.

Chapter 4: Results and Evaluations

4.1 Chapter Introduction

This chapter presents a profile of the participants interviewed to provide general background information, which may assist in understanding the discussion surrounding the core categories and sub-themes that surfaced from the data analysis process. The data analysis from the three stage coding process revealed that there were three main categories. These were as follows:

- Educator Motivation
- Time Considerations
- Educational Focus

Within these categories were sub-themes that captured the thoughts, emotions, and fears contained within incidents experienced by the participants, which go toward fully explaining their current perceptions of E-learning. The relationship between the emergent categories and prevalent sub-themes will also be described.

4.1.1 Participant Profiles

To fully integrate the participants within the context of this study I felt it essential that a profile of all the participants, aimed at providing insight and background information as to their personal credentials, would also give an understanding of each of them as people responsible for the daily supervision and education of one of our countries most valuable resources – our children. As a part of the profiling process, all involved participants and schools were provided with an alias in order to protect their privacy. This participant profile data is presented in Table 9: Participant Profiles.

A total of nine teachers comprised the study sample. Four were male and five were female. The females were marginally younger than the males**,** with the age brackets of the males being [30-39], [50+], [40-49], [40-49] and the females being [40-49], [40-49], [40-49], [30-39], [40-49].

Alias	Gender	Age	Position	Primary Field	Teaching Experience	Grades Taught
(T1)	Male	30-39	Teacher	Science	0.5 yrs	Grades 5 & 6
(T2)	Female	40-49	Teacher/ICT	Primary School	23.5 yrs	Grades 1 & 2
(T3)	Female	40-49	Teacher	Primary School	20.5 yrs	Grades 3 & 4
(T4)	Male	50+	Principal	Primary School	30.0 yrs	Kindergarten to grade 6
(T5)	Male	40-49	Ass/Principal	Primary School	20.0 yrs	Kindergarten Grades 3 & 4
(T6)	Male	40-49	Teacher	Primary School	25.0 yrs	Grades 5 & 6
(T7)	Female	40-49	Librarian	Literature & Research	26.0 yrs	Kindergarten to grade 6
(T8)	Female	30-39	Teacher	Primary School	2.0 yrs	Prep and grade 1
(T9)	Female	40-49	Teacher	Early Childhood	26.0 yrs	Grades 1 & 2

Table 9: Participant Profiles

This table clearly demonstrates that the participants selected for this study were a diverse group, ranging from newly contracted teachers to very experienced personnel holding key positions within the educational infrastructure of a school environment.

Education and work experience

Both male and female participants had extensive education, with several participants having already obtained a module 5 accreditation (showing evidences of varied and constant use of computers in the classroom) – or well on their way to achieving this career milestone. The Education Department experience of the teachers involved within this study averaged out to slightly less than 20 years per participant.

Participants were also purposively selected to cover the range of grades found within an average primary school as well as supervisory, management and logistical positions within the context of the educational environments studied.

This diverse assemblage of participants generated significant meaningful data, which assisted in forming the core categories and sub-themes for this research. A discussion of these emergent core categories and sub-themes is presented below.

Why choose educating children as a profession?

Part of the demographic information collected touched briefly on the reasons behind the participants electing a career in a position within a Primary School environment. This important information gave some insight into their personal agendas for selecting this career path as well as powerful indicators to their perceptions of how and why they are doing what they are doing in their classrooms.

One participant admitted to entering the career path as an educator without the benefit of choice, simply because at the time: -

> *"Studentships made it affordable…"(T4).*

This was found to be especially true at the time of entry for this participant – as government funding was non-existent, and the realisation of scholarships was reserved for the few elite individuals that met the then current criteria of the individual academic organization concerned. (T7) further confirmed this limited choice of options by stating that: -

> *"There were limited professions for girls…even when given aptitude tests, girls were generally directed to teaching or nursing. I was unaware of the choices available…and anyway, I enjoy being around children."(T7)*

The most consistent answers received pertaining to preference of a teaching career; revolved around the premise: - that being a teacher was an intense personal interest and a great passion for the individual participant(s) involved. Examples of these responses include: -

> *"Children are societies and our future…and there isn't any profession more rewarding." (T8)*
>
> *"…I thought it was worthwhile." (T9)*
>
> *"I thought learning was vital to a person's independence and success. I thought children deserved to be treated with kindness." (T7)*

"I liked the idea when I was in grade 10. I even took a lesson and was critiqued by my teacher." (T6)

4.2 Educator Motivation

This core category captures the participant's reasons for initially undertaking and integrating technology and E-learning into their classrooms.**Error! Reference source not found.** depicts the three main sub-themes within this core category, which are also described in further detail below.

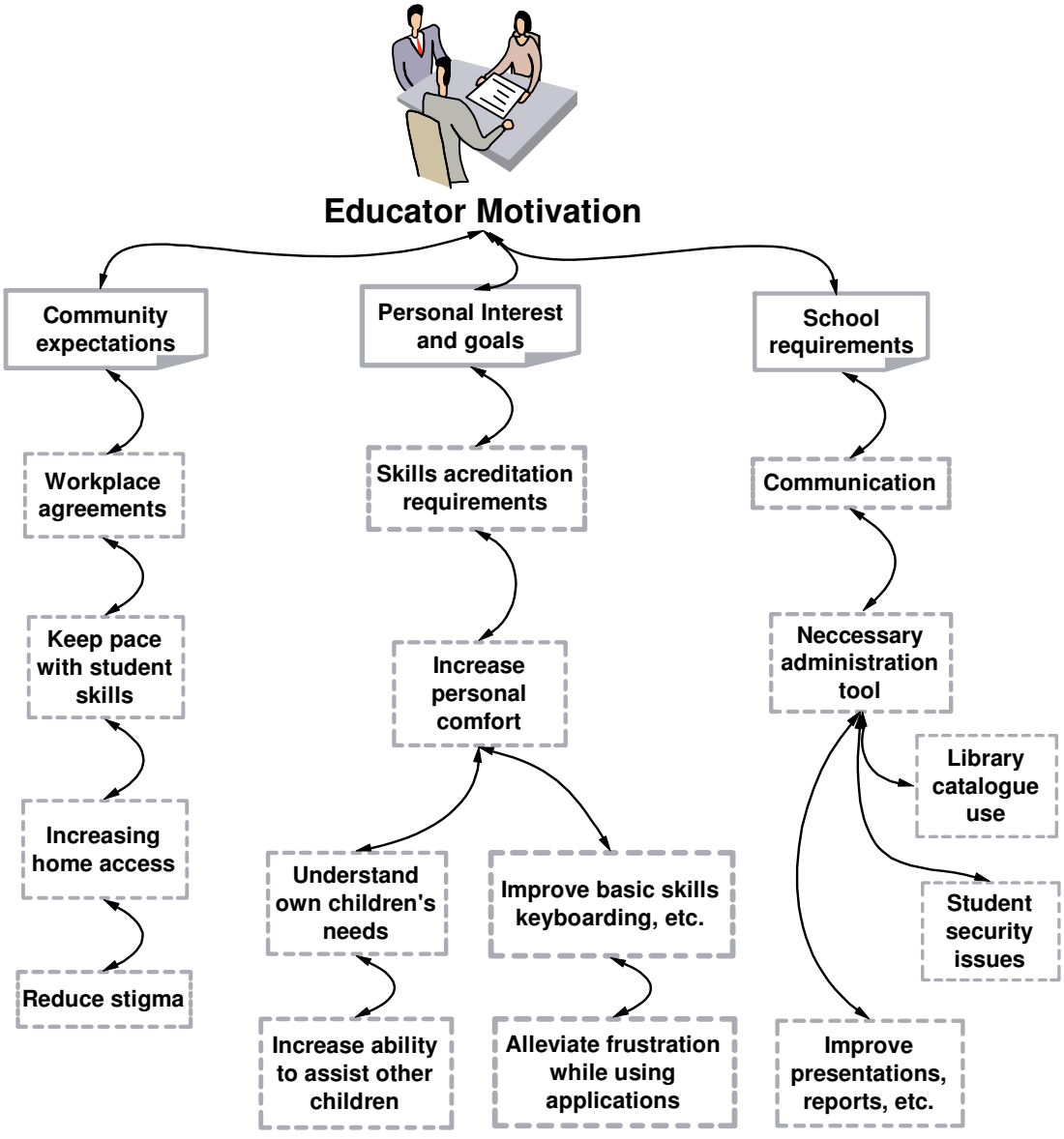

Figure 7: Educator Motivation

Data analysis revealed that educators have diverse reasons for employing E-learning within their classroom environment. Some of these reasons were by means of personal motivation and interest, others originated through a need or perceived requirement from today's social norms and influences, other reasons were anchored in simple requirement from the powers that be within the workplace setting.

4.2.1 Community Expectations

When talking about learning and teaching, people often refer to these processes as being contextually based or socially embedded. While it seems obvious that the goal of education is to prepare learners for the life outside the classroom walls, it seems that the how and why some things are done sometimes retain a certain level of obscurity. Some participant's seemed to accept with certainty the view that integration with technology is almost fatalistic. An example of an accepting view was provided by (T8) as: -

> *"Computers are the future of the workforce, therefore children need to be educated using them." (T8)*

This difficulty to articulate the bridge between the goals and the means of learning becomes more apparent when considered in context with societal demands on teachers and increasing access to technology for escalating levels of student populations. This perception was best summed up in a response by (T3): -

> *"Yes – it (the school) has to keep pace with the rest of the community." (T3)*

Workplace Agreements

Synonymous with Community Expectations is the fact that educators now have what is recognized as a Partnership Agreement in place. That such an agreement does exist, and is a motivating force in teacher/technology utilisation, was clearly stated in the following examples: -

> *"Proficiency in the module (5: showing evidence of varied and constant use of computers in the classroom) is required by our partnership agreement." (T7)*

> *"Pressure from senior staff to complete unit 5, as is stated on our partnership agreement with parents of the school." (T3)*

This is a semi-formal agreement between teachers, the school and society in general as to a code of conduct, skills management and an agreement of principles considered compulsory for successful edification of students with a leaning to holistic integration into broad-spectrum society.

Increasing student skills

The increasing incidence of children being kept occupied by gaming machines as an oft-used pretext for babysitting control has elevated many skills of those children in similar situations in relation to daily operating skills necessary to utilize hardware and software commonly found in classrooms across Tasmania. This perception was further explained by (T9): -

> *"…They (children) would like to play games all day…(their skills are) possibly better than many teachers." (T9)*

While some students appear to excel and flourish with operating a computer, there are divergent indicators that not all students are flourishing at the same level. This perception, albeit widely held, was best explained in this clarification from (T7): -

> *" The range of competence and familiarity is huge. Many are keen; few reluctant but still a large number with only basic skills…Wide range of reactions from obsessive through to reluctant, some arrogant – thinking they are superior in skills and that a computer holds all the answers. Some will avoid other work to be at a computer, even if the task has already been completed or is easy or predictable." (T7)*

The result of this activity appears to have resulted in a perceived as well as actual increase in skills by some students that far exceed those of even experienced teachers. This perception was further reinforced when (T4) stated: -

> *"We have still come a long way, but need to keep pace with technology and student knowledge."(T4)*

However, this upward trend in skill enhancement does not necessarily bode well for teachers or Education Department hardware, security issues are becoming increasingly paramount in the protection of the classroom Intranet infrastructure, (T9) goes on to affirm this by pointing out: -

> *"I have one child who needs to be constantly watched or he accesses and changes folders and files he is not meant to touch".*

Increased home access to computers by students

Lowering hardware costs, increasing average family incomes and a very real peer group pressure have all contributed to a marked increase in Personal Computer (PC's) workstations in the home. This fact was brought to light by comments from both (T6) and (T3): -

> *"I guess the pressure is on for a computer at home as most projects are being typed and a lot of research is done on the net…Out of 27 children, only 5 don't have access to computers at home." (T6)*

> *"Those that have them at home are very comfortable but others without them at home are generally very hesitant and want a human readily at hand for troubleshooting." (T3)*

Their observations as to the increased home ownership of PC's can be directly linked back to the fact that more computer-based activities were being introduced in advancing older grades within Primary schools.

Reduced student stigma

Students are no longer seen as *"nerds"* if they spend time on a computer rather than playing suburban sport on the local park grounds. The social swing to groups sharing game experience while sitting around the inevitable computer monitor or electronic gaming station is now increasingly vying for equal placement with sporting activities. This observation was articulated in remarks made by (T6): -

> *"Children like to interact with each other. They will certainly use computers more and more but probably only a third of the class are enthused about them." (T6)*

Observations indicate that in reality the child with the biggest, fastest or the latest machine is sometimes even considered the local neighbourhood hero – sometimes even eclipsing the *"sporting hero"*.

4.2.2 Personal Interests and Goals

Some of the participants agreed that their interest in technology and E-learning in general, while being necessary for their profession had a more personal and closer to home reason for developing their initial interest in E-learning. (T8) stated that *"Educating my children and an awareness of current technological progression" w*as a fairly high personal priority for them. While a similar view was also expressed by (T3): -

> *"…Wanting to use the WWW, to be a more effective teacher. Wanting to do what my own children can do…(and) personal frustrations in the speed of what I want to do…" (T3)*

Increase Personal Comfort

Participant's personal level of comfort, combined with their current skill level, dictated to some degree the use of E-leaning within individual classrooms. Emergent themes concerning personal agendas were also prevalent when analysing the data and this also contributed to the active level of integration into classroom activities, of electronic technology.

> *"We take lots of digital photos – most useful. I like searching for info re my profession, class research, ideas etc… I'd love a laptop for planning and word processing, and a digital camera for my class." (T9)*

While (T2) also made similar comments, aligning personal interests in corresponding defined areas of workplace importance, as well as confirming a need for educators to feel comfortable in what they are attempting.

> *"…Personal interest, curiosity, troubleshooting, specific needs of the school…Yes – it takes time – a big long learning curve. Teachers have to be skilled and at ease before it can really happen"*

(T4) shared a comparable view – pointing out that IT and E-learning are considered at the supplemental, and not always at a premium level, when compared with other areas of classroom teaching.

> *"We need to change classrooms and deliver better educational outcomes. Planning for IT is only one aspect needed in a modern classroom." (T4)*

Skills Accreditation Requirements

One of the more interesting sub-themes to emerge from the data was the link between personal ambition and personal goals by the acquisition of recognised skills accreditation. The Department of Education has a progression of modules that require teachers to undergo personal development and training in an attempt to meet defined criteria within each module. These modules can be completed, more or less, at an individual level and at a pace that suits each individual. As (T6) explains: -

> *"I am responsible for helping teachers obtain their computing modules. I am also heavily into video editing. All my children use computers for research so it is essential I can use a computer. All teachers are supposed to have done 4 modules and should be on module 5. Teachers are also expected to write reports on computer."*

Recognition for completion of these modules does however have associated rewards, either in salary or prestige for example, that can tend to add weight of potential incentive to pursuing completion of these modules.

4.2.3 School Requirements Motivation

With technology being instigated into many facets of societal daily life, many educators are confronted with the necessity in having to use this technology within process and procedures of their daily activities. As (T1) defines: -

> *"Keeping up to date with current technology and applying it …you have to…"*

An encompassing commentary describing the real necessity by educators to embrace technology – albeit with some reservations, was further explained by (T7): -

> *"The necessity to gain the next Department of Education module accreditation. There is a need to have a working knowledge of educational technology and to keep pace with students. Technology needs to be required of all educators but not forced on them. Time and resources for competent delivery need to be given. If teachers are responsible to implement it, they must have constant access to support in both hardware/software and net usage."*

Communication

The use of emails is becoming predominant form of communication for most organizations. Schools and other educational facilities appear to be no exception. Teachers with access to the technology are using email facilities to communicate to other sentients on a regular basis and so do the children with access to those facilities. Email is not only being used to send messages; it is also being used to communicate on higher levels via the use of electronically transmitted pictures and presentations. Pen pals of old are rapidly being replaced with email pals from across the globe. As (T2) describes: -

> *"…Lots – thrill of exchanging and communicating with others, web finds, their interest in seeing own works and photos published, sharing work with parents, celebrations of new skills, and having a choice of how to present work...Yes – L. S. C. W. Ch. (Look, say, cover, write, check), journal writing, designing, reporting, creating, email, communicating, etc....(Also)…software challenges."*

Administration Tool

Technology in most of today's organizations does carry a heavy burden, especially in the field of administration. The creation and promulgation of memos, reports and many other mandatory documents are quite easily passed over to uncomplaining computer workstations. This sentiment was clearly articulated in the following comment from (T7): -

> *"…Word documents, Internet research, library catalogues, scanning, publishing, and emails. I would prefer to use a computer for all documents - I rarely handwrite anymore."*

Library Catalogue Use

Computerised database repositories are becoming familiar tools in researching and presentation activities, as (T7) explains: -

> *"Computers are in constant use by people in the library and extras needing research/publishing plus online learners (Ad Astra). Our book resource will still be the major component especially for literature and for balanced research."*

Finding information faster this way appears extremely beneficial to both the current user and those users that also wish to access similar information.

Presentations

Many of the participants expressed a perception that using computer technology as a means of enhancing their project or report work was necessary to not only allow experience with handling differing layouts of hardware but to also allow creativity and originality aspects of students work to flourish. These perceptions were confirmed by the following comments: -

> *"Mainly…In the areas of project research and educational research I would say yes. All the kids have done power points and many will present their next projects that way."(T6)*

> *"…Researching and presentation of (Microsoft) word documents…"(T1)*

> *"…Many – especially processing and graphs, Power Point displays, digital photos and additions to them as well as editing video using EMAC." (T3)*

Student Security Issues

However, this upward trend in skill enhancement does not necessarily bode well for teachers or Education Department hardware, security issues are becoming increasingly paramount in the protection of the classroom Intranet infrastructure, (T9) goes on to affirm this by pointing out: -

> *"I have one child who needs to be constantly watched or he accesses and changes folders and files he is not meant to touch".*

Skills Accreditation Requirements

All participants discussed the necessity of training sessions that were mandatory for teachers attempting both new skills accreditation and maintenance of existing skills. Some of these skills areas are highlighted by the following comments: -

> *"EL's, Mental compilations Integrated Inquiry Based Learning. Some is school based, but the mental arithmetic is outside school hours and expected to be attended by everyone... EL's is more" (T3)*

Many educators articulated in some detail, the extent that they were required and expected to go to, and the extent that they personally would like to achieve in conjunction with higher-level curriculum planning associated within their school. (T3) explains further: -

> *"We have done a lot in the "Essential Learnings" and "Mental Compilations" in maths. We have also had a focus on "Integrated Inquiry Based Learning" with Kath Murdock but this ties in with the Essential Learnings. Each year I have to submit a professional development plan – where I list the school's focus and some personal focuses as well. I have also opted to do work on gifted and talented children." (T3)*

> *"… Modules of professional development…All facets of the curriculum eg Essential Learnings, numeracy, literacy etc, Department of Education requires it for registration…" (T8)*

Mandatory training and personal development time are however, inexorably linked to the funding available to each individual school, development and training in areas of personal interest are not given high priorities, as (T7) explains: -

> *"…Mostly internal modules, proficiency in the module is required by our partnership agreement…Theoretical Framework (Essential Learnings), pedagogies, behaviour management, gender issues, library updates, curriculum areas. There is a core-required time delivered by pupil free days and work back evenings (3:30pm – 7:00pm) about 6 full days equivalent. Individual areas of interest are encouraged but not required…Relief cost is considered before Personal Development time is endorsed for individual interest areas." (T7)*

Yet it appears that sometimes the two driving forces can sometimes be combined – or one added to sweeten the effort required to gain the other. (T2) explains more fully: -

> *"…Yes – Department of Education units. Have obtained Unit 5. I have also been asked to do the Education Departments – Grad. Diploma of educational computing."*

4.3 Time Considerations

The core category that emerged more emphatically than any other was in reference to time – its availability – and the widespread perception that there were not enough hours in a day to do every necessary activity required by pedagogical duties in general.

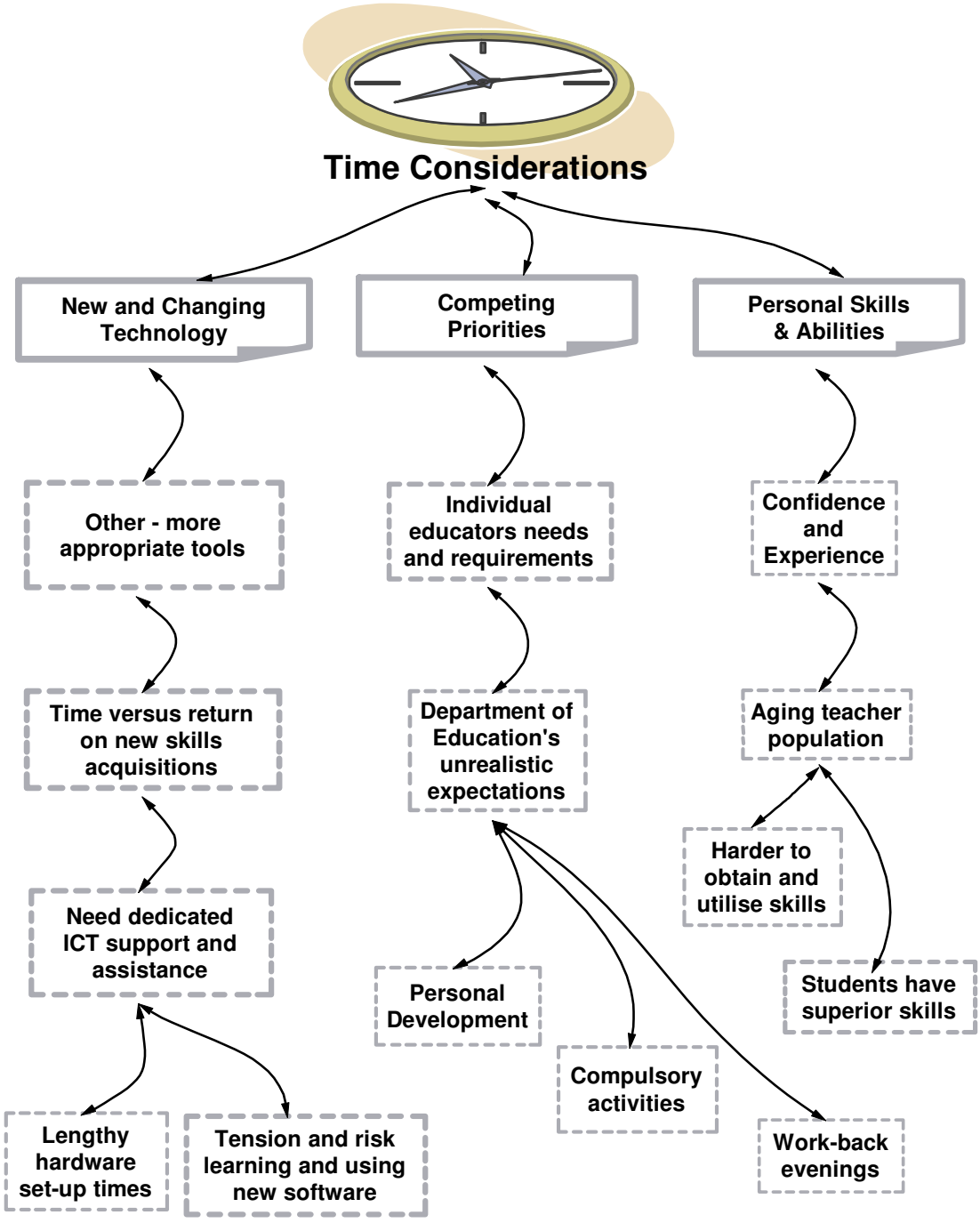

Figure 8: Time Considerations

4.3.1 New & Changing Technology

Technology is changing so rapidly that many educators appear hard pressed to keep up with theses advances, let alone satisfactorily integrate the technology into the classroom, several participants expressed concerns, as (T7) explains: -

> *"I always feel technology races ahead faster than we can cope and that is a specialist field. Can I manage it? How does it work? How will it fit? What does it supersede? What new hardware/software will I need to accommodate?*"

When asked if they as educators experienced any real concerns when meeting new technology, several responses were similar to those illustrated below: -

> *"Yes – the time to get up to speed sufficiently to be able to teach it to the class." (T3)*

> *"Yes - lack of time and facilities to use effectively and efficiently." (T8)*

> *"Some…and always a tension when trying something new...because it is very time-consuming to set up and we have three computers for twenty-three children." (T9)*

Other educators responded to the changing hardware situation by purchasing machines they were familiar with, and installing them into their classroom – thus ensuring they could maintain some form of control over what was made available to them. This was demonstrated in the following comment made by (T6): -

> *"We use computers a fair bit but not every second of the day. It depends what we are doing. Research, typing and maths are the main times. I have 3 computers in the class connected to the net and another 3 that I have bought, (old Macs)."*

While not personally feeling daunted by the integration of technology, (T6) went on to say: - *"The only problem is getting the time to find out how they work. I do know teachers who are literally terrified of computers."*

4.3.2 Competing Priorities

Many of the participants felt that perhaps ICT, although perceived as being an excellent tool, was not high on a list of priorities, nor was it seen as the most appropriate undertaking for a particular activity, as (T2) illustrates: -

> *"I still believe that there are some times when using ICT is not the most appropriate tool. I try to take the challenge to incorporate it into lots of learning experiences." (T2)*

(T3) also expressed a similar philosophy: -

> *"Regularly in class contract time we have an ongoing activity each week as well as incidental work when needed. When we do Integrated Inquiry work we regularly use the computers also. They are not used during reading or maths time."*

Other participants also stated that their time in class was at a premium, and having to use technology to conform to standards or procedures instigated by higher authorities – sometimes didn't warrant the additional time that had to be found and allocated to it. As (T6) describes: -

> *"Yes…but you have to put it in perspective. We have so much going on. Computers are just a small part now. (It also) Depends what is available. If there are modules available that sustain the interest of the children, I would use them otherwise I would continue to use them as I do today."*

(T6) also stated: -

> *"It is a drain both financially and time wise for teachers. It is much easier for students to become more skilled than the teachers because they have more time in their day to skill up. The time I spend on a computer per week - what am I no longer doing that I used to do so that I have time on a computer? Search engines get better; time will be more efficiently used. I don't think the department realises how much time teacher's waste on computers. It has become an extra for teachers, which means less time for other classroom duties."*

In conjunction with this theme of discussion, (T6) also illuminated a perception from the students' perspective that, they too, on occasion encompassed alternative priorities: -

> *"…Sitting in front of a computer can become boring. A lot of children don't read well enough to sit there all day. They like getting up and doing things."*

4.3.3 Personal Skills and Abilities

Hand in hand with both of the previously discussed sub-themes is the perception that planning and training for the introduction of any new technology encompassed new needs and skills that are necessary for the teacher to acquire. These take time and funding to advance to a point where an educator is both comfortable, confident and familiar in the use of any new technology, and that the attempt to transfer knowledge to students via any new medium will be reasonably successful to the point that the students will be able to operate with a set of similarly enhanced skills - relational to the current task(s) at hand.

> *"Yes...Teachers are at various levels of progress. We still need to stretch boundaries and possibilities in teaching practice."*

(T4) went on to attach additional insight to that statement: -

> *"We need to change classrooms and deliver better educational outcomes. Planning for IT is only one aspect needed in a modern classroom. I think this will rapidly improve as IT skills of teachers improve."*

(T4) also incorporated some more personal clarification with this additional comment: -

> *"ICT has motivated me to improve my skills and develop my teaching. I believe its (ICT) development in education is exciting and offers me lots of interest and I am keener to grow with it. I wish I had more time and more skills!"*

By and large – the general perception of time allocated to skills acquisition and allowances for familiarity by teachers were best demonstrated by the following comments: -

> *"Unless someone throws money at the proposal and withdraws teachers to develop units/experiences, the general classroom teacher will not have the time to do so." (T6)*

> *"Teachers do need to try new things. We need time to do this though. When we can see that ICT is very useful we adopt this in our practice…it is pushed politically but also the more teachers use ICT, the more comfortable we become with it." (T9)*

4.4 Educational Focus

Another core category that emerged from the data analysis is educational focus, which describes the forces integral, yet externally acting upon, the educator's perceptions of E-learning. The three main sub-themes are described I further detail below.

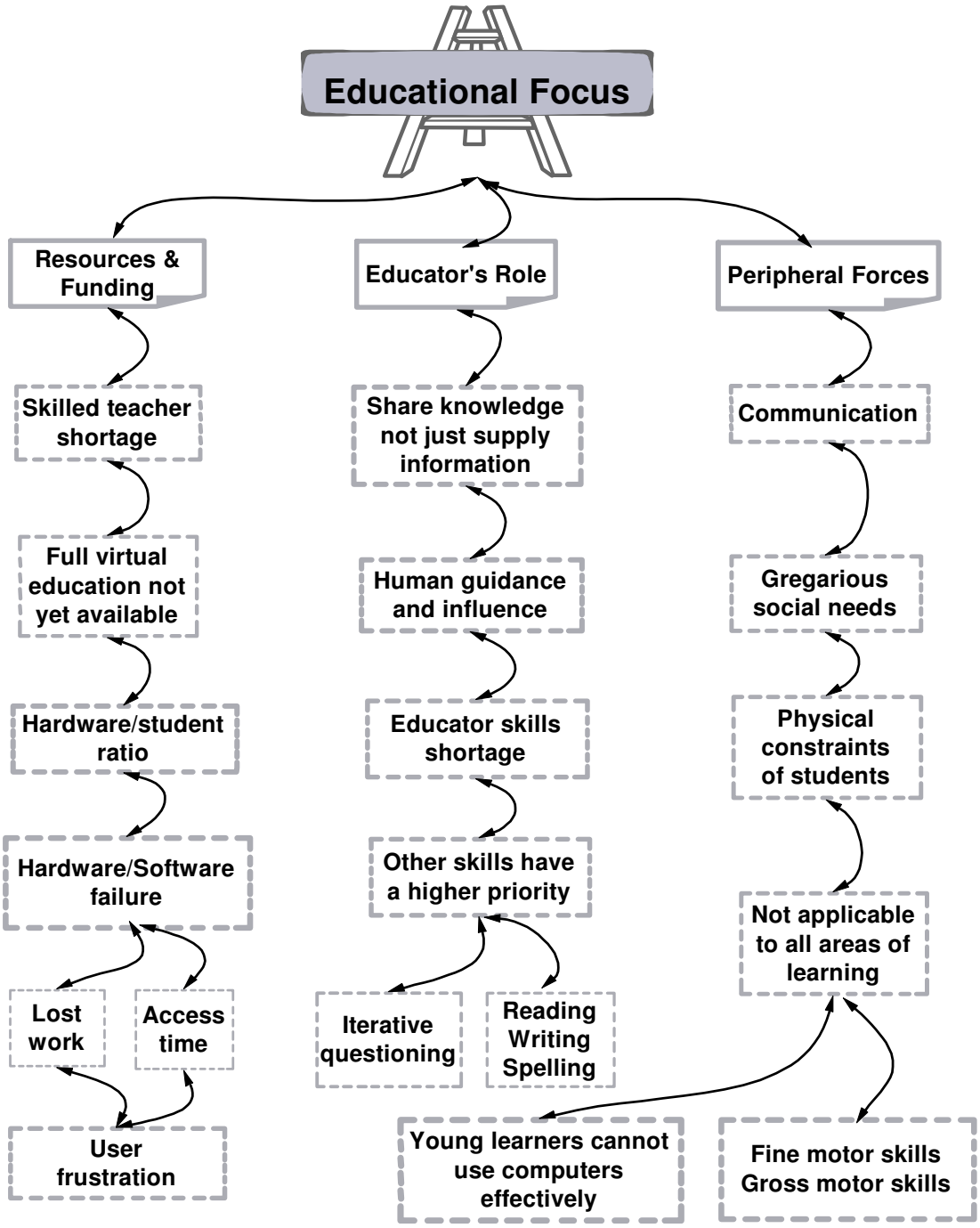

Figure 9: Educational Focus

Forces affecting the direction and scope of educational focus within individual schools come from many differing factions. These include higher-level management bodies within the Department of Education, government funding passed on to the schools by the Department of Education, social and community group pressures, even the fundamental physical structure of today's students play an important roll in our ergonomically conscious culture. All these forces exert some influence on the perceptions held by the participants in this research.

4.4.1 Resources & Funding

A primary influential force is the directly associated with the amount of government funding relegated to individual schools. While it is an acknowledgement that we don't all live in a utopian society with a bank balance far in excess of our daily requirements, there is some feeling that the directions received from the Department of Education would be far easier to comply with if additional adequate funding and staffing were provided. These perceptions were illuminated with comments made by (T4): -

> *"Principals have been directed from above…but we are too slow in picking up on directions. We have financial constraints also. I believe E-Learning can deliver valuable learning to all learners, whether students with disabilities, learning difficulties, or gifted. What we need are more teachers to make it succeed."*

(T6) confirmed that a lack of sufficient funding was a real problem, along with a lack of time by educators to adequately prepare, by this response: -

> *"Unless someone throws money at the proposal and withdraws teachers to develop units/experiences, the general classroom teacher will not have the time to do so."*

Funding deemed necessary to adequately increase the physical hardware necessary for the successful integration of E-learning was also discussed, with several participants sharing similar perceptions: -

> *"Only if schools are funded to have classrooms of computers…funding will be the issue to all new introductions." (T8)*
>
> *"…Not enough computers per child per classroom." (T3)*
>
> *"Possibly, if the ratio of computes is increased. Yes – ICT is only one component of the budget – it is hard to keep the computers and*

> *the network up to date - as well as increasing computer ratio and growth in schools." (T2)*

Along with funding for technological hardware came the need to also fund additional training and familiarisation time for teachers. (T7) made a pertinent comment on the acceptance of new technology: -

> *"…It comes with extra dedicated funding* AND *the necessary Personal Development time."*

(T7) also illuminated on the fact that there were additional considerations when massaging the funding dollar inasmuch as the ongoing maintenance and already experienced failures of some software and hardware.

> *"…Failure of web addresses, failure of book rap sites to deliver promised sessions. Failure of hardware, loss of book marks, confusion with password securities, shortage of time."*

(T9) agreed with this need for additional funds and time, and went on to further explain: -

> *"…It takes a lot of money. Our reading schemes need updating. Teacher Assistant time could be increased." (T9)*

4.4.2 Educator's Role

More passionate responses were received from participants when discussing the future role of teachers within the Department of Education. It was generally well acknowledged that the role would change, but there were many differing perceptions of exactly what that role would be. Some agreed that the teacher would become more of an educational facilitator rather than just hands on approach.

> *"…I believe the role of the teacher will change – but – the teacher will still play an important part in facilitating learning." (T2)*

> *"…I equally think that a teacher will become more critical in facilitating learning of individuals and groups…Teachers will have a much more significant and important role as facilitators. T4*

This was given a different perspective with a response from (T9): -

> *"…That would assume that all students are the same in independence and self-direction – they aren't." (T7)*

However, all participants responded with an emphatic "NO" when asked if teachers would eventually be replaced with some form of autonomous E-learning facility such as the virtual schools currently being utilised within the Canadian Education System. (T6) supplied a practical response: -

> *"Not in the foreseeable future. If the computer could talk and answer questions - maybe. But the computer won't go and clean up the art area or pick up the papers on the floor."*

Most participants agreed that at this point in societal evolution, children still required the guidance and assistance of a human educator: -

> *"Young children – no – all children- need the personal touch and encouragement, computers are not personal, encouraging, smiling etc. and don't give explanations when asked." (T9)*

(T7) provided an insightful perception on the limitations of impersonal hardware as opposed to the *"life skills"* deemed integral to any educational experience: -

> *"…Still need to ask basic how to and why questions which computers can't answer. Wide range of reactions from obsessive through to reluctant, some arrogant – thinking they are superior in skills and that a computer holds all the answers."*

> *"There will always be a need for questioning, discussing and articulating - basic requirements for understanding. If reading books couldn't deliver an entire education, how could hardware and software that is not equally available to all people? And information is unmediated by someone with discernment and experience? If education is delivered by unidentified de-personalised "tutors" – then relationship which is important to people is removed from learning. If learning is by connection to an identified person interactively – then we still have a teacher.*

(T3) agreed with this synopsis, and went on to explain further: -

> *"Most enjoy the challenge. I insist* <u>all</u> *students attempt the weekly computer job – initially this was scary for several of them, but now they know they can get assistance when necessary."*

> *"…We are not merely educating them on facts and processes, as we are focussing on the essentials in learning that involve a lot of issues of personal qualities that require human contact to develop… pupils will always need personal contact, and they learn a lot by interacting face to face."*

4.4.3 Peripheral Forces

The final sub-theme explored, was that of all other motivational forces that influenced even minor or even overlooked factors that have some bearing on the perceptions of the participants.

The physical limitations of students were mentioned on more than one occasion, with (T9) pointing out: -

> *"Children need the human touch – computers make eyes and backs tired. Children need to move around and interact with each other. (There are) effects of too much computers on health, brainwaves, physical fitness, diminution of reality..."*

(T2) also recounted an example of negative student experiences: -

> *"Occasional loss of work can upset the students, lack of available computers for use in an activity, they need to wait their turn – this can be a turn off."*

As did (T3): -

> *"…Generally good – however there is a real frustration in the level of keyboard skills and how this can really slow down progress and tie up the computers."*

(T6) provided an insight to a similar situation – and how they provided a mutually acceptable solution to the computer/student ratio predicament: -

> *"Provided everyone has access, it will work well. Equity says this must happen. If a group of children were always video editing, I would have a lot of discontent. The fact that they all get a turn actually makes them more appreciative of the skills being developed. Power points worked the same way. Every child did a 5-slide power point and presented it to the class. This worked well."*

> *"Our traditional classroom has changed dramatically this year. Just look at the interruptions. This will actually provide an opportunity for computer use because we are tending to work in smaller groups doing lots of different things at once."*

Other participants were not quite so positive concerning all aspects of E-learning as well as technology in general. This sentiment was clearly articulated in the following comment from (T9): -

> *"It depends how it is set up. I have had experience with video links, I didn't like it – but it may suit others."*

4.5 Chapter Summary

The discussion on the three main categories and sub-themes identified that certain sub-themes were externally related to each other. Figure 9: clearly demonstrates these associations.

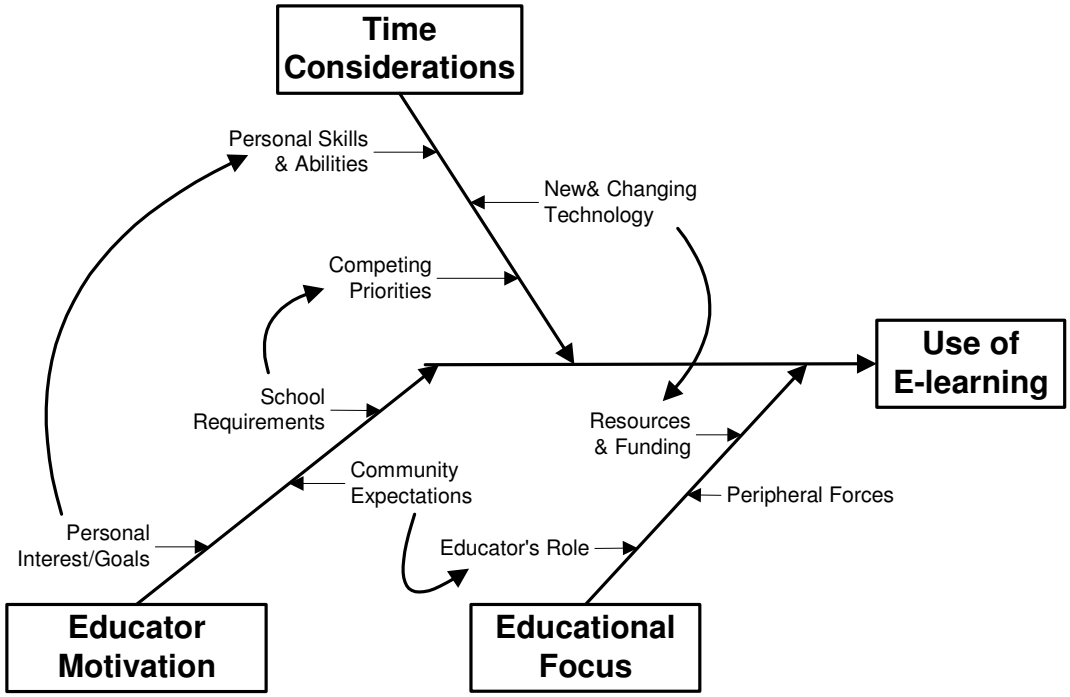

Figure 10: Core Category Relationships

This chapter presented a discussion on the core categories and relevant sub-themes uncovered by the data analysis process. Within this chapter I have provided evidence of the participants' experiences through a selection of rich, descriptive extracts, which I believe has given credence to the core categories and sub-themes. The purpose of this exploration was to allow for further insights and understandings into the complexities of the perceptions held by the participants.

The participants in the study reported that their use of E-learning was firstly shaped by their personal and/or professional motivation, that is, their interests and goals, school requirements and community expectations

And these factors were interlinked in that community expectations tend to shape the role of the educator. Similarly school requirement can result in conflicting priorities for the educator.

Chapter 5: Analysis and Conclusions

> *"I am pleased to see someone speaking from something other than blind enthusiasm toward computers in education. I am amazed at the potential, and dismayed at the actual lowest common denominator use and the endless cost... so often if seems they are going for symbolic gesture instead of focused, self-motivated, and thinking students."*
>
> *Katie Fisher, computer teacher, Lihue, Hawaii*

5.1 Chapter Introduction

This chapter discusses the main findings derived from the data analysis process. Discussed also are the conclusions which relate to the three core categories, with the aim of comparing and contrasting these findings against current literature. In doing so, the findings within this study may assist in extending the current body of knowledge regarding the perceptions of E-learning. Finally this chapter, whilst not presenting any practical implications for educators, provides implications for future study, as well as some reflective considerations on the subject of the pedagogic task and the study's main limitations.

5.2 Analysis Overview

Let's start with an overview of current perceptions concerning E-learning and technology in general, based on the analysis of the emergent core categories and their sub-themes that were realised during the course of this research.

1. Educators work in a contextually unique iterative environment that utilizes process from the fields of knowledge management and knowledge transfer. The windows of opportunity to utilise modern technology, when presented, are fleeting, and rarely match the ability or capabilities of those who are not fully prepared to exploit any presented situations. Therefore the utilization of available time by educators, combined with considerations imposed by all other vested interests surrounding their daily environmental requirements, creates a premium priority task list that rarely sees the induction of those newer, more modern process and techniques that are thought mandatory within the considered changing realm of modern education.

2. The educational value of today's computers has been vastly oversold to parents, educators, and the general public, primarily by people who benefit financially from adding computers and software to the traditional educational mix. *"…It would probably be dominated by sponsorship and by computer specialists – not by learning specialists." (T7)*

3. Research is also needed to determine if, when, and how computer applications can actually improve different forms of learning. It appears that far too little attention has been given to either developmental needs or potential effects of human/digital interaction on the growing brain. Good research will also give us a better understanding of how the human mind itself learns and creates.

> *"…There will always be a need for questioning, discussing and articulating – basic requirements for understanding." (T6)*

4. Objective and well-controlled research on computer effects on learning and motivation is badly needed. Consensus is lacking even on basic definitions of "learning," which now depend more on belief than on science.

> *"What is E-learning? … If it is what I have just described, the answer is yes but not every teacher will rush out and embrace it…!" (T6)*

5. An urgent need exists for better research on fundamental questions related to the physical health of children who use computers. *"Children need the human touch – computers make eyes and backs tired. Children need to move around and interact with each other. (There are) effects of too much computers on health, brainwaves, physical fitness, diminution of reality..." (T9)*

6. Home use of computers to date; consist of far more game playing than education. Parents, who think computer use is more constructive than television viewing, are relatively uninvolved in most children's home computing and underestimate its potential negative effects. Yet optimal home use depends on informed decisions, reasonable supervision, and on-site support from adults.

> *"Those that have them at home are very comfortable but others without them at home are generally very hesitant and want a human readily at hand for troubleshooting." (T3)*

7. New technologies are expensive and drain badly needed funds from proven educational needs.

> *"…ICT is only one component of the budget – it is hard to keep the computers and the network up to date - as well as increasing computer ratio and growth in schools." (T2)*

8. Smaller classes, more active student learning, more attention to individual needs, and more thoughtful curriculum would generally achieve the same or even better results without today's technology. For schools with these ingredients already in place, computers are expensive frosting on the cake. For those schools without such educational attributes, computers represent more of an excuse than a remedy.

> *"…The computer is a tool to be used like other tools or strategies." (T9)*

9. No critical period exists for computer use; normally developing children do not need computers before primary-school age, and they may do without them very happily until even later.

Filling children with information does not necessarily constitute learning, and may interfere with their ability to use the information in conceptual ways. Nor will using today's technologies necessarily prepare children for success. Future "haves" and "have-nots" will be separated by the intellectual value of their education, not necessarily by their amount of exposure to computers. Too little exposure may be far better than too much.

5.3 Analysis in Relation to Emergent Categories

From the literature and the data gained during the course of this research; it is of paramount interest that the personal beliefs and practices of each participant heavily influence their use of procedures and techniques within their own classroom environment.

5.3.1 Educator Motivation

Whilst it is true that an educator must conform to guidelines laid down by a higher managing authority – in this case the Department of Education, it is also self evident that along with enthusiasm, experience and unique knowledge – comes some paranoia, fear and an obvious uphill struggle against internal funding allocations as

well as attempting to conform to social requirements, that must be competed against equally in order to achieve what is deemed necessary in order to educate today's societal learners.

The passion and interest in the career choice of the participants was very evident, in both their related experiences and the manner in which they freely offered their perceptions on all matters of enquiry – not just the main research topic of E-learning.

Teaching and Learning

When talking about learning and teaching, people often refer to these processes as being contextually based or socially embedded. While it seems obvious that the goal of education is to prepare learners for the life outside the classroom walls, it seems that the notion of the social basis of the concept of knowledge or the means considered appropriate for its transfer - or its appropriation by learners - remain still obscure. This difficulty to articulate the bridge between the goals and the means of learning becomes particularly apparent in the context of assessment (Fasse and Kolodner, 2002).

It is commonly the case that teaching objectives are established prior to the commencement of learning while the assessment criteria, though often articulated to learners; remain ambiguous to them and possibly also to teachers.

From the available literature, (Fasse and Kolodner, 2002) describe interviewing seven university professors who had extensive experience working with non-native graduate students on their academic writing. Hoping to receive from them precise understandings of the notion of analysis and critical writing - terms that they equated directly with critical thinking and that the professors commonly used - (Fasse and Kolodner, 2002) asked them to define these terms. They reported, however that: -

> *"This question was surprisingly difficult for them to answer, despite their confidence in using these terms in the language of their assignments, and despite the ease with which they were able to identify such characteristics as "good analysis" and "difficulties with analysis" in their students' writings." (Atkinson, 1997)*

It the light of these remarks it appears that the relationship between the goals of teaching and the assessment criteria is not a straightforward matter for all involved. Furthermore, if, as the quote above illustrates, the goal of critical thinking appears

equally confusing to teachers, chances are that teachers may well not be quite clear about the kinds of support structures that would best enable learners to fulfil their course obligations. The difficulties reported above suggest that, more often than not, intuitive solutions to teaching and assessment are being applied with pedagogues lacking a critical base for approaching their own beliefs.

The situation becomes gloomier when one considers that teachers' failure to critically approach their own pedagogic beliefs means that it becomes quasi-impossible for learners to understand the objectives that drive both the teaching and the assessment agenda. Effectively, a problem of inequality and power imbalance is created. Everyone, ranging from politicians, through teachers and finishing with employers, is entitled to the belief that they are able to discern the properties of knowledge with which education should equip learners and which will prove of value to their future lives and work. In this perspective, learners become the object of expert's attempts at classification with no possibility of influencing these (Persson, 2000).

The difficulty of linking teaching and assessment on the basis of principles of inclusion rather than exclusion is the subject of the critique presented by (Freebody et al., 1991) in the context of literacy training. They point out that, in spite of the general socio-political sensibility in the field of education, teaching practices remain largely uncritical to the ways in which they approach the issue of knowledge, its production and reproduction. The consequence of this attitude are educational technologies which turn learners into cybernetic machines to be filled with programs for their efficient functioning, and ready for future updating. There is little room in such teaching models for the notion of learners as individuals whose actions and judgments cannot be disembodied from their socio-historical contexts:

> *"It is by now something of a common place to assert that an educational curriculum cannot be interest-free. Nonetheless, the models of literacy alluded to above purport to present universally valued accounts of reading and writing – accounts based on and aimed at, for example, efficient information processing, enhanced retention of knowledge, generically "better-formed" texts, or personal growth through genuine response to valued literature. Such accounts typically do not "interrupt" the naturalizing drives of the text by directly addressing the thesis that school texts and literacy activities are important material resources in the complex politics of cultural production and representation." (Freebody et al., 1991)*

In the context of this criticism it would appear that the personal agendas of both teachers and examiners prevail as the sole solution to the problem of bias in teaching and assessment. The danger with this approach is that the teaching objectives established and the assessment criteria applied will function more as limits of knowledge than as a springboard for all involved to seek out innovation and new perspectives.

This is where properly facilitated and mediated access to E-learning may prove beneficial to both educator and student alike by making available information or perspectives not even considered by either.

5.3.2 Time Considerations

When considering the changing culture within the pedagogic environment and the factors affecting reduction of available time within the context of daily work procedures utilised by participants involved with this research, (T6) made the subsequent exceedingly applicable comments: -

> *"Most primary and secondary schools only use PC's because that is all the department will support therefore, other types of computers like Macs may not get used and yet they may be the type of computer you are talking about, especially for video editing and CAD etc. Most schools buy the cheapest or second cheapest machines. These machines do not always do the latest things."*
>
> *"Another factor is that schools are no longer putting ICT at the top of their list. Most new programs in the Department last about three years before being superseded. Schools are now focusing on the ELS, which have to be reported on by 2005. This is where the money is now being focused."*
>
> *"Teachers are more flat out than ever. With "inclusion", we have more duty than ever before. With the introduction of the ELS, we have more PD sessions than ever before. Our school is also involved in Integrated Curriculum with Kath Murdoch, Maths with the University, Flying Start, Flying Finish, The Bridges Reading Program, children go out for Peer Mediation training, extra art, extra Maths, Esk Band, Student Rep Council, motor skills helpers, Adastra (extension work for gifted and talented students, done on a computer), Green Force, Harry Potter Club, Choir, school web page development etc, etc. There is no time left to explore on computer."*
>
> *"Because teachers are not in their classes as much, what free time they have goes on developing new units of work based around the*

> *ELS, marking and displays. They certainly don't have time to explore for sites on the web. Most of our staff members are heading towards module 5. We do have a teacher two days a week for computing but if she had received a promotion, the position was going to be abolished. Without her input, computers will go on the back burner. Schools without such a person would be struggling now."*
>
> *"So now to your question. We already use computers for video editing and three of my children are in Adastra. I have tried Web CT but it was too slow and caused too many problems. Teachers need something that the children can do without calling on the teacher to fix a bug in a program. Such distractions for the teacher ruin whatever else the teacher is doing with the other 24 children in the class".*
>
> *"We use computers for delivery of material with power point and the projector. If there was suitable material, I would certainly get children working through modules. My class was involved in a Federation project with another class from the West Coast? That was fun. Video conferencing would be good but reliability and another class with the equipment is a problem but could be done."*
>
> *"Mostly, my children are researching on the web but anything is possible. Money to buy equipment does help." (T6)*

These comments portray the perceptions held by most of the participants within this research and fully exacerbate the underlying perceptions that; at this point in time the compute is simply another tool in the armoury of the educator and is employed only within the comfort zones of both the utilising teacher, and the accessing student.

Comments like these show a definite disparity in the level of available trained teachers. This has the negative effect of reducing the time available to working teachers in allowing them to fully facilitate E-learning. E-learning as such is not considered a driving educational force, but is being integrated on an increasing scale into activities within the modern classroom environment.

5.3.3 Educational Focus

The increased availability and use of Internet technology within business and education is spurring an increase in the use of these tools for online teaching and learning. Creating a flexible learning system incorporating these technologies can maximise student understanding and retention of new information. The mystery here is how to also expound effective knowledge transfer via a medium that is incapable of language and sound inflection, or even reaction to essential human issues such as

emotion and finite query – so common in classrooms and traditional learning environments.

5.4 Research Related Conclusions

Education as a field where social relations are played out immediately raises concerns regarding the sources of power, which regulate the ways in which knowledge is introduced and managed. Questions thus arise regarding the criteria by which decisions are made regarding the teaching/learning objectives and the means for their achievement.

5.4.1 The Complexity of Pedagogic Knowledge Transfer

This research has been undertaken with the aim to presenting a view into the perceptions of E-learning of participants in daily contact with the classroom environment, the question of the pedagogic task and its articulation in the context of the opportunities that multimedia technology opens up to education.

Fundamental to this goal has been to illustrate the relevance of assumptions about learners from the available literature, also the perceptions of E-learning which underpin modern educational environments and which, in turn, inform different uses of technology. Drawing on several intellectual frameworks, the question of the pedagogic task has been posed as embedded within the larger framework of understandings that shape institutional and individual perceptions of the goals and methods by which education should proceed. These perceptions are formed in the contexts of social interactions, which are not free from models of social order, social power, and social change. Therefore to reflect upon the 'How?' of technology - or its place and function - in education is to reflect upon the goals which technology is to support and make possible (Baskerville and Wood-Harper, 1996).

5.4.2 Technology and Education

To facilitate a step in this direction, this research has sketched out a framework for thinking about technology within education. In particular, it looks at the concepts of knowledge and knowledge transfer from the perspective of the goals that motivate their specific forms of integration into a learning environment. This research suggests that the solutions to successful integration of the E-learning model into pedagogic problems do not lie so much in technology as in the ability, on the part of

the pedagogues, to approach critically the issue of knowledge production and reproduction.

It is also suggested that technology itself is neither - liberating, empowering nor enabling one to be with other people but that it will serve whichever goals motivate its incorporation (Klein and Hirschheim, 1983).

Technologically-supported learning (TSL) environments offer considerable promise for the enhancement of student learning through the various interaction opportunities available in the feature sets of the computer-based communication tools. At the very least, the computer-based communication provides additional venues for class participation. However, when class participation is positioned within a TSL environment, it is not clear how learning/performance benefits are associated with effective knowledge transfer (Grover and Davenport, 2001).

(T2)'s perception provides some insight into a possible benefit: -

> *"Class group will be segmented; children will be more able to pursue own interests at own levels etc. However the children will be able to still work in groups and teams (fluid make up of one from Tasmania, one from Norway, one from Japan perhaps). Where you are studying won't matter – ICT will connect them and enable them to work as a team and perhaps not see each other in real life – great stuff!" (T2)*

5.4.3 Perceptions of E-learning

We are now at the frontier of the use of two technologies, the Internet and the World Wide Web, for teaching and learning. Some believe that these technologies are going to have a major impact on improving teaching and learning in areas such as student performance, access, communication, richness, collaboration, active and life long learning, effectiveness and efficient knowledge transfer. As Neil Rudenstine, president of Harvard University recently stated,

> *"The Internet has distinctive powers to complement, reinforce, and enhance some of our most effective traditional approaches to teaching and learning" (Rudenstine, 1997).*

As technology-based course delivery increases and faculty and student interest in these areas grows, careful analysis of the acceptance and impact of various technologies in connection with different learning models needs to be conducted. By

the same token, teaching and learning processes need to be adjusted to the use of these new technologies in order to achieve the objective of improving teaching and learning. The Internet and the Web facilitate life long learning, which is a major purpose of education. The Internet and the Web can be used to efficiently disseminate information and knowledge (Rudenstine, 1997).

5.4.4 Looking Forward in the Learning Environment

Trying to get a clear fix on the future of technology is like peering into a crystal ball. Bold and outlandish predictions, too, inevitably reflect this paradigm. In 1996, Dave Morsund predicted in a journal article "*Learning and Leading with Technology"* that certain trends would occur in computer systems within a decade:

- Continuing increases in processor speed
- More power for less money
- Dramatic differences in memory and storage capabilities
- More seamless interface among various software tools
- Better human-machine interface: easier to operate complex programs
- More worldwide connectivity
- Increased digitisation of information: dramatic expansion of on-line libraries
- Improvements in and wider use of artificial intelligence (e.g., better voice input; refinement of intelligent agents and expert systems for teaching)
- Merger of media (telecommunications, television, computer)

Since a major software manufacturer funds the foundation for which Morsund works, it is not surprising he recommends that families and schools continue to spend increasing amounts of money to keep up with the changes. He offers what is probably a "wish list" for the I.T. industry:

- Every student and teacher with a powerful portable computer and a full range of applications software

- Every classroom with a technology infrastructure that includes scanners, printers, camcorders, desktop presentation software and network connections
- Every student and teacher with good access to the full range of technology-enhanced learning (TEL), including computer assisted instruction and distance education
- Maintenance and repair staff and other needed support
- Continuing in-service learning and support for teachers
- Ongoing curriculum revision and development to keep pace with technological change

Ted Hasslebring at Vanderbilt University, who is one of a group pioneering a wide selection grounded in psychology and teaching, states, *"Computers are going to become a way of life in education!"* One reason is the lack of good professional development, but two other reasons are equally important.

First, technology to date has not been powerful enough to fulfil expectations placed on it; newer machines have sufficient power, but most schools don't yet have them.

Second, were only now learning how to make and use good software. He cites a tutoring system for poor readers or non-readers in an American middle school, which took several years and a lot of field-testing to develop. It was recently tested with two thousand Florida students and achieved *"great results"* in raising their reading level as much as four years. He predicts that if good voice recognition software becomes a reality, we will get programs that will almost be able to emulate the human teacher-student interaction.

5.5 Relationship to Research Questions

Through the use of qualitative research techniques, this research has rigorously investigated the following posed research questions:

Primary: ***How is a process involving theory-based formative evaluation perceived and utilised by primary education pedagogues?***

Secondary**: Does the current design of E-learning processes ensure generation and dissemination of information whilst providing effective knowledge transfer to learners in today's constantly changing educational environment?**

A subset of questions to assist in determining a response is:

- In what context can E-learning work?
- For what use is e-learning most appropriate?
- Will E-learning replace traditional learning approaches?
- How can E-learning be designed to be effective?

5.5.1 Primary Research Question

With respect to question one, the fundamental research discovery was that the participants shared similar perceptions of E-learning. That is, technology is currently considered a tool that takes time and money to correctly utilise to anywhere near its maximum capability.

The research also uncovered several factors and sub-themes that influenced the participant's perceptions of E-learning. These factors included personal interest, personal comfort and confidence with the technology, time available to investigate how to use the equipment correctly and the requirement to use the technology in conjunction with everyday administration tasks. These influencing factors either negatively or positively affected the participant's perception of new technology as well as E-learning in general.

If the participant's perceptions were negatively altered, the scope of introduction and utilisation of technology was markedly lower that those whose perceptions were positively altered. Another dominating factor was the relative age of the participants

and the requirement to come to grips with a newly introduced form of electronic knowledge transfer process. This factor was mentioned several times, with several participants' comments involving "steep learning curves" and a reluctance by older teachers to utilise technology.

This research has essentially revealed that the current perception of what an educator's role is, and how it is evolving, has influenced many teachers to try and make time to incorporate some form of E-learning within the daily classroom curriculum. This innovative addressing of how best to utilise new technology is self-manifest in the extra electronic activities currently being conducted within the school. For example the Adastra program (for gifted children).

Given the time, funds and access to informed training sources – many participants exhibited much interest and enthusiasm to include further E-learning activities involving any associated new technology that may be necessary for its inclusion into their classroom environment.

5.5.2 Secondary Research Question

With respect to question two, technologically-supported learning (TSL) environments offer considerable promise for the enhancement of student learning through the various interaction opportunities available in the feature sets of the computer-based communication tools. At the very least, the computer-based communication provides additional venues for class participation. However, when class participation is positioned within a TSL environment, it is not clear how learning/performance benefits are associated with effective knowledge transfer (Grover and Davenport, 2001).

As technology-based course delivery increases and faculty and student interest in these areas grows, careful analysis of the acceptance and impact of various technologies in connection with different learning models needs to be conducted. By the same token, teaching and learning processes need to be adjusted to the use of these new technologies in order to achieve the objective of improving teaching and learning. The Internet and the World Wide Web facilitate life long learning, which is a major purpose of modern education. The Internet and the Web can be used to efficiently disseminate information and knowledge (Rudenstine, 1997).

Further research and discussion on effective knowledge transfer via these new mediums is however, well beyond the initial scope of this study.

5.6 Relationship to policy investiture

The findings illuminated within this study will add a perspective to the creation of Education Department policy investiture, the perspective of the end user. This will differ to the extreme with the recommendations liberally handed over by the technology houses that insist that more hardware is always better. This is not necessarily so. Many of the participants have expressed concerns at the requirements impose on them to utilise technology that they do not have the appropriate skills or time to effectively persevere with.

However, all participants did emphasise that – given time, training, appropriate technical support and access to beneficial content – all would increase their utilisation of newer technology and software.

These not insignificant findings would add an apparently lacking consideration during the discussion and creation of broad sweeping policies that are seen to be the norm, handed down indiscriminately by those that have no further contact with what they have just mandated

5.7 Findings Limitations

Currently the Tasmanian Department of Education has many hundreds of registered teachers and administrative staff posted to various schools and institutions around the state. This research involved interviewing nine people from institutions from the north of the state to gain deep understanding of their perceptions and experiences.

Clearly, I am not attempting to generalise from a sample of this type to the total workforce of the Tasmanian Department of Education. This study could not state what percentage agreed or disagreed with the utilisation of modern electronic technology and E-learning. However, this was never the intention of this research, rather I wanted to gain a deep understanding of the research participant's perceptions via in-depth semi-structured interviews.

5.8 Chapter Summary

Does that mean we won't need teachers anymore? From the perceptions of the participants - absolutely not, the best results obtainable are when there is a really good teacher, along with technology, who can facilitate, monitor and reinforce what the student is learning. The participants are all in agreement in their thinking that they don't think you can ever bypass the teacher.

Effective applications of new technologies appear to occur in schools with the following ingredients:

- Good teaching
- Teachers well-versed in integrating technologies into a strong curriculum
- Well-planned utilization of a variety of technologies (including books and paper), guided by which medium is best suited to each task
- Adequate or excellent technical support
- Active learning, questioning, and understanding on the part of students rather than passive response to artificially engaging or simple drill-and-practice software
- Energetic and thoughtful leadership

Hopefully, the findings from this study will help on-line researchers refine and focus research questions related to the implementation and delivery of E-learning courses.

Chapter 6: Implications for Future Research

This is an exploratory study that sought to collect and analyse rich data from a limited number of participants. As such, it provides a sound basis for broader investigations into E-learning use, how it is constructed and how best to use its associated procedures. This suggests the need for further systematic research to authenticate the core categories and sub-themes proposed here and ascertain the validity of the explanatory scheme.

The ability to learn and to engage in lifelong learning is the central dynamic of a successful educational system. This central role of learning is matched by an extraordinarily enhanced capability to engage in, and to deliver learning. E-learning provides a mechanism for access to information, and to learning experiences, with a dramatically increased independence of location and time requirements. Of course not all learning can be most effectively achieved without face-to-face interaction. Equally, there are many elements where the learning process can be improved. E-learning allows distance learning to become the norm, rather than the exception.

6.1 Additional related research areas

Additional research is needed in the area of constructing effective E-learning packages to suit the needs of both the educator and learner. Beyond the provision of appropriate electronic access, and the development of a wide range of pedagogical material, the major restrictions appear to be in the deeply laid assumptions of the teaching profession, and the bureaucracy responsible for the management of the Education System.

There is a substantial challenge to examine and evaluate all the logistic limitations on the delivery of education (adequate infrastructure - classrooms, equipment, etc., and the consequent requirement of minimum class sizes, limited subject availability), to determine the extent to which they can be overcome or reduced through E-learning.

E-learning also provides the basis for re-examining the structural educational assumptions that most learning should be provided in the early stages of life; thereafter it is optional. The increased access to educational material, and interest in learning, is providing a ready and willing market for learning at all ages.

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Appendix A: Participant Information Letter

RESEARCH PARTICIPANT INFORMATION LETTER

Title of Project:
Perceptions of E-learning within Primary Education in Tasmania with Regards to Future Design, Direction and Policies

Teaching Staff
C/- Mr. Chris Crawford 3 June 2003
Principal
Norwood Primary School
Launceston TAS 7250

Dear Teacher,

My name is Douglas Colbeck and I am currently enrolled in a Bachelor of Information Systems (Honours) degree at the University of Tasmania, School of Information Systems.

In order to fulfil part of the requirements of my degree I am undertaking a study on 'The Perception of E-learning within Primary Schooling in Tasmania'. This will be under the supervision of Professor Christopher Keen, Head of School within the school of information systems.

The study will be conducted with as many of the teaching staff as are willing to volunteer. If any staff member wishes to participate in this study you will be asked by the researcher to participate in a single interview. However it may be necessary to do a small follow up interview just to clarify some points. The interviews time and place would be negotiated between the researcher and the participant, keeping in mind issues of your convenience, comfort and privacy.

Details for Participants:
Title of the Research Project: Perceptions of E-learning within Primary Education in Tasmania with Regards to Future Design, Direction and Policies

Principal Investigator: Professor Chris Keen.
Investigator: Douglas Colbeck (B.Comp)

Procedure: Any participation in this study is completely voluntary. Participants will be asked to meet with the investigator for a one on one interview. It is anticipated that the interview will last approximately forty minutes to one hour. In this interview participants will be asked to share their feelings, thoughts and opinions on E-learning and its future from their perspective.

The interview will be recorded and later transcribed in to written form. I will review the transcripts in order to identify the themes and/or patterns, which may emerge from the interviews.

All participants will be asked to sign a consent form prior to the interview.

Risks: There are no risks anticipated beyond those that occur in daily life. Participants will be volunteers and, and may withdraw from the project at any time with no penalty.

Data Collection and Storage: Confidentiality will be strictly adhered to, both during, and after the conclusion of my research. Any participant may choose, or will be given an alias or pseudonym, which will be used in all transcripts and printed materials.

All research data will be securely stored on the University of Tasmania premises for a period of 5 years. The data will be destroyed at the end of 5 years.

Results of this study will be made available to the participants involved, and anyone else interested in this study. The findings from this study will be presented both in a thesis and a public presentation later in the calendar year. The findings may also have the potential to be published in an academic journal.

Contact Information: For any problems or questions regarding your rights as a participant you can contact:

Principal Investigator:
Professor Chris Keen on (03) 6226 6204, email Chris.Keen@utas.edu.au

Or the Investigator,
Douglas Colbeck, on (03) 6324 3659, email dcolbeck@utas.edu.au

Ethics Approval: This project has gained ethics approval from the following committees:

- Northern Tasmania Social Sciences Human Research Ethics Committee

Tasmanian Education Department Departmental Consultative Research Committee (DCRC).

Thank you for taking the time to read this information and I look forward to hearing from you soon regarding whether or not you wish to participate in this study.

Regards

Douglas Colbeck (B.Comp)
Bachelor of Information Systems - Honours Student
University of Tasmania, Australia

Agreement to Participate in Research

Please contact your Principal, or either the Principle Investigator or the Investigator if you are willing to be interviewed.

Yes, I will participate in the research study.

Name _____

Available from: _____/_____/2003. To: _____/_____/2003.

Preferred Contact:

Day Phone: ( )

Night Phone: ( )

Email:

Appendix B: Participant Consent Form

RESEARCH PARTICIPANT CONSENT FORM

Title of Project:
Perceptions of E-learning within Primary Education in Tasmania with Regards to Future Design, Direction and Policies

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 analysing any and all information I put forward to the researcher.

4. I understand that there is no personal risk involved, and my anonymity is assured and will be maintained during the entire project.

5. I understand that all research data will be securely stored on the University of Tasmania premises for a period of 5 years. The data will be destroyed at the end of 5 years.

6. I agree that research data gathered for the study may be published provided that I cannot be identified as a subject.

7. I agree to participate in this investigation and understand that I may withdraw at any time without any effect to my person.

Name of participant_____

Signature of participant_____ Date___/___/2003

8. 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_____ **Douglas Colbeck** _____

Signature of investigator_____ Date___/___/2003

Appendix C: Interview Question Format

INTERVIEW QUESTIONNAIRE

Personal Issues

This part of the interview is designed to uncover whether or not the participant is comfortable with the concept of E-learning, computers in general and any experience they may have had with technologies in general. This will also aid in breaking the ice, so to speak, as well as providing some background information about the participant, as the questions are designed to be general in their nature.

The first few questions that I will be asking you are historical in nature.

Q1. What position do you currently hold within the school?

Q2. If you do not mind me asking, which age bracket would you fit into?

Q3. What is the teaching field you are mainly interested in?

Q4. How long have you been a teacher?

Q5. What primary school grade(s) do you currently teach?

Q6. Why did you choose educating as a profession?

Teacher's process of maintaining and improving skills

These questions are designed to facilitate further knowledge on the extent to which an educator is required to maintain and upgrade their personal skills, how often, and to what degree.

Now that I have an understanding of your background in teaching –

Q7. How personally comfortable are you in using a basic computer?

Q8. What are the factors prompting/motivating you to update or maintain your skills in utilizing the current technologies within the school?

Q9. Are you required as an educator to gain further formal accreditation/recognition of your ICT skills and if so - to what extent?

Q10. What other areas of your work are you required you to undertake professional development?

Q11. How often is this required and by whom?

Teacher's personal comfort with current technologies

This area of data collection is designed to ascertain what levels of personal control the participant may apply on the technological advancement into their comfort-controlled domain of the classroom environment.

Q12. Do you feel any concerns when meeting newer technology?

Q13. To what degree is computer technology currently incorporated into your classroom activities?

Q14. Do you think current computer technology is utilized to its fullest extent by the school?

Q15. Are you comfortable with the rate of increase of computer technology within the school?

Belief of student's comfort with current technologies

Some basic information is required at this point to assist in applying rigour and depth to the interview by providing some related background information as to the perceived level of acceptance by students of E-learning in general.

Q16. Do the students in your classroom use computers to complete projects, or pursue other activities?

Q17. Do you consider that your students are comfortable and satisfied with the use of ICT and the assistance currently offered by the school?

Q18. How are students coping with the increasing trend to use computers as a tool within their work?

Q19. Have there been any incidents that have been detrimental to class activities that have involved computer related tasks?

Q20. Have there been any circumstances that have been beneficial to class activities that have involved computer related tasks?

Q21. How do your students react toward computers (impersonal pieces of machinery) compared with/to a human educator? (Teacher, teachers aid, parent help)

Educator's preferences for activities using E-Learning

In this section of the interview the educator will offer insight into, as well as highlight their preferences as to what, in-class activities will benefit from the introduction of E-learning as a tool The term E-learning used during the course of the rest of the interview is used in application to both full on-line E-learning experiences as well as in-classroom teacher assisted tasks.

Q22. What areas within your sphere of teaching do you currently use computers to assist students?

Q23. Is current computer assisted usage aiding or detracting from the learning experience of the student?

Q24. Are there other areas in your own field of teaching speciality that may benefit from the introduction of a computer-assisted tool?

Q25. To what extent can this assistance be utilized within this specialty area?

Traditional versus new age technology

This portion of the interview is attempting to ascertain if the educator is comfortable with the potential concept of technology progressively taking over an educator's traditional role.

Q26. How much computer assisted E-learning is currently provided for within your classroom environment?

Q27. Futuristically speaking, do you see the time allocated to using E-learning in your classroom increase to the point where it will become the major component of learning for the students?

Q28. Are the E-learning facilities available sufficient in their current format?

Q29. Is the installation of larger and faster forms of computer driven technology to facilitate an increased E-learning component too large a drain, given current levels of funding available to schools?

Q30. Do you see your time educating students diminishing to the point where you as an educator will be merely assisting the student instead?

Q31. Do you foresee a time where a student will not require the need or assistance of a human educator?

Future uses of computer technologies

Futuristic visions of technology no matter how imaginative can, at some point, be interpreted to have potential for addition to teaching processes. That is, those who develop and create information and how it is to be disseminated to learners will use technology in imaginative ways. This section of the interview is an attempt to attract such imaginative information from the participants.

Q32. Will the traditional schooling culture continue to adapt to the likely introduction of newer, more powerful and faster, yet more expensive technology?

Q33. Is there a place for E-learning within a modern school classroom environment?

Q34. Will the traditional physical teaching environment give way to a 'virtual classroom' of the future?

Q35. What benefits do you see in the incorporation of E-learning into future curricular activities?

Q36. To what level of interaction and consultation do you imagine current educators and teachers will be involved in the construction of E-learning materials and packages?

Q37. Can E-learning be focused to assist the areas that may be neglected by current teaching methods?

Q38. Technology is likely to enable students to have more choice. Will giving students more choices in what, and how, they study tend to segment the class group or improve group/team work skills?

Closing of Interview

I think we have covered what you perceive computer technology to be and where it is heading in the future.

Q39. Is there any final comment you would like to add?

Thankyou for agreeing to do this interview, and after analysing your thoughts and comments - if I need to clarify any issues with you, may I email you to confirm any queries or details?

END OF INTERVIEW

Appendix D: Glossary of E-learning Terms

Asymmetric Digital Subscriber Line (ADSL): A communications technology that allows data to be sent over existing copper telephone lines. ADSL supports data rates from 1.5 to 9 megabits per second when receiving data and from 16 to 640 kilobits per second when sending data.

Analog: A signal that is received in the same form as it is transmitted, while the amplitude and frequency may vary.

Asynchronous: Communication in which interaction between parties does not take place at the same time.

Asynchronous Transmission Mode (ATM): A method of sending data in irregular time intervals using a code such as ASCII. ATM allows most modern computers to communicate with one another easily.

Bandwidth: How much data or information you can send through a connection. Usually measured in bits per second. A full page of English text is about 16,000 bits. A fast modem can move about 16,000 bits in one second. Full-motion full-screen video would require roughly 10,000,000 bits per second, depending on compression.

BBS: An electronic message centre. Most bulletin boards typically serve a wide variety of specific interest groups. They allow you to dial in with a modem; review messages left by others and leave your own messages.

Broadband: A transmission technique using a wide range of frequencies, which permits messages to be communicated simultaneously.

Browser: Software that allows you to find and see information on the Internet.

Chat: (Internet Relay Chat or IRC): Chatting is real-time, interactive on-line conversations on the Internet, allowing Internet users to join theme discussions or post comments on their screen at the same time as other participants. Chatting can

also include communication in virtual reality environments using avatars (the virtual representation of the user by a 2D or 3D character).

Compressed Video: Video signals that are downsized to allow travel along a smaller carrier.

Computer-Assisted Learning (CAL): Teaching process in which a computer is used to enhance the learning environment by assisting students in gaining mastery over a specific skill.

Computer Managed Learning (CML): *A* software management tool that is primarily designed to assist large groups of learners, teachers and administrators cope with the problems of tracking learners through series of individualized instruction.

Courseware: Software that has been designed for use as an educational program.

Desktop Videoconferencing: Videoconferencing on a personal computer.

Dial-up Teleconference: Using public telephone lines for communications links among several locations.

Digital: An electrical signal that varies in discrete steps in voltage, frequency, amplitude, location, etc. Digital signals can be transmitted faster and more accurately than analog signals.

Distance Education: The process of providing instruction when students and instructors are separated by physical distance, involving technology, often in tandem with face-to-face communication.

Distance Learning: The desired outcome of distance education.

Electronic Mail (E-mail): Messages sent from one computer user to another.

Essential Learnings (EL's): Tasmanian Department of Education framework consisting of a statement of values and purposes, a description of the learning that is recognised as essential, and a set of principals to guide educational practice.

Facsimile (Fax): System used to transmit textual or graphical images over standard telephone lines.

File Transfer Protocol (FTP): A computer protocol that allows files to be moved from a distant computer to a local computer using a network like the Internet.

Fully Interactive Video: Two sites interact with audio and video as if they were located in the same place (two-way interactive video).

GIF: Pronounced 'jiff or 'gift (hard 'g'), stands for *Graphics Interchange Format,* a bitmapped graphics file format used by the World Wide Web, CompuServe and many BBS's, GIF supports colour and various resolutions. It also includes data compression, making it especially effective for scanned photos.

ICT: *Information Communication Technology,* an acronym currently used for computer based technologies within E-learning.

Internet, Intranet and Extranet: The Internet (Inter Network) is the "mother of all networks." It is an immense computer and telecommunications network that spans the globe. Started by the American military in 1969, as ARPANET, and quickly expanded for use by universities. In 2000, over 80 million Internet users had access to the Net to communicate (by electronic mail), access and download information and files, exchange data files (FTP), publish information (World Wide Web), stage videoconferences and much more,

Intranets are smaller and more secure versions of the Internet - private internal networks used within an institution or business. **Extranets** are the gateway to an intranet. Remote users can use a network (Internet, dedicated lines, telephone lines, etc.) to access the intranet securely.

JPEG: *Joint Photographic Experts Group,* pronounced 'jay-peg'- JPEG is a compression technique for colour images. Although it can reduce file sizes to about 5 per cent of their normal size, some detail is lost in the compression.

Local Area Network (LAN): Two or more local computers that are physically connected.

Modem: Equipment that allows computers to interact with one another via telephone lines by converting digital signals to analog for transmission along analog lines.

Multimedia: Any document that uses multiple forms of communication, such as text, audio and video.

Network: A series of points in different locations connected by communication channels.

Real Video A streaming technology developed by Real Networks for transmitting live video over the Internet. Real Video uses a variety of data compression techniques and works with both normal IP connections and IP Multicast connections.

Streaming - Live Radio**,** Audio and Video: This "continuous" broadcast mode, called streaming, can be found on the Internet and intranets to process data (display images or video, or play sounds or music) before they are fully downloaded or uploaded. The information is compressed at the source, usually in MPEG format, and then decompressed by the user. Several users can simultaneously view or listen to the posted files. Streaming technology allows the user to listen to, view and even interact (while viewing or listening) with multimedia files. The streaming mode is essential for listening to conferences and radio or television programs live or in delayed broadcast, although the video broadcast quality is entirely dependent on the telecommunication network and the user's hardware (modem, processor, etc.).

Synchronous: Communication in which interaction between participants is simultaneous.

Telecommunication: The science of information transport using wire, radio, optical or electromagnetic channels to transmit and receive signals for voice or data communications using electrical means.

Telecommunication Network: The interconnection of computers and communication technology. The Internet is a network of networked computers, a "highway" that enables various media and new telecommunication means to be displayed or broadcast.

Teleconferencing: Two-way electronic communications between two or more groups in separate locations via audio, video and/or computer systems.

URL: *Uniform Resource Locator,* the standard convention of specifying the location of every resource on the Internet and within a Web application. A typical Web URL takes the form of: - http://www.website.com/a_page.htm

Videoconferencing and Desktop Videoconferencing: Videoconferencing makes it possible for two or more people to communicate in real time. There is two-way sending and receiving of sound and images (video) from different locations. There are two kinds of videoconferencing: personal (or face-to-face) via personal computers, and group (person or persons talking to a group of persons) using a dedicated videoconference system via monitors or televisions. The basic system includes a monitor (television or computer screen), a camera, a microphone and speakers. Sounds and images are conveyed by the telephone network, by ISDN (Integrated Services Digital Network) lines or, more economically, by the Internet. Compression is required to transmit sound and video, because the digital format files are enormous in terms of data (bits).

Video Teleconferencing: A teleconference including two-way video.

Virtual Reality and 3D Imaging: The representation of real and imaginary objects or places, in computerized form, to create simulations. It is also known as "Web 3D." Entire worlds are created in digital format and made available in video games, on CD-ROMs and on the Internet.

Whiteboard: An area on a computer screen that multiple users can write or draw on. Whiteboards are a principal component of online conferencing or multi-user learning applications because they enable visual as well as audio communication.

World Wide Web: A global, interconnected system of Internet servers that support specially formatted documents, commonly known as Web pages. Web pages are formatted in HTML and support links to other documents, as well as graphics, audio and video files. Users accessing a Web page can jump from one page to another by clicking on hyperlinks. Documents on the WWW are published in HTML (hypertext markup language) and other protocols (dynamic HTML, stream, Java, etc.).