

CHAPTER 1

INTRODUCTION, RATIONALE AND CONTEXT

Introduction : Cycles of the study and plan of the thesis

This action research study outlines the development of a *conceptual framework* and a *pedagogic framework* for constructivist information literacy learning within and beyond the New Zealand school curriculum.

Constructivist thinking is seen to underpin the pedagogy implicit in New Zealand's new curriculum documents (McNaughton, 1996). The purpose of developing a pedagogic framework was to improve information literacy learning within teaching programmes by making it easier for teachers to guide and support this learning. A constructivist approach supported this pragmatic orientation. This is elaborated in Chapter 4. Similarly, the need to survey, synthesise and continuously reinform the design of the pedagogic framework from a wide base of theory and documented practice, building in the practical experience of the research participants as they used the framework in the context of the classroom, supported an action research method. This is elaborated in Chapter 3.

The structure of the thesis reflects the two distinct stages of the action research process: **Stage 1** (Chapter 1 - 4) involves the analysis of the theoretical context, and the design of the framework. **Stage 2** (Chapters 5 - 10), involves the evaluation of this framework. This structure supports the author's contention that the major and original contribution of the study lies in the synthesis and contextualisation (theoretical and pedagogical) of previously discrete domains.

Six action research cycles evolved. The first four cycles and the final cycle had three foci, theoretical, epistemological and pedagogical, and involved the researcher only, iterating between theoretical and practical insights, sifting, synthesising and linking from theory to practice and practice to theory. The researcher's integrative focus was, therefore, the defining characteristic of Cycles 1,2,3,4,6. Action research conventions of planning, acting, observing and reflecting, were used as an orienting focus for iterative cyclical textual analysis (for example Kemmis & McTaggart, 1988).

Cycle 5 was the only cycle involving teachers as research participants in a practical action research cycle intended to evaluate the new information literacy learning framework in the context of the New Zealand classroom. The emphasis in this cycle was on applying the pedagogy. The researcher's epistemological and theoretical focus and broader conceptualisation of the pedagogy of information literacy were not reflected in this cycle. Instead, Cycle 5 focused on 'letting the teachers' data speak'. But what teachers said represented a far broader representation of teaching and learning within the New Zealand education system than fitted the narrower information literacy learning focus of the study. The dilemma was resolved by giving over Chapters 7 and 8 to the teachers' views and representing them as they evolved, in relation to the key concepts and propositions which shaped the framework, rather than trying to interpret them around the theoretical, epistemological and pedagogical insights derived in chapters 1 - 5. In Chapters 8 and 9 the researcher returned to this trifocal analysis, concluding that the practical insights derived from teachers' experience in Cycle 5 could be used to re-frame the pedagogical model as well as providing valuable epistemological, theoretical and pedagogical insights to inform further work in the field.

CHAPTERS	ACTION RESEARCH CYCLES	SUMMARY
1 Introduction, rationale and context - The information society - The New Zealand Curriculum	CYCLE 1 (exploratory) The information society and New Zealand education system as a context	The information society provides a powerful rationale for information literacy, while curriculum development provide both context and constraint.
2 Information literacy: an introduction - Origins in resource-based learning - Origins in technology-based learning	CYCLE 2 (exploratory) Origins and development of information literacy	Analysis of three decades of resource-based learning studies suggests that teachers and students find RBL challenging. Developments in constructivist technology-based learning indicate new directions for pedagogy: RBL+TBL = IL+constructivism > ILL pedagogy.
3 Action research methods	CYCLE 3 Theoretical underpinnings of information literacy learning	Constructivist principles of learner control of learning, coaching and providing authentic contexts relate to critical factors in information literacy learning, and to the work of Vygotsky's (and other theorists) as a theoretical underpinning.
4 Establishing a conceptual framework... - Information literacy learning and constructivism - Vygotsky's work as a guiding metaphor - Theories and models of learning contributing to information literacy learning - Assumptions examined in theory - control, coach, context	CYCLE 4 Designing a Constructivist Information literacy Learning (CILL) Framework	From this base of documented practice and theory, three theoretical assumptions and ten pedagogical propositions emerge. These are sustained in theory, and they are then used to underpin the design of the CILL model and framework.
5 Designing a pedagogic framework ... - Designing constructivist information literacy learning - examples - Design issues - Designing the CILL Framework	CYCLE 5 Trialling the CILL Framework with teachers	The CILL model and framework are used in a series of four action research cycles with teachers, embedded within Cycle 5, over one academic year to establish utility as a classroom tool and impact on learning and teaching. In Cycle 5A and B the Framework is used in a diagnostic manner, revealing systemic and contextual constraints to this type of learning that mirror the findings of the three decades of RBL studies. Based on teachers' feedback the Framework is revised and in Cycles 5B and C the emphasis moves to how - using different strategies focused by the propositions to deepen student learning and understanding. All teachers show deeper understanding in relation to all assumptions and propositions; all teachers achieve success with students in relation to all assumptions and propositions, but the extent relates to educational level.
6 Designing the CILL Framework trial	CYCLE 6 Using insights from Cycles 1 - 5 to inform insights into the use of the CILL Framework and the pedagogy of information literacy	Through repeated iterations back through Cycles 1 - 4 (the existing body of practice and theory), Cycle 5 findings are used to inform deeper insights into information literacy learning, and to suggest further pedagogic developments.
7 The CILL Framework in use with teachers - Evidence in relation to assumptions - Evidence in relation to propositions - Evidence in relation to changes in teaching/ learning - Evidence in relation to use of the Framework	CYCLE 6 Using insights from Cycles 1 - 5 to inform insights into the use of the CILL Framework and the pedagogy of information literacy	
8 Theoretical and pedagogical insights		
9 Conclusions		

Fig. 1: Overview of chapters and research cycles

Outline of the cycles

Cycle 1 represented an exploratory phase which sought to establish a theoretical underpinning for the study. It was driven initially by the question: 'What is information literacy, and what theory or theories underpin it?' Extensive reading suggested, firstly, the futility of trying to define and embed the concept of information literacy in decontextualised theory. Secondly, it suggested the value of distinguishing between information literacy and information literacy *learning*, and developing both a contextualised theoretical framework for information literacy learning, and a contextualised pedagogic framework for New Zealand teachers to use to integrate information literacy learning within teaching programmes.

Attempts to relate emerging theoretical concerns to the emerging ideas of information literacy, and to try to extrapolate principles to inform the design of a constructivist information literacy learning framework, also intersected with a redefinition of what has traditionally been known as 'instructional design' and its movement toward an explicitly constructivist approach to 'designing learning'.

As a result of this attempt to identify and examine key and related characteristics and principles in four fields which are discrete in terms of their literature, research and professional bases - *curriculum*, *information literacy*, *constructivism* and *learning design* - an integrative focus emerged as a major purpose of the study.

As this initial exploratory cycle evolved the relationships between these four major fields were explored with reference to theory. Driven by the argument that constructivist information literacy learning is contextualised within the information society and, in this study, within the New Zealand school curriculum, significant curriculum, assessment and Qualifications Framework documents were surveyed. Constructivist approaches to information literacy learning were found to be embedded in all of these documents. The focus question at this stage was whether a theoretically coherent framework for constructivist information literacy learning would be consistent with the learning principles and approaches embedded in the curriculum documents.

Cycle 2 extended this exploration into an investigation of the origins and development of information literacy, and, specifically in its origins in resource-based learning and in technology-based learning. Questions which framed this stage of the research included asking 'How is information literacy defined?', 'How has the definition of information literacy influenced its interpretation in various professional fields?' and 'What does existing research tell us about successful and less successful practice of teaching it?'

In **Cycle 3** the focal question became how the concepts and principles from resource-based learning, technology-based learning, constructivism and related approaches, together with instructional/ learning design could be distilled into a model of constructivist information literacy learning. The next question became whether this model was sufficiently robust to sustain the design of a pedagogic framework, called the Constructivist Information Literacy Learning (CILL) Framework which would be developed in Cycle 4.

Cycle 4 was the design phase in which the model of information literacy learning distilled in Cycle 3 was translated into a pedagogic framework. The focus question was 'How can a pedagogic framework represent the richness and complexity of the theoretical and pedagogical issues raised in Cycles 1 - 3 as well as being 'teacher-friendly' and useful to non-experts in a practical teaching context?' The CILL Framework is intended to embody constructivist principles to provide a series of question-driven prompts allowing teachers to suggest ways of working with students to implement information literacy learning in a variety of curricular contexts. Providing a flexible pedagogic framework embodying constructivist principles was seen as a way of helping teachers to overcome some of the difficulties documented over three decades of practitioner research in

implementing resource-based and information literacy learning in teaching programmes (Appendix 3 a, 3 b, 4 a).

Cycle 5: The CILL Framework was designed to help teachers coach students to achieve successful information literacy learning within normal teaching contexts. Four teachers' action research cycles within the six cycles (Cycles 5 A - D), documented teachers' year-long use of the framework, providing a pragmatic and dynamic forum for evaluating the framework, its theoretical and pedagogic assumptions and design. The guiding questions evolved from sub-cycle to sub-cycle within a broad focus question, 'Is the CILL Framework viable as a guiding pedagogic framework for teachers working within the New Zealand education system?' The CILL Framework was substantially modified to reflect teachers' suggestions (Appendix 4b).

Cycle 6 reverts to the initial broader-based epistemological, theoretical and pedagogical focus established in Cycles 1 - 3. The analysis of the data gathered in Cycle 5 reflects this emphasis (Appendix 2). This cycle responded to the researcher's final focal question, 'How did the teachers' response to the CILL Framework replicate, challenge or expand the insights derived from the earlier (Cycle 1 - 3) analysis of the theoretical and pedagogical foundations of information literacy learning and teaching?' The researcher concluded that trends and problems highlighted in previous studies (both in resource-based learning and technology-based learning) had been mirrored in this study, but that this study had yielded sufficient depth of data to indicate significant progress in developing a pedagogy of information literacy.

Outline of thesis argument

The exploratory phase (Cycle 1) contributed working arguments which shaped the study suggesting that:

- there is no discrete theory of information literacy; it is helpful to distinguish between information literacy as a 'state' and information literacy learning as pedagogy, and to use the existing practice/ research base to inform the development of a theory-based pedagogy;
- the roots of information literacy learning are in resource-based learning (RBL) and technology-based learning (TBL). However,
- existing RBL and TBL approaches provide an inadequate precedent for a constructivist information literacy pedagogy because they share a flimsy underpinning of theory and a relatively small empirical research base; existing research is fragmented, repetitive and often unsophisticated;
- this practice/ research base supports the suggestion that teachers and students have significant difficulties with information literacy learning; however, critical success factors and needs can be extrapolated;
- learning approaches characteristic of constructive information literacy learning are built into key New Zealand school curriculum and primary, secondary and tertiary education documents. It is, therefore, valuable and timely to:
 - develop a constructivist information literacy (CILL) learning framework within the context of current primary, secondary and tertiary programmes, and to
 - trial this framework using participatory action research methods to establish the effectiveness of this framework for enhancing information literacy pedagogy.

A study which sets out deliberately to be integrative, eclectic, subjective and interdisciplinary might need defence. A model developed by Snelbecker (1983) provides a valid perspective. Snelbecker identifies two groups, one concerned with 'knowledge production' and one with 'knowledge use'. Both groups search for understanding, but the nature of the search is dictated by its ultimate purpose - "in certain instances, personal and professional responsibilities dictate certain emphases" (ibid., p. 440). The 'Knowledge-producers' group comprises researchers and theorists who typically tend "to

view research findings, principles and theories as end results". The 'knowledge-users' group comprises policy makers and practitioners who are "perennially searching for information that it can use in practical situations" (ibid., p. 440).

This study seeks unashamedly to synthesise a broad theory base from a 'knowledge-user' perspective to illuminate and improve practice. From this perspective it can be argued that a theory or pedagogy may be good in itself, but its ultimate value should be determined by its integration into and influence on practice. Stenhouse claims that "Any research into classrooms must aim to improve teaching" (1975, p. 157). Robinson (1993, p. 16) refers to Carr and Kemmis who "call for researchers to focus on the theories that inform practice." Carr and Kemmis suggest:

The gaps between theory and practice which everyone deplors are actually endemic to the view that educational theory can be produced from within theoretical and practical contexts different from the theoretical and practical context within which it is supposed to apply (1986, p. 115).

If a major goal of education is to improve the quality of learning and teaching, it is appropriate that the study employs what is termed 'Greeno's educational utility criterion' (Donmoyer, 1997, p.34). To this end theory has been 'mined' selectively, rejecting, for instance, much work subsumed under the terms information processing, radical constructivism and instructional design, not because it proceeds from an objectivist, interpretivist, critical or whatever paradigm, but because it proceeds from a 'knowledge-producer' perspective. Studies which ground themselves in a particular theory, establish research parameters, gather data commensurate with this theory, and evaluate the results using criteria derived from the theory, have a self-serving circularity incompatible with utilitarian criteria like adoption or improvement of practice. Green (1997, p. 1) argues for "a new sense of the necessary articulation of curriculum and literacy":

This involves the social practices of teaching and learning, on the one hand, organised around the principle of knowledge. On the other hand, it involves the social practices of reading and writing, organised around the principle of text. My point is that these have all too often been addressed separately, and that's something that is simply no longer tenable, whether theoretically, practically, institutionally or professionally.

Parameters and limitations of this study

The parameters which defined this study contributed to limitations (as well as strengths) some of which the researcher acknowledged from the outset, and some of which emerged in the course of the study.

The ambitious scope of the project - an attempt to synthesise major bodies of theory and integrate them into a new pedagogical model, and to trial this model with New Zealand teachers - inevitably led to breadth of focus rather than depth. While the researcher sees the synthetic and multi-focal nature of the study as its major contribution, she freely acknowledges the limitations her choice imposed.

A major limitation is a methodological one, acknowledged above in the interpretation of action research in two ways, firstly as an orienting focus for structuring a cyclical analysis and integration of significant bodies of literature, and secondly, as a research methodology for implementing the trial of the CILL Framework with teachers. Ideally, in action research, the research generates insights and perspectives which have evolved out of the cycles of planning, action, observation and reflection by the group, and which are shared by the group. In this study this was true insofar as the insights generated by the teachers in Cycle 5 represent valuable pedagogic insights shared by the teachers. However, the researcher's growing recognition that her 20 years of teaching in the field, and the intensive research and analysis process undertaken in Cycles 1 - 3 had equipped

her with a perspective different from that of the teachers and potentially threatening to them suggested a role different from the traditional participant in an action research process. It encouraged her to put these epistemological, theoretical and pedagogical questions and insights 'on ice' for the duration of the practical action research cycle (Cycle 5), and to let teachers explore the model and the pedagogic framework with as much freedom as the practical constraints of the process allowed.

These practical constraints in turn determined limitations. The researcher had only met one of the participants, and only one of the participants had had previous experience using audioconferencing as a learning/ communication medium. Participants were drawn from primary, secondary and tertiary teaching sectors. Audioconferencing as a method for implementing action research had major advantages. However, it also had major disadvantages. It became obvious, as the research progressed, that participants from each sector needed to embed their understanding of the key concepts of the CILL model and Framework in the context of their own, and each other's sectors. While this enhanced understanding of how information literacy learning would have to be integrated differently into each sector became one of the perceived benefits of the study in their eyes, it made for very slow progress in Cycle 5 A and B in the researcher's eyes.

Paradoxically this slow period of sharing problems, perspectives and stories to locate the model and framework in their experienced reality of teaching at their various levels and in their various contexts allowed the group to develop into a cohesive online community of professional friends with a shared conceptual language and a trust. This in turn, paradoxically, provided its own limitations because, as the online community developed, individual perspectives blurred and teachers found contributing to a group narrative immensely rewarding. The fact that this shared narrative often went in directions not indicated by the parameters of the study frequently left the researcher in a dilemma. On the one hand time was precious, and progress in implementing the CILL Framework often appeared painfully slow. Teachers frequently embarked on long stories about what had happened in their classrooms which seemed only tangentially related to the use of the Framework. As their confidence with audioconferencing and with each other as empathetic listeners grew, these narratives grew longer and more complex as different teachers contributed and elaborated on the basis of their experience.

On the one hand this broader perspective contributed by teachers meant that they had a larger ownership and enjoyment of the process than in the initial meetings. On the other the researcher often sensed that the intention of the project (to evaluate the CILL Framework) had become secondary in the teachers' eyes. However, the extent to which it became apparent in ongoing transcription and analysis of the taped audioconference meetings that apparently 'off-task' narratives frequently illuminated recurrent problems and threads reinforced her decision, in Cycles 5 B and D to 'go with the flow' and just let teachers talk and explore with just an occasional invitation to them to locate what they were saying to the context of the CILL concepts and propositions.

This decision had the major consequence of leaving the analysis of the data, in terms of its epistemological, theoretical and pedagogical implications to a further cycle (Cycle 6) which did not involve the teachers. This could be seen as a major methodological limitation arising as an inevitable consequence of the initial decision to evaluate the new information literacy learning in as authentic a situation as possible, reflecting the reality of primary, secondary and tertiary teachers trying to implement information literacy learning in the normal context of their classroom curriculum programmes.

These limitations are explored further in the course of the study.

Use of terms in this study

This study accepts that the term *information literacy* is so broadly used that it defies the development of any one precise definition or description, or the development of any one pedagogy. The purpose of this study is not to contribute to defining and describing information literacy (for example: Bruce, 1996a; Jones, 1997; Langford, 1998). It proceeds from a view that no 'literacy' is an immutable state. Reading, writing, media, visual, technological or information literacies (whether they exist as independent or interrelated entities, or subsets of one, or of each other) are always context-dependent and contextualised. In this study the context provided by the New Zealand classroom provides one illustration, not of information literacy, but of teachers and students using the skills, competencies and processes that help them to teach and learn in information and technology-enriched environments in pursuit of curriculum-focused learning goals.

How the terms *information literacy* and *learning* are interpreted is functional and contextualised. Information literacy is what information literacy is and does in a particular context. Information literacy is an evolving journey rather than a fixed destination. How people learn to become information literate, and what information literacy is, depends on context - who they are, where they are, what and why they are learning.

It would be reasonable to claim that few New Zealand teachers set out to *be* information literate, or teach their students to *be* information literate. Instead, as a result of their teaching and student learning in a variety of curricular and extra-curricular contexts, they and their students become information literate, to a degree. This study proceeds from a concern that this degree is demonstrably not sufficient to meet existing curricular learning goals, but could be improved with more precisely focused pedagogical strategies (Chalmers & Slyfield, 1993; Crooks & Flockton, 1998; 1998; Moore & St George, 1989). It also proceeds from a concern that, while lists of attributes and competencies, and designs for an 'information literacy curriculum' (for example: Bjorner, 1991) are valuable, these efforts tend to reify and ossify a notional, ideal state of information literacy that exists 'out there'. This study supports a view that knowledge is socially constructed and situated. Learning in an information society requires traditional literacy skills like reading and writing and, increasingly, sophisticated thinking, viewing, listening, communication and technology skills that can be clustered under the umbrella term *information literacy* skills. The level of information literacy that results may conform to a degree to the existing attribute lists and descriptions. That degree will not be absolute, but related to the context. *Context* is interpreted as the implementation of curriculum at policy and classroom level. *Curriculum* is interpreted broadly as the official guidelines shaping New Zealand school education and influencing tertiary education.

The term *information literacy learning* has been used to distinguish between the prevalent view of information literacy as a *state* defined by attributes and competencies, and the type of *learning* which may lead to information literacy. *Information literacy learning* subsumes the earlier term *resource-based learning* (Breivik, 1993). This recognises that most current definitions of information literacy see technological literacy as a key component, whereas in earlier descriptions of resource-based learning, if technology was mentioned, it was usually in the context of the library's information retrieval technologies. The term *technology-based learning* has been coined in this study to parallel *resource-based learning* to describe work being done in technology-enhanced 'knowledge construction' environments (for example, Jonassen, 1994).

What information literacy is in this study, and the types of learning which contribute to it, will largely be determined by the teachers (and their students) who participate in the study, and will relate to the context in which they teach and learn.

RATIONALE AND CONTEXT

In Beswick's milestone book on resource-based learning, a comment by the renowned New Zealand educator, the late C.E. Beeby was cited:

Modern prophets tell us that, in some subjects, knowledge is doubling every ten years. Whether or not this is literally true I do not know - it is certainly not true of wisdom - but there is some justification for the view, now commonly expressed, that new ways of teaching, learning and understanding must be found if the new generation is not to be intellectually smothered beneath a mountain of facts (1977, p. 5)

The rationale for this study is simple but not trivial.

If students are to become effective learners in an information society, as educators we need to explore teaching and learning approaches which will scaffold this learning. And we need to involve both teachers and learners, as participants in this exploration. This is what this study seeks to do.

The information society: context for information literacy learning

In later chapters *context* is interpreted as situated within the practical implementation of the New Zealand Curriculum. In establishing a rationale for the study, a broader interpretation of *context* is helpful. Learning is part of a broader educational, social, economic, cultural context. The huge sub-literature which has generated terms like the information age explosion/ revolution/ society emphasises the need to get beyond clichés to the nub of the question raised three decades ago by Beeby. This question lies at the heart of this study:

Does the exponential increase in information and information technologies lead to or require different ways of learning, teaching and understanding? If so, different in kind or emphasis?

On the surface it is easy to compare the learning of children using a textbook in a teacher-driven, test-oriented classroom with a flexible, generative, student-centred resource-based approach where students work independently on computers on team enquiry projects to observe the difference. On a deeper level the difference is less obvious, and needs to be debated in order to focus the question underpinning the study:

What types of learning and teaching lead to information literacy?

If there is a need to design new approaches to learning as Beeby (cited in Beswick, 1977), Banathy (1993) and Laszlo and Castro (1995) suggest, and if *information literacy* is adopted as the term to describe one such approach, it has significance beyond the context of the New Zealand classroom. New Zealand developments mirror many aspects of recent curriculum and education development in Australia and Britain. A common curricular emphasis on finding and using information for problem-posing and problem-solving has been seen as the emergence of a technology-focussed global enquiry curriculum (for example: Taylor, 1991b; Wirth, 1994). What is less clear is how to reconcile the rhetoric of the self-directed information superhighway driver with the dilemma described by Beswick:

Meanwhile the problems faced by slow learners, new learners, insecure learners and teachers, when faced with vast numbers of learning sequences, multi-megabyte capacity, and the contents of the world's libraries, are not simply daunting: they are horrific. Even a modest book library presents problems of selection and choice... (1987, p.5).

Whether or not information literacy is a theory, a pedagogy or merely a convenient umbrella term, what students do with the unprecedented quantities of information they access through sophisticated technologies needs close examination.

This study explores the idea that, ultimately, the design of the learning environment, not the technology, is likely to determine the type and quality of student learning.

Laszlo and Castro (1995, p.9) say “learning to know and learning to do must be replaced by learning to become learning oriented.” They see information technology as integral to the creation of new learning environments where “the key to this new learner-oriented paradigm is a renewed and redirected emphasis on the relationship between the individual and his or her information environment.” Melchior highlights the need to rethink traditional approaches to resource-based and technology-based learning:

Recently one of us, as an exercise, wrote a 68 page paper on Burkina Faso... The paper contained maps, charts, comparisons of economic indicators and information on culture, religions, and political systems. The paper was reviewed by faculty members and judged to be an effective, comprehensive article. Yet the author put it together electronically in 38 minutes and acknowledged that he knew little more about the country than when he had begun...

This practice is already evident in schools where students have ready access to educational technologies (1995, p. 94).

The difference between doing a sophisticated electronic pastiche of *information* on Burkina Faso and building *knowledge* about Burkina Faso relates to how we interpret the notion of learning in an information-enhanced environment, and the role of the teacher in ensuring that students have the skills and competencies to *build knowledge*, not just use technology.

In a world where data increases exponentially each year, a major challenge for schools is to prepare students to access and use information effectively. Learners frequently become lost in a morass of data from texts and from inquiry projects. Without higher-order thinking skills, they cannot synthesize large volumes of information into overarching knowledge structures... (Dede, 1992, p. 54).

Dede predicts the introduction of highly realistic virtual collaborative interactive environments, but suggests:

Such learning environments risk overwhelming their users unless they incorporate tools that help students and teachers to master the cognitive skills essential to synthesize knowledge from data (ibid., p. 54).

Between electronic information pastiches, such as the Burkina Faso example, and *knowledge* construction lies the information literacy challenge.

In the near future, all the representations that human beings have invented will be instantly accessible anywhere in the world on intimate, notebook-size computers. But will we be able to get from the menu to the food? Instant access to the world's information will probably have an effect opposite to what is hoped: students will become numb instead of enlightened (Kay, 1991, p. 100).

Does the teacher have a role in helping the child to get from the menu to the food?

Projects, or setting a topic and requiring students to go and ‘look it up’, have been documented as a teaching/learning method since the 1890s (Board of Education, 1928; Ellis, 1971; Fowler, 1915; Stott, 1951; Winks, 1899). There is, surely, little difference between the learning skills required to do a manual or photocopied information pastiche and an electronic pastiche? In Dede's plea to identify the “tools that help students and

teachers to master the cognitive skills essential to synthesize knowledge from data” do we recognise Beeby's agenda for new ways of learning, teaching and understanding which go way beyond ‘information pastiches’?

The need to explore, if not resolve, these issues is one of the most pressing and practical elements in the rationale for this study.

In the 1970s Beswick's work gave the term resource-based learning (RBL) widespread acceptance, particularly among the international teacher/school librarianship community. The knowledge explosion represented more than the accumulation of more 'facts'. It signalled unprecedented access to organised information in a greater range of media than traditional print, and the need for teacher guidance in effective resource-based learning (Beswick, 1977, p. 6). Irving said, “The information society has arrived quickly, and preparing young people for it must be done quickly - we need tomorrow's education today” (1985, p.1). Naisbitt talks about “a period of thrashing creative chaos” signalled by the “blending of technologies” and “global interconnectivity” (1994, p. 153). Taylor suggests that technology will change the content as well as the methods of education (1991b, p. 2). Implications for the role of the teacher are, as yet, barely explored.

While there is a significant body of anecdotal commentary on the transformatory effects of this proliferation of media and information technologies on learning:

Studies of the effects of information technologies on student achievement are only now being conducted (Rothenberg, 1994, p. 283).

The results to date are, at best, ambivalent (Healy, 1998; Lee, 1998). Nevertheless, as Rothenberg suggests, “(d)espite the repeated failures of earlier technologies to live up to claims that they would fundamentally change education, support for the use of technology as one means to reach the goals of the reform movement appears to be higher now than ever before” (1994, p. 279). Means suggests that “the use of technology creates a shift in a classroom's control structure” and that this “leads to a different model of student-teacher interaction... (where) students are actively engaged not only in solving problems but also in formulating them” (Means, 1994, p. 16).

Laszlo and Castro (1995, p. 7) comment on the capacity of new technologies to “launch human potential through the generation of repertoires of learning responses that foster inquisitiveness and readiness to deal with challenge”, but, like Farmer (1992), Fleming (1989, p. 323) and Fiske (1991), they recognise that the challenge is systemic, not technological. Laszlo & Castro suggest that current education systems tend to focus on the production of ‘knowers’ instead of ‘learners’. Technology “turns out to play a very traditional role. It is either viewed as a matter of isolated subject mastery, or as a means of augmenting and enhancing the material to be learned” (1995, p.7; see also: Becker, 1992a, p. 6; *ibid.*, p. 8). In an extensive survey of computers and learning, Healy says simply, “I am looking hard for learning, but I am having trouble finding it” (1998, p. 45).

Laszlo and Castro describe the need for learning environments where:

This learning relationship must be organized and made available according to the relationship-with-meaning need of the learner rather than the structured conveniences of the subject material or the learning technology. In this regard, modern technology takes on a critical new role as the gateway between the learner and the learning. Learner-interface technologies can help develop navigational, representational, and referential dexterities. They are designed to facilitate a relationship centered on responding to, empowering and enlivening the learner (op. cit. pp. 8 - 9).

They see the teacher's role as pivotal in creating these new learning environments (see also, Brown, 1994b, p. 146; Crook, 1994; Healy, 1998, p. 273; Rothenberg, 1994, p. 287). If technology does not change the way teachers teach, is it likely to change the way students learn? Despite initiatives like AskERIC, the evidence of the impact of technology on teachers and teaching is slim, and there is evidence of teacher 'resistance' (Crook, 1994, p. 3; Hannafin & Savenye, 1993). Barron and Goldman (1994) are among many who point out that most teachers come from technology-poor environments. This is certainly true in New Zealand (Information Technology Action Group (ITAG), 1998; Ministry of Education, 1998; Moore, 1998). The phenomenon of teacher 'resistance' may be more appropriately called 'reluctance', attributable to insufficient access to technology, training and practice time for teachers, and the expectation that, nevertheless, they should be able to design and inspire the type of technology-enhanced learning and information retrieval that they themselves have never experienced (for example, Moore, 1998; New Zealand Educational Institute, 1999). Brown points to the increasing phenomenon of what he calls the superficial implementation of technology (1994b). Crook says "there are also hints that while this technology may sustain interactions that are lively, this does not necessarily mean that they are rich in a cognitive sense" (1994, p. 146).

Zuboff explores the phenomenon of 'electronic text' leading to a way of workplace learning and communicating that she calls 'informating' (1988, p. 9). Informating is a highly intellectual process whereby personal knowledge is abstracted and computerised to become reorganised, shared, digitised experience - a process she sees as both empowering and democratising for the workers who have the skill and will to accept it (see also, Wirth, 1992, p. 57; *ibid.*, p. 390). Applied to education, it is possible that the notion of 'informating' could reconfigure the nature of learning, as Beeby anticipated.

As information technology is used to reproduce, extend, and improve upon the process of substituting machines for human agency, it simultaneously accomplishes something quite different. The devices that automate by translating information into action also register data about those automated activities, thus generating new streams of information... Activities, events, and objects are translated into and made visible by information when a technology informs as well as automates... when the technology also informs the processes to which it is applied, it increases the explicit information content of tasks and sets into motion a series of dynamics that will ultimately the nature of work and the social relationships that organize productive activity (Zuboff, 1988, pp. 9 - 11).

The workers who were successful in Zuboff's automated work environment were those who were able to visualise processes in the 'mind's eye' and reconstruct physical processes from abstract visual clues. In contrast, Hargreaves points out the superficiality of instantaneous visual culture (1994, p.75). Perelman (1992) notes education's over-reliance on the verbal mode for learning, and our neglect of iconic and symbolic modes (see also, Beswick, 1981; Breivik, 1995; Gerber, Boulton-Lewis, & Bruce, 1995; Lanham, 1995; Meek, 1991, p. 221; Petterson, 1989; Rushkoff, 1996). This signals the need for "a kind of learning... which demands the construction of meaning from symbols"; where confronting electronic text "frequently requires a sharing of hypotheses and insights to secure the best interpretation of the text" (Wirth, 1992, p. 60). It illustrates Abbott's comment that "(t)he transformation through which we are now passing is witnessing the application of knowledge to knowledge itself" (Abbott, 1994, p. 17). Meek's seminal comment, "TV can make lying seem easy" points to an unprecedented need for critical literacy (1991, p. 221).

As the rate of change alters technological, social and moral realities, we are compelled to do more than revise our abstractions: we are also forced to test them more frequently against the realities they are supposed to represent or explain (Toffler, 1974, p.14).

There have been many predictions of the profound and sweeping changes the 'microelectronics revolution' will have on schools and education (for example: Cronin, 1983, p. 279; Gosling, 1981, p.20; Martin, 1988, p.4; Tuman, 1992). However, decades of school reform have required, and resulted in, little redefinition of the roles of teachers and learners. Reforms "are not driven by the need to improve student achievement, some exceptions notwithstanding" (Abbott, 1995, p.1; Brown & Campione, 1996, p. 320; Jones & Idol, 1990, p. 5). Banathy questions the impact of the 'reform rhetoric' on learning:

The escalating education reform rhetoric has created high expectations, but the realities of improvement efforts have not delivered on those expectations regardless of how much money we have invested in them (1993, p. 33).

Bereiter challenges the global curricular focus on problem solving:

The issue is not whether students are solving problems and thus constructing knowledge. We assume that this is always going on. The issues are what problems are being solved and what knowledge is being constructed as a result (1992, p. 348).

While the New Zealand Curriculum (Ministry of Education, 1993a, p. 7) aims to "foster the development of the knowledge, understanding, skills, and attitudes that will empower students to take increasing responsibility for their own learning", ultimately the link between what problems are being solved, what knowledge is being constructed as a result, and evaluation, assessment and transfer remain elusive.

McGarry suggests that information overload may have a 'narcotising' effect and asks whether we "could reach a stage where merely receiving or assimilating information about a problem is taken as a substitute for the appropriate action in seeking a solution" (1981, p. 103). In Australia Jones suggests:

The fragmentation of knowledge may lead to an incapacity or unwillingness to examine technical questions in a wide social context, with a failure to connect and overall, an inability to comprehend what is going on (1984, p. 13).

In New Zealand, there is evidence of:

The frantic effort of the school system to teach children skills 'of use to employers'... defined by the fact that - if only there was work to get - for the most part they do not need what education offers or even what it hopes to offer in the future (Robins & Webster, 1987, p. 150).

Butler says of New Zealand:

Knowledge generally acquired through schooling is becoming the key resource, so educational institutions (from primary school through to tertiary) and libraries are at the knowledge society's centre. They must be empowered to operate in a first class, internationally competitive manner. We must resist any tendency to make schools organs of social policy at the expense of their primary role (1996, p. 5).

Education and curriculum cannot be seen apart from sociopolitical contexts. Butler seems to suggest that a knowledge society is one where schools adopt a business model but that this is *not* social engineering. This raises fundamental questions like 'what is information; how does it relate to knowledge; what is curriculum; what is learning; what is teaching?' which need to be contextualised, not just in abstract theory, but in the *social fabric* of education.

The New Zealand curriculum as a context for constructivist information literacy learning: Developments in the curriculum in New Zealand

The relevance of information literacy learning has been emphasised by significant change in the New Zealand education system in recent years, particularly in the area of curriculum development and associated areas of teacher development, assessment and qualifications structures. Recent developments in curriculum in New Zealand need to be set against a decade of change in the education system. Jesson describes this broader context of change:

Following the Education Act in October 1989 a complete change has occurred in the mechanisms for New Zealand curriculum development. This has resulted in conflicting demand on teachers... The 1989 Education Act created a new administrative system for both schools and tertiary institutions through the 'Tomorrow's Schools' and 'Learning for Life' projects. There has been a fragmentation of functions and provision, different responsibilities for compulsory and post-compulsory schooling and also different bodies responsible for different parts of the curriculum process. The changes have limited the influence of organised teachers nationally in policy making (including curriculum), increased the effect of 'market choice' in education and at the same time have attempted to implement a new model of curriculum. These changes have exposed gaps in the steering mechanisms of education, while at the same time have greatly intensified teachers' work (1995, p. 143).

In 1987, under New Zealand's fourth Labour government, a review of the curriculum was undertaken with wide community consultation (Department of Education, 1987).

(T)he diversity of views and demands evident at this time demonstrates clearly how the education system functions as a site of struggle or contestation for different interest groups within the society (Simon, 1994, p. 74).

While this study does not seek to examine this 'struggle', it recognises the current more overtly political and polemical nature of education, and the inevitable influence on what happens in classrooms. Jesson describes three current "opposing and different demands on the curriculum" (1995, pp. 148 - 149). The first is "ideological", a "neo-liberal" demand which views curriculum as a commodity to facilitate choice and market differentiation. The second is a demand "to develop a more technocratically literate population", the third is for "a developmental curriculum with school-based assessment, reflecting the social concerns developed earlier through the *Curriculum Review*." Jesson maintains that the second and third demands form the background rationale from which the current curriculum writing teams operate.

In 1993 *The New Zealand Curriculum Framework* was released. It is a short, broad-based document describing seven Essential Learning areas (ELAs), eight Essential Skill areas (ESAs), principles, attitudes and values, and approaches to assessment (Ministry of Education, 1993a). The principles confirm New Zealand's "strong tradition of child centred learning in New Zealand with associated concepts of individualised learning and holistic learning" (McGee, 1994, p. 81).

The principles give direction to the curriculum in New Zealand schools. They are based on the premise(s) that the individual student is at the centre of all teaching and learning... (Ministry of Education, 1993a, p. 6).

This document was to be supplemented by the gradual release of more detailed Curriculum Statements which replace primary and secondary curriculum syllabus statements. While ostensibly following a devolved model in keeping with the direction of educational administration, in practice Jesson asserts "(c)urriculum direction was now

dependent on politicians and backroom networks of influence” and cynically calls it “curriculum policy by dodgems” (1995, pp. 150, 154).

Two authors involved with the emerging field of information literacy learning offer simple curriculum models useful for the explanatory power they provide for current New Zealand curriculum developments, particularly related to information literacy. Wellington looks at education and the school curriculum in an information society and suggests the categories *vertical* and *horizontal* as useful. The New Zealand secondary curriculum has traditionally been subject specialised or vertical. The new curriculum in both primary and secondary schools is becoming increasingly integrated or horizontal.

Skills which run horizontally... will play a more dominant part in the curriculum. The development of information skills... are a key example. Language and communication skills, to be developed in every subject specialism, will also become increasingly important in a society based on information (Wellington, 1985, p. 247).

Stenhouse rejected “the objectives model as a strategy for the design and development of curriculum” (1975, p. 84). Through his work implementing Bruner's ideas in the MACOS project, he evolved his idea of a *process model* of curriculum development, implying “teaching by discovery or inquiry methods rather than by instruction” (ibid., p. 91). He saw the process model as “essentially a critical model, not a marking model”, noting that it “raises problems for the assessment of student work” (ibid., p.94, 95).

These models highlight some of the tensions between the teaching/ learning and assessment approaches in the new documents. Conflicting demands for assessment are one factor contributing to the high current level of teacher stress (for example, Bell & Gilbert, 1994, p. 483; Jesson, 1995, p. 152). Teacher stress was acknowledged by the (then) Minister of Education in his decision to extend the timeline for the implementation of the final three curriculum statements (Perris, 1995, p. 1).

Any attempt to contextualise research in the New Zealand curriculum must acknowledge that it is a *developing* curriculum with numerous industrial and political factors impinging directly on implementation. For example, withdrawal from all training or other efforts associated with the implementation of the curriculum statements was a measure of teacher anger and concern, put in place by the Post Primary Teachers Association (PPTA) in 1996. At tertiary levels, there has been sustained opposition to the New Zealand Qualifications Framework. The implementation of recent national education policy, and associated monitoring and assessment measures, have been dogged by an uncharacteristic level and duration of industrial unrest and anecdotal accounts of teacher stress and disaffection.

The curriculum statements have also been the subject of acrimony. They are written by individuals and teams on contract to the Ministry of Education. After trials and submissions they are revised, sometimes by different individuals/ teams. Inservice training for implementing these curricula is contracted out as ‘Curriculum Initiatives’ to teams from Colleges of Education, universities, education advisers, or private providers. One curriculum might be inserviced in different ways in different parts of the country. Some initiatives are school-based. Some involve facilitator visits to the school. Many rely on ‘cascade’ methods. There are also other Ministry-sponsored inservice initiatives not related to particular Curriculum Statements. For example, several Information Technology Initiatives ran in tandem with the Curriculum Initiatives although information technology is, in fact, embedded in the new Technology Curriculum Statement and IT skills in ‘information skills’. This has compounded teacher confusion about the role of the Essential Skills. On the one hand the Curriculum states that the eight groupings of essential skills (communication, numeracy, information, problem-solving, self-management and competitive, social and co-operative, physical, work and study) are “to be developed by all students across the whole curriculum throughout the year of teaching”

(Ministry of Education, 1993a, p. 17), and, on the other, the Ministry's own inservice is signalling to teachers that the new learning area, technology, is a synonym for problem-solving, to the extent that asking teachers to work with students to problematise and investigate a situation in *any* curriculum area is seen as 'doing technology.'

Likewise, although information technology skills are one of five information skill components, the technology curriculum subsumes information technology. This confusion is illustrated by a teacher who commented about a recent information literacy course, "It was really useful for showing me how to really do technology."

Teacher exposure to the new curriculum statements through inservice education has not been uniform across curricula, across the country, or between schools, or teachers (Lai, 1999, p. 19). Jesson comments on the funding of this inservice:

While some Ministry funding is available for teacher development, all schools are being required to use their operations funding or to increase school fees to 'purchase' the teacher development (or retraining) (op. cit., p. 147).

In addition to the curriculum statements simultaneously being trialled/ inserviced/ implemented, other developments are having a significant impact on the curriculum and approaches to teaching and learning.

Assessment

Assessment, prior to 1988, was the responsibility of the Inspectorate who graded teachers on the basis of individual performance (primary) and graded schools (secondary). This function has been assumed by the *Education Review Office (ERO)*, one of several new education agencies existing alongside the Ministry. In 1994 the Ministry published its own guide to assessment, intended to complement the curriculum initiatives (Ministry of Education, 1994). The Education Review Office (ERO) published its own assessment guide (1995). This highlights approaches to assessing the achievement objectives of the national curriculum statements against standards which are not specified in the Ministry's documents and, arguably, compromise the teaching/learning directions and principles specified in the New Zealand Curriculum Framework. ERO claims, in relation to the curriculum, that "(s)tandards of achievement are to be found more in the rhetoric than the reality. The *National Curriculum Statements* do not define standards but describe achievement objectives for a number of levels" (ibid., p. 32).

Implementation of the new curriculum and assessment policy initiatives requires a major shift in the way schools think about, organise and deliver the curriculum, assess students' achievement and report to their communities about student and school performance (ibid., p. 31).

This shift runs counter to the educational ideology espoused in the Framework itself. This has been noted by McGee, "Proposals for greater testing of students conflicts with a strong tradition of child-centred learning in New Zealand primary schools, with associated concepts of individualised learning and holistic learning" (1994, p. 81). While the tensions between the competency-based, behaviourist approaches to assessment in the 'ERO' document, and the implicitly constructivist design of the new Curriculum Framework may not be apparent at the moment to many classroom teachers, the decision to delay the implementation of two curriculum statements acknowledges the degree of teacher anger and distress at the speed with which they have been expected to implement new curricula, and new, potentially conflicting, assessment methods.

Primary school teachers, in particular, have to implement every area of the curriculum... both social studies and technology (a completely new curriculum) had a 1997 implementation date. This would have presented a major difficulty for most primary schools which usually have one major curriculum focus in their annual development plan.

Most secondary schools are working toward adoption of the National Qualifications Framework. They are thus adjusting to the assessment requirements of the National Qualifications Framework while, at the same time, responding to the new curriculum (Perris, 1995, p.1).

Assessment could be seen as a 'hidden' curriculum (Lovat & Smith, 1995, p. 36), running alongside, but ideologically in conflict with, the national school curriculum.

(A)ssessment procedures have a profound effect on the way in which students learn. Providing a constructivist teaching environment will have little effect on the quality of learning while conventional assessment procedures remain in place (Entwistle, Entwistle, & Tait, 1991, p. 353).

Unit standards

The New Zealand Qualifications Authority (NZQA) is a major stakeholder in the implementation of curriculum, especially in relation to upper secondary schools, teacher education and tertiary education (polytechnic and college of education qualifications and degrees). As secondary schools struggle to get accredited to teach Unit Standards from the Qualifications Framework, the blurring between curriculum and assessment becomes more evident, not least because the Ministry and NZQA employ different levels and standards, and these co-exist with the ERO requirements and School Certificate and University Entrance examination system. Jesson comments:

There is also an apparent mismatch of assessment requirements between the requirements of the National Curriculum documents, NZQA and ERO, leading to even more frustration and cynicism. At the same time, some teachers in both primary and secondary schools are becoming disturbed at the increasing use of appraisals of teaching performance which are framed around curriculum outcomes (1995, p. 152).

In 1998 it was announced that, "starting in 2001, senior secondary school students will be aiming at a new set of national qualifications" (New Zealand Qualifications Authority (NZQA) & Ministry of Education (MOE), 1999, p. 1). "Schools will be able to offer courses that package any combination of achievement standards and unit standards" (ibid., p. 2). In effect NCEA (National Certificate of Educational Achievement) standards will replace unit standards at school level.

Information literacy learning and the New Zealand curriculum

As outlined earlier, the context for information literacy learning is the information age/society. These are "phrases coined to describe the present-day proliferation of information that technological advances have made possible, yet often used glibly, without adequate understanding of the changes that are under way and the consequences that these will have on the availability of information" (Carpinter, 1991, p.1).

Dordick comments that "New Zealand's economic future may very well rest upon its appreciation of the true meaning of the word 'information'... It is an era in which information is the raw material out of which value and wealth is created" (1987, p. 155). Discussing information skills, "the skills needed to gain access to and make use of available information" which "are an imperative for everyone in society", a New Zealand report claims:

A population well equipped for the information age will be able to promote its interests and will be an essential asset in achieving economic recovery, given that information is becoming the prime economic resource and source of competitive advantage (Carpinter, 1991, p. 55).

Education for the information age is only implicitly acknowledged in the national curriculum although information skills are one of the eight Essential Skills:

Education in New Zealand today operates within the context of rapid social and economic change. The curriculum must help students to be adaptable and play their full part in this changing environment (Ministry of Education, 1993a, p.3).

Dordick says “(i)t is surprising that New Zealand, a nation that has been so concerned with societal values, has not been more concerned with the social changes likely to result from the adoption of information technology” (1987, p. 154). It is no less surprising that, while the Curriculum “promotes new emphases in learning areas which are important to the country's health and growth, such as technology, second language learning, te reo and nga tikanga Maori, and studies of New Zealand and those regions important to New Zealand, such as Asia and the Pacific” (ibid., p.1), it is a view of the future bounded by trade rather than inspired by vision of a knowledge or learning society. Martin (1988, p.4), sees information as the lifeblood of education, but a major research project on ‘Libraries learning and teaching in New Zealand schools’ concluded that:

Almost all principals considered that it was essential or desirable to have in-service training for teachers in order for students to acquire information skills as described in the draft New Zealand Curriculum Framework (97% of primary principals, 98% of secondary and 95% of composite school principals).

However:

Very few primary schools had information retrieval technologies, and fewer than 10% were planning to obtain them...

and

(t)he main purposes for which primary teachers used the library were to take students to change their library books on a regular basis and to borrow resources to encourage students to read. Secondary teachers tended to use the library to refer students to when they were doing research topics and to borrow resources for students to use independently (Chalmers & Slyfield, 1993, p. 171).

New Zealand studies by Johnson (1990), Moore and St George (1989), Moore (1998) and Chalmers & Slyfield (1993) provide similar evidence. A recent survey showed that under one per cent of schools had 75 per cent or more of their students using the Internet in a typical week (Information Technology Action Group, 1998). It could be suggested that schools with an unsophisticated appreciation of the role of information and information literacy in learning are badly placed to challenge education by ‘marketplace ontologies’.

New Zealand's Minister for Information Technology presents this view:

The minister says IT is not only something to be learnt in schools but is a learning tool in itself to assist with other subjects. It was needed in schools because it enhanced learning outcomes, improved efficiency, assisted New Zealand in maintaining its competitiveness with the rest of the world, students liked to use it and "the most important reason which encompasses all of those is that it gives New Zealanders the skills they need to participate in the society of the future” (Wallis, 1995, p. 1).

Australia's (then) Minister of Information Technology commented:

Learning is a process of growth, self-actualization and self-recognition - a means of pursuing abundant life, assisting people to understand the world around them and

the world within, to enlarge their personal ranges of choice, experiencing the satisfaction of creation and/or understanding (Jones, 1983, p. 171).

Ironically, this resembles Fraser's (1940s) view which shaped New Zealand's humanistic, child-centred personal growth educational tradition (Garrett, 1970, p. 19). Bell's (1977, p. 3) comment that "the post-industrial society rests on a knowledge theory of value - that is to say, value is fundamentally increased, not by labor, but by knowledge" would arguably hold true in New Zealand today only if 'free trade' were substituted for 'knowledge'. Jesson describes New Zealand as being in a 'time warp' in that the belief in the rationality of the market continues to have "the status of a political creed" (1999, p. 7). Effects of this creed on education have, arguably, been profound.

Despite international research which questions the impact of technology on learning (for example, Healy, 1998; Kay, 1991; Lynn, 1995, p. 16; Maddux, Lamont-Johnson, & Willis, 1992; Piller, 1992, 218; Pournelle & Pournelle, 1994; Silver, 1995), extravagant claims have been made in New Zealand for computers as cheaper, more motivational and effective than teachers:

Productivity should be increased and higher student/ staff ratios achieved as more advanced learning technologies are introduced, with no reduction in quality of teaching - in fact it may be increased (Butler, 1996, p. 11; see also, McMillan, 1995, p. 19).

Whether reality mirrors rhetoric is less important than the support it lends to the notion that a 'personal growth' model of learning has been superseded at policy level in New Zealand by a marketplace ontology:

The New Zealand Curriculum recognizes that all students should have the opportunity to undertake study in essential areas of learning and to develop essential skills. Such learning will enable them to develop their potential, to continue learning throughout life, and to participate effectively and productively in New Zealand's democratic society and in a competitive world economy (Ministry of Education, 1993a, p.3).

If Fraser's vision of education for personal growth, democracy and an egalitarian society is kept alive, it can only be because the vision of so many teachers is visibly and vocally at odds with the official model.

Summary

In broad terms, the type of learning seen to lead to information literacy is supported within the New Zealand curriculum both in terms of the inclusion of information, communication, information technology, thinking and problem-solving skills among the eight essential skill areas, and also in the nature of the learning tasks suggested in the curriculum statements.

What is not clear is the extent to which the various inservice 'Curriculum Initiatives' have influenced teachers' thinking with regard to the need to integrate all the Essential Skill areas across all the Essential Learning areas, particularly in the ambivalent area of technology. Technology is seen as an all-embracing pedagogy (problem-solving), an all-embracing tool, and an all-embracing topic. Information literacy sits uneasily between information skills as an Essential Skill, information technology (as a subskill of information skills), other Essential Skills (like communication, problem-solving, self-management and competitive, social and co-operative skills) and Essential Learning areas like Technology, English and Social. The fact that there is no consistency in the vocabulary between learning areas compounds the tendency for teachers to see each Curriculum Statement as having a distinct pedagogy, despite the intended cross-curricular nature of the Essential Skills as the 'how' for learning the content.

CHAPTER 2

INFORMATION LITERACY AND CONSTRUCTIVISM:

An introduction : Cycle 2

The Information Age requires that the concept of literacy be expanded to include information literacy - the ability to locate, evaluate, synthesize, organize, and apply information...

Information literacy is emerging as one of the most critical literacies for an educated person who will be living and working in the twenty-first century... the graduation of students who are information literate and experienced in resource-based learning should, therefore be one of the most obvious and easily agreed on goals for higher education... (Farmer, 1992, p. 103).

Defining information literacy

Information literacy is frequently described as a *state* of being information literate, focusing on aptitudes, competencies or capabilities. For example, Doyle's (1992, p.2) Delphi Technique study, lists characteristics of an information literate person:

- recognizes the need for information;
- recognizes that accurate and complete information is the basis for intelligent decision making;
- identifies potential sources of information;
- develops successful search strategies;
- accesses sources of information, including computer-based and other technologies;
- evaluates information;
- organizes information for practical application;
- integrates new information into an existing body of knowledge, and
- uses information in critical thinking and problem solving.

A much-quoted description of an information literate person adds the dimension of learning how to learn:

To be information literate an individual must recognise when information is needed and have the ability to locate, evaluate and use effectively the information needed... Ultimately information literate people are those who have learned how to learn. They know how to learn because they know how information is organised, how to find information, and how to use information in such a way that others can learn from them (American Library Association Presidential Committee on Information Literacy, 1989, p. 1).

This definition anchors information literacy in learning and echoes Dordick's (1987) emphasis on information literate people *as a resource*. Boyer says:

People who are information literate, who know how to acquire knowledge and use it, are America's most valuable resource (cited in Breivik, 1993, p. 9).

Doyle's definition sets information literacy in the context of the information society:

Information Literacy is the ability to access, evaluate and use information from a variety of sources. As students prepare for the 21st Century, traditional instruction in reading, writing and mathematics needs to be coupled with practice in communication, critical thinking and problem-solving skills... (1995, p.30).

Kuhlthau (1990, p. 22) and Bruce (1996b, pp. 1 - 5) claim that the term *information literacy* was first used by Zurkowski in a 1974 proposal to the National Commission on Libraries and Information Science which called for a national program to achieve information literacy by 1984. Bjorner cites an early use of the term in 1977 by Lee Burchinal, and claims that it was first used as an ERIC descriptor in 1990 (1991, p. 160). The term has been widely promulgated in the 1980s and 1990s by an American librarian, Patricia Senn Breivik, founding chairperson of the National Forum on Information Literacy.

The terms *resource-based learning* and *information literacy* are linked (Breivik, 1993; Farmer & Mech, 1992; School Library Associations of South Australia, 1993, p. 29). Breivik sees resource-based learning as “involved in the whole thinking process... in fact a subset of information literacy... part of the critical thinking skills... a major shift in paradigm... about how learning takes place” (1993, p. 13). She cites the definition of information literacy in the American Library Association Presidential Committee on Information Literacy Report:

being able to recognize when you have a need for information.

being able to identify the kind of information that can help in that particular situation, to be able to locate it, to evaluate it, organise it and use it effectively (ibid., p. 10).

However, many interpretations of information literacy reflect traditional library-centred approaches to library/ resource-based and information skills instruction. Bjorner hints at a paucity of examples of practice in the literature, and a tendency to revise and adapt rather than rethink library-focused teaching approaches :

While there has been much discussion and some consensus on the definition of and need for information literacy, there has been little examination of the actual details of teaching for information literacy. What should be taught, who should teach it, when and how it can be taught have received little attention in the literature. Although individual librarians and teachers may be devising and adapting lessons to develop information-literate students, reports of those lessons have not yet received wide dissemination in either the literature of information science or education (1991, p. 151).

It is suggested here that one cannot teach a state (for example American Association of School Librarians, 1998), or even a set of competencies or abilities (‘being able to...’); that information literacy is helpfully distinguished from information literacy *learning*.

Origins of information literacy learning in resource-based learning

Bruce asks “(how) should we teach to encourage information literacy?” (1994, p. 11). Given the unsophisticated interpretation of information literacy in New Zealand's educational policy and practice outlined above, the question must be answered with reference to the body of overseas school-level practice and practitioner research that has emerged in the context of resource-based and information skills learning.

Farmer and Mech (1992, p. 1) and Breivik (1993, p. 11) link the state of information literacy to resource-based learning as the means. Beswick described the parameters of resource-based learning and signalled the urgent need for good learner guidance (1977, p. 6; 1987). Some 60 studies in Britain in the 1970s and 80s (summarised by: British Library, 1990; Irving, 1983; Irving & Snape, 1979; Heeks, 1989; Rogers, 1994; Winkworth, 1977), along with several American studies (for example, Kuhlthau, 1988b; 1990), and work at tertiary level in Britain and Australia (for example, Best, Heyes, & Taylor, 1988; Biggs, 1987b; Brake, 1980; 1990; Laurillard, 1993; Rudduck & Hopkins, 1984; Rudduck, Hopkins, Sanger & Lincoln, 1987; Tabberer & Allman, 1983), indicated that the need was wider than the need to teach students to access information in a range of library resources and media. These studies showed that even where 'library' or 'study skill' lessons taught students how to find and use information, the skills were seldom transferred to project work or curricular learning. Many students lacked, or were unable to apply, the 'learning to learn' or thinking skills necessary to make critical and creative use of information (Appendix 1).

The professional affiliation of many of the researchers and research sponsors led inevitably to a focus in this body of research on finding information within school libraries to support classroom-related topics or projects (for example, Avann, 1984; Brake, 1985; British Library, 1990; Griffin, 1983; Heather, 1984b; Heeks, 1989; Howard, 1989; Irving, 1983; 1990b; Knapp, 1966; Kuhlthau, 1988a; 1988b; Lincoln, 1987; Tabberer, 1987; Thomson & Meek, 1985; Valentine & Nelson, 1988).

There was a gradual shift away from the term *resource-based learning* to *information skills* (Tabberer, 1987, p. 1). Marland's working group revised Irving's information skills process framework (Marland, 1981). This provided nine question-driven stages by which teachers could integrate the effective teaching of information skills with cross-curricular resource-based learning 'project' work. The teaching and learning implications of the information process were explored in depth by Irving (1985, pp. 33 - 110).

This information process framework was adopted and adapted by practitioners in several countries, notably New Zealand, then Australia and, subsequently America and Canada (for example, Australian School Library Association (ASLA)/ Australian Library and Information Association (ALIA), 1993; Dawson & Kallenberger, 1989; Eisenberg & Berkowitz, 1988; Gawith, 1984; 1987).

These information process frameworks have influenced the policies and resource-based learning pedagogies adopted by these countries and, in particular, by teacher-librarians/information specialists working in schools. American literature, however, evidences persistence of a behaviourist model of teacher-directed library or 'bibliographic instruction' (for example, Breivik & Gee, 1989; California Library Media and Educators Association, 1994; Parks & Sorrow, 1994; Reichel & Ramey, 1987). There is also significantly less evidence in the American literature of the influence of the Canadian educators, Ken and Carol Haycock whose visits to Australasia introduced teacher-librarians and teachers to Cooperative Program Planning and Teaching (CPPT) as a means for implementing resource-based learning (for example, Library Services Directorate, 1989; Vickers, 1988).

While the sixty studies generated in the 1970s and 1980s demonstrated that students needed considerable help in using information, there has been little recent research of major significance from this library/ information-oriented group (Bruce, 1996b; 1998; Todd, 1996; 1995). Much of the current popular professional literature repeats the themes of the 1980/ 90s teacher-librarianship and information skills literature under the new banner of information literacy. *Information literacy* is now seen as synonymous with, and subsuming, resource-based learning and information skills teaching (Breivik, 1993).

Todd illustrates the professional affiliation of writers mentioned above and the tendency to subsume all the previous resource-based learning and information skill studies under the new *information literacy* label:

A considerable body of literature exists in the educational arena on the part played by information literacy in learning. Information literacy is consistently presented as a means of personal and national advancement and an essential competency for lifelong learning. In Australia much of this literature has been generated by teacher-librarians... and the concept is firmly embedded in professional role statements (Todd, 1994, p. 3).

The inheritance of a body of work with a significant library focus may contribute to one of the difficulties experienced in translating these ideas about information skills and resource-based learning into a precise pedagogy of information literacy learning. If one separates out the (post-1990) literature specifically designated *information literacy* it is, in fact, a *small* body of literature, most of it comprising articles in the professional press, little of it 'scholarly', little of it research-based, and much of it reminiscent of the themes dominant in the earlier body of work. This post-1990 work is referred to as second generation literature, its pre-1990 predecessors as first generation.

An analysis of this second generation literature reveals a curious anomaly. On the one hand key figures in the field set information literacy in a broad educational and social context, and define it so widely that it becomes a synonym for all learning, for example:

What does it mean to be literate in an information society? Information literacy is closely tied to functional literacy. It involves the ability to read and to use information essential for everyday life. It also involves recognizing an information need and seeking information to make informed decisions. Information literacy requires the ability to manage complex masses of information generated by computers and to learn throughout life as technical and social changes demand new skills and knowledge...

Information literacy is not only a knowledge of resources. It is not solely dependent on the library as the only source of information. It is not merely finding information, but also understanding information... (Kuhlthau, 1990, p. 15).

and

To be prepared for a future characterized by change, students must learn to think rationally and creatively, solve problems, manage and retrieve information and communicate effectively. By mastering information problem solving skills students will be ready for an information-based society and a technological workplace. Information literacy is the term being applied to the skills of problem solving (American Association of School Librarians (AASL), 1995, p. 20).

On the other hand, these ideals are seldom translated into a pedagogy for classroom practitioners. Their heritage in first generation librarianship and school/ teacher-librarianship literature is evident in that most stop short of explaining how these skills underpin *learning* as opposed to finding and using information in a library. Breivik (1993, p. 158) says that information literacy is not a new term for library instruction but the view of learning many information literacy writers depict is a library-centred model arguably incompatible with constructivist views of learner-centred construction of *knowledge* (Gapper & Styles, 1993; Kirk & Todd, 1993, p. 129; Rushton, 1996). Kuhlthau says:

Interpretation skills involve how the information is used after it is located. Thinking about information, seeking further information based on expanding thoughts, preparing to present information to others incorporating a sequence of interpretation skills. Recalling, summarizing, paraphrasing, and extending interpretation skills. An

example of interpretation skills occurs when, after a student has located information on tigers in the book, he or she reads the section, then closes the text and writes about what is recalled as important and interesting (1990, p. 15).

There is an unease about what exactly is meant by *using* information once it has been located. It appears that the processes of using information and learning are assumed to be synonymous. This can be challenged by the fact that librarians locate, retrieve, organise and even collate, synthesise and summarise information on behalf of clients. But will they have *learned* it?

The issue of the relationship of information use to learning is not satisfactorily addressed in the literature of information literacy (both first and second generation) to date. Thomson and Meek (1985) and Tabberer (1987, p. 118) both identified the vacuum between information use and learning (see also, Brake, 1980; Carter & Monaco, 1987, p. 107; Hopkins, 1987; Kinnell, 1992; Norris & Sanger, 1984; Winkworth, 1977). Thomson and Meek state:

(I)t is not enough to find, retrieve collect, collate, organize, index and arrange information. It has to be read, judged, made cognitively and affectively coherent (1985, p. 98).

Candy provides a useful perspective:

Information literacy is not an end in itself, but rather a means to an end. Its value lies in the fact that it bestows on people, not simply the ability to 'recognize when information is needed... and to locate, evaluate, and use effectively the needed information', but to do so within a constantly changing social and cultural context and over a lifetime (1993, p. 61).

The essence, he suggests, is that information literacy “is *highly context specific* and that the search for universal skills of information literacy will be elusive and fruitless” (ibid., p. 65). Candy is undoubtedly correct in asserting that “information literacy, as a response to the information society, is a complex and multifaceted notion” (ibid., p. 67). Potentially, it becomes less elusive if contextualised within the core business of the school, *student learning*, rather than within the school library or the role of particular professionals.

In short, the term information literacy is used in relation to a hybrid body of writings and practice which largely takes its bearings from the use of information in and through libraries. While the definitions set information literacy in a wide social and learning context and acknowledge the centrality of information technology to both definition and practice, attempts to explicate learning/ teaching principles reflect the library-orientation of past work, and reveal two significant gaps between definitions and what is written about practice which would need to be bridged in order to create a theoretical framework for information literacy learning.

The first gap was outlined above - the lack of clear understanding about what is meant by ‘use effectively’ in terms of the relationship between information use and learning.

The second gap is an assumption that the only role of information technology is to provide access to information (for example, Gellatly & Heeks, 1987, Norman, 1987). The concept of *learning* technologies, influencing how, what and why learners learn is largely missing, although there is an extensive base of writings and smaller research base (see below) which supports these ideas. Tabberer (1987) discusses the need for enhanced visual literacy and hints at Zuboff’s concept of ‘informacy’, outlined earlier. However, in general, in the library-centred information literacy writing there is an absence of recognition that the integration of technology might require, and result in, new ways of learning, teaching and understanding. Most second generation information literacy writers

that enhanced critical thinking skills are needed to reject as well as select and interpret information. Frequently these thinking skills are implicitly related only to the textual information that is retrieved - a repackaging model of learning, as Robertson (1991) suggests.

Emerging from this analysis is a fundamental question about apparently irreconcilable world views or ontologies. The existing base of information literacy is, with a few exceptions, grounded in an information/ library-centred perspective, whereas constructivist approaches to learning are, arguably, grounded in learner-centred philosophies.

In one of the few attempts to contextualise information literacy in theory, Bjorner lists four 'philosophies' of curriculum development: discipline-based, student-based, social-utilitarian or social-reconstruction. She claims that "(t)he information literacy curriculum - which is aiming to change lifelong information management behaviour - demands a move toward the student centered model" (Bjorner, 1991, p. 152). Like Bjorner, Candy (1993), and Eisenberg and Small (1993), Lenox and Walker see the need to accommodate a learner-centred view of learning:

First, we must accept the fluidity of information and shift our instructional emphasis from acquisition of a product to execution of a dynamic process.

They acknowledge the limitations of the inherited model:

Although Breivik and the American Library Association support the idea that information literate people know how to find, evaluate, use and subsequently communicate information effectively to solve particular problems or make decisions, their definition of information literacy fails to account for sources of information - both visual and aural - beyond the traditional contents of libraries...

In years past, teaching information literacy simply required us to teach students how to use the library often through the concepts and principles of bibliographic instruction. Today we understand that information literacy is also a conceptual framework for the development of educational models and new curricular concepts in systematically addressing information skill development in a diverse society (1992, pp. 4 - 5).

The extent to which information literacy learning is seen, on the one hand, as focused on library-centred learning, and, on the other, as a synonym for *all* learning, decision making and problem-solving makes its translation into a pedagogical framework challenging. It is now also seen to embrace the concerns and concepts of open, flexible and distance learning (for example, Gawith, 1998; Harrison, 1993, p. 110; McRae, 1994) and learning to learn (for example, Australian School Library Association (ASLA)/ Australian Library and Information Association (ALIA), 1993; Bruce, 1996a). This compounds the difficulties of pedagogical implementation. It can be seen as a fabrication by librarians in the interests of professional self-justification (Cavalier, 1993). Or it can be seen as the key to learning to learn, to flexible self-directed learning in an information age, as Candy suggests (1993, see also, Bruce, 1996b; 1993).

Information skills writers have contributed, it appears, from a solid base of practitioner knowledge. Supported by a body of 1970/ 80s research evidence that both students and teachers had problems with resource-based learning, they set about improving school libraries (quality of resources and access through information technology), improving information skills, integrating information technologies and developing programmes and frameworks to help guide students through resource-based learning. In a decade when their own positions were frequently under threat, they drew strength from each other, through what Kulleseid calls 'codes of conviviality', working together globally, but

seldom linking their work to work, theories and theorists outside their own field (for example, Kuhlthau, 1987a; Kulleseid, 1985; Lowrie & Nagakura, 1991; Nimon, 1990).

Summary

Information literacy is frequently used to indicate a state of literacy achieved through resource-based learning, mediated by the ongoing use of an information skills/ process frameworks such as Irving's model (Marland, 1981) and adaptations of the model (for example, Eisenberg & Berkowitz, 1990; Gawith, 1987). What exactly information literacy is has been the subject of very little debate. Where such debate is emerging, it highlights some of the tensions raised above (Bjorner, 1991; Bruce, 1996b; Candy, 1993; Cavalier, 1993; Eisenberg & Small, 1993; Laurillard, 1994).

While *information literacy* is a widely used term, its precise definition in epistemological and pedagogical terms depends on *context* - which country, which professionals (librarians, school librarians, teacher-librarians, classroom teachers, educational technologists) and which level of education (Candy, 1993; Cavalier, 1993). As a state its meaning seems to have broad consensus understanding in the literature. As it is interpreted at more specific levels of educational theory, policy and professional practice, the limitations of its origins and theory base become apparent (Cavalier, 1993).

Information literacy can, therefore, be seen to have emerged as a useful but multifaceted umbrella concept, evolving from and incorporating the concepts and pedagogies of the resource-based learning and information skills movements, but including the recent emphasis on access to information through automated library networks, and a range of information and communication technologies.

This study takes its bearings on information literacy from the question raised by Beeby in 1977 as to the ways of learning, teaching and understanding needed in an age of information. It assumes that information literacy teaching will need to integrate work from several previously discrete professional domains, and cannot be focused too narrowly on the preoccupations of one group of professionals.

It is anticipated that much of the work which will inform the design of an information literacy learning framework will be from a second group, educational technology educators working in what is called here, for convenience *technology-based learning*. Their work has been underpinned by an explicit commitment to constructivist principles which is not evident in the writings of the information skills educators.

Origins of information literacy learning in technology-based learning

While many professionals working in the 1980s in information skills and resource-based learning were united by their concern with students' difficulties in making effective use of information, similar concerns began to preoccupy a different group of educators in the 1980s - those working in the area of educational/ information technology. It is curious that, while they share an interest in students' use of information and information technology, the two professional fields remain discrete. Research and development into types of learning and teaching that characterise constructivist information literacy are more evident in recent work undertaken by these 'IT' educators.

Meta-analyses and summaries of research in the area of computer-based learning (for example, Becker, 1992a; Fletcher-Flynn & Gravatt, 1995; Means, 1994), reveal both positive and negative claims for the impact of technology on learning, depending on whether attitude to learning is seen as a synonym for learning itself. There is a substantial body of evidence that computer-based learning (CBL), computer aided learning or instruction (CAL, CAI), integrated learning systems (ILS), and 'drill-and-skill' programs are effective in providing individualised tutoring, self-monitoring and self-assessment opportunities where repetitive practice and rote learning are needed (Becker, 1992a;

Crook, 1994; Fletcher, Hawley, & Piele, 1990; Herman, 1994; Kulik & Kulik, 1991; Kulik, Kulik, & Bangert Drowns, 1985). Only recently has there been documentation of attempts to evaluate enquiry, problem-solving, information literacy-type learning in technology-enhanced knowledge construction (Jonassen, 1994) or generative learning (Wittrock, 1974) environments (Bransford, 1996; Cognition and Technology Group at Vanderbilt (CTGV) 1991a; 1991c; 1992; 1993a; 1994a; 1994b; Lamon et al., 1995). The focus has frequently been on documentation of projects rather than critical analysis. Rigorous research is scarce. The Cognition and Technology Group at Vanderbilt (CTGV) has made a valuable contribution in this regard. CTGV's evaluation of their 'Jasper' videodisc projects concludes:

Almost anything new generates enthusiasm, especially when it involves volunteer teachers who get to use "gee whiz" technology such as computers and videodiscs. Given such enthusiasm, it is tempting to declare victory and move on rather than look beneath the surface. But whenever we did look more carefully, we found lots of room for improvement. Transfer was often not as flexible as it should have been...; assessments were often less pleasant and informative for teachers and students than we would have wanted...; groups often functioned in a manner that was less than ideal...; and our attempts to help teachers understand and implement new approaches to teaching and learning often failed because of a lack of support for change and because problem- and project-based curricula quickly push people to the edges of their knowledge (1994a, pp. 199-200).

Evaluated projects such as Schools for Thought (SFT) which involves integration of three successful projects, CTGV's Jasper Woodbury Problem Solving Series, FCL (Fostering a Community of Learners) and the CSILE Project (Computer Supported Intentional Learning Environments), are furthering understanding of how students learn, and how teachers teach in these information- and technology-enhanced knowledge construction environments (Lamon et al., 1995, p. 1; Meichenbaum & Biemiller, 1998).

While many research projects focus on interactive technologies in learning environments (for example, Atkins & Blissett, 1989; Barron & Baumbach, 1990; Chiou, 1992; Newman, Griffin, & Cole, 1989; Peled, Peled, & Alexander, 1989; White, 1989), none has evolved over as many years or been subjected to substantial analysis in terms of learning benefits. The CTGV and recent SFT projects, therefore, provide a rich source of insight into how education theory sustains and challenges developments in technology-enhanced information literacy learning. These projects are outlined below. Their findings contribute significantly to the design of the framework.

Examples of generative knowledge construction projects

There are a number of telecommunications-based projects reported in the literature which demonstrate constructivist characteristics. These include Apple Global Education Network, Computer Pals, Global Laboratory, GTE World Classroom, KIDS-91, Teleclass International, and numerous smaller projects (Bagley & Hunter, 1992, p. 24; Kurshan, 1991, p. 48). Students use e-mail, audioconferencing, or videoconferencing, to conference with peers in other countries. Some are electronic pen pal exercises with little learning purpose beyond learning to use the technology; others fit Jonassen's definition of knowledge construction environments:

- *provide multiple representations of reality, thereby:
avoiding oversimplification of instruction by representing the natural complexity of the real world;*
- *focus on knowledge construction, not reproduction;*
- *present authentic tasks (contextualizing rather than abstracting instruction);*

- *provide real-world, case-based learning environments, rather than pre-determined instructional sequences;*
- *foster reflective practice;*
- *enable context- and content-dependent knowledge construction; and*
- *supporting collaborative construction of knowledge through social negotiation, not competition, among learners for recognition (1994, p. 35).*

Kurshan points out that “(t)he growth of global classroom projects and their implementation have become a point of focus for the educational restructuring movement” (1991, p. 47). But, as Harris says, “We can log on to the Internet, send mail, use remotely located programs to find and move files, and join our colleagues online. Now that we’re all here, what are we going to do?” (1993, p. 35).

Where there is a curriculum purpose, the learning seems to be less superficial (Cook, 1995; also recent New Zealand initiatives, for example, Graham, Donaldson, & Sommerville, 1997; Haines-Stiles, 1998). Referring to their own attempts to create computer-mediated learning environments through networked computers in locations across America, Newman Griffin and Cole see these experiences as authentic, exciting and beneficial to learning if adequately guided:

Within a well-designed environment, adults can capitalize on these activities to promote skill development in traditional school subjects... as well as the emphasis on problem-solving and other metacognitive skills (1989, p. 150).

There are numerous descriptions of students researching information to construct databases. Crook discusses the difficulties researchers face in this area:

The studies reported here were conceived to explore the dynamics of shared knowledge during collaborative computer work; how collaborators invested in its creation, what form the creation took, and how it could be exploited as a platform for reasoning. Thus very little of the research has conformed to the procedures of experimentation (1994, p. 188).

While there are some examples of open-ended discovery-type projects conforming to Jonassen’s parameters, many are technology-focused rather than learning-focused, and ask, ‘Did it work, and did students enjoy it?’ Rigorous evaluation is scarce.

The French **Ecole Moderne Freinet** classroom is an exception, emphasizing the school’s teaching/ learning climate.

While the Freinet classroom may be child centered it is also teacher led. It is the teacher who selects, organizes and facilitates the activities of the children (and in a communications dense classroom sifts through the mountains of information and decides which and in what form it is presented to the children). It is the role envisioned by John Dewey - the teacher, being the most mature member of the group, is the "leader of group activities" ...

It is the teacher-craftsman who must organize additional learning activities that relate this information to more organized knowledge. This means the curriculum (Lee & Kazlauskas, 1995, p. 17).

They see this as avoiding:

...many of the criticisms leveled at Constructivism, of the child learning fragmented and unrelated bits of information... At the same time, they share many assumptions in that they both subscribe to the concepts that learning is a

matter of assisting children to develop their own constructs or representations of knowledge...” (ibid. , p. 17).

Freinet schools, it appears, have much in common with the New York ‘essential schools’ movement of the Coalition for Essential Schools and the ‘New Vision Schools Initiative’ reported on by Reibel and Wood (1991):

Both these initiatives are guided by the constructivist idea that the dominant metaphor in school should be the student-as-worker, and by the supporting idea that the student's authentic inquiry that is carefully conceived to help her integrate new requirement's into her corpus of knowledge/ skills.

As Hannafin comments, “(t)he concept of integrated, supported activities centred around topical themes is neither new nor revolutionary. Since the early work of John Dewey (1933), idealised visions of learning environments have evolved” (1992, p. 50), and these initiatives have yet to be evaluated in terms of their impact on learning.

The construction of knowledge need not be based on collating print or electronic information in a complex technological environment. **Bubble Dialogue** (Language Development & Hypermedia Research Group (LDHRG), 1992, p. 43), is an ‘open’ software project which perfectly exemplifies Shuell's insistence that in constructivist learning “the student must do certain things while processing incoming information in order to learn the material in a meaningful manner” (cited in Simons, 1991, p. 291).

Bubble Dialogue relies on children's existing knowledge, ideas, values and opinions as the information resource. It is a relatively simple hypercard-based language program which can be customised for different contexts. It combines “elements of role play, comic strip creation and a process... called reflexive dialogue analysis” through which students “engage actively with their own ideas and those of others, including those of their teacher” (ibid., p. 44). It encourages students to work collaboratively with each other and with teachers to use their own knowledge, understanding and feelings as an information resource. The teacher plays a key role, selecting the topics of the dialogue, the roles and contexts. McMahon and O'Neill, the developers, say:

We believe that its use by imaginative teachers can produce conditions in the classroom where students are motivated to engage for surprisingly long periods in the constructivist processes outlined (ibid., p. 44).

Bubble Dialogue did not develop from theory, but constructivist thinking provides a rationale and pedagogical route map. Dede says:

Multimedia in schools must bridge from its current role of augmenting data delivery instruction to instead fostering a new model of teaching/learning based on learners' navigation and creation of knowledge webs. Such a transformation requires evolving today's often fragmentary multimedia applications into more structured enquiry approaches that build on web-like architectures from hypermedia (1992, p. 56).

This appears to be what Spiro and Feltovich are attempting with **Cognitive Flexibility Hypertexts (CFHs)** (1991a). They suggest that “CFHs are for case-based instruction in complex and ill-structured domains for the purposes of advanced knowledge acquisition, ie. mastery of complexity and development of the ability to flexibly apply or transfer knowledge to a wide range of new, real-world cases” (1991a, p. 24). They see “hypertext environments (as) good candidates for promoting cognitive flexibility in ill-structured domains” (1991b, p. 29). They stress “the vital importance of students' active participation in learning” (ibid., p. 28), and that “(c)ontent must be covered more than once for full understanding because of psychological demands resulting from the complexity of case and concept entities in ill-structured domains... and the need for

multiple knowledge representations and multiple interconnectedness of knowledge components..." (ibid., p. 28).

Whether relatively simple, in software terms, like Bubble Dialogue, or relatively complex, like CFHs, hypercard initiatives represent a major direction for generative knowledge construction environments. Burwell's analysis of research into the effectiveness of interactive videodiscs in terms of "reduced learning time, improved learning performance, and greater content retention" (1991, p. 37) signals another.

The most significant work in the area of interactive videodiscs has been done by the above mentioned **Cognition and Technology Group at Vanderbilt (CTGV)**. Their work is unusual in that it began in the 1980s and continues to evolve; in that it has been extensively documented from learning development as well as technological perspectives, and also in terms of the efforts made by the researchers to situate their work in relation to current education theory. CTGV's concern is for *learning*, enabled by technology:

The rationale for recent work at the Vanderbilt University Learning Technology Center derives from widespread concern about the failures of our schools and our society to help students learn to think more effectively, and to help them develop effective problem-solving, reasoning and learning skills...

The generative learning environments that we have developed over the past five years are based on a theoretical framework that emphasizes the importance of anchoring or situating instruction in meaningful, problem-solving contexts... (1991a, p. 34).

CTGV's more recent MOST (Multimedia environments that Organize and Support learning through Teaching) project attempts to "accelerate the development of literacy skills in middle school and high school students who are at risk of school failure" through the design of MOST environments (1994b, p. 23) They claim that "MOST environments are effective because they engage students in authentic tasks that place the students in a position to create interesting and important multimedia products that *teach* their peers, parents, and others about important life topics" (ibid., p. 23). While research into the MOST project is at an early stage, their earlier research for the McDonnell Foundation's Cognitive Studies for Educational Practice (CSEP) programme (helping 5th and 6th grade students to learn to solve word problems through the 'Jasper' videodisc series) illustrates the team's explicit commitment to research *with* teachers:

In our current work we are trying to increase the power of the Learning Community model by capitalizing on opportunities to work more closely with teachers... We are also spending time in classrooms on a daily basis to better understand how the ideas are translated into practice and to learn about teachers' perceptions of what transpires in the classrooms (Barron, Vye, Zech, Schwartz, & Bransford, 1994, p. 25).

Their commitment extends to developing different models for teaching with the 'Jasper' videodiscs. They say "(c)ritical to student learning activities with Jasper is the model of teaching at work in the classroom" (Cognition and Technology Group at Vanderbilt, 1991a, p. 19). They link seven design features (video-based presentation format; narrative format; generative learning format; embedded data design; problem complexity; pairs of related adventures; links across curriculum) to hypothesised student benefits, making the pedagogic links clearer to the teacher (ibid., p. 19).

From a learning perspective, the most interesting initiative is the **Schools For Thought (SFT)** project which is "designed to combine the resources of three different research teams in an effort to create middle school classrooms that support extraordinary school achievement" (Lamon et al., 1995, p. 1). The three core programmes are:

1. The **Jasper Woodbury problem solving series** (Vanderbilt)
2. The **Fostering a Community of Learners (FCL) Program** (Berkeley)
3. The **CSILE (Computer Supported Instructional Learning Environments) Project** (Bereiter and Scardamalia, Toronto)

The following excerpts from a paper by Lamon, international director of the SFT programme, provides a brief outline of the three projects:

1. *The Jasper Woodbury Problem Solving Series*

Vanderbilt's Adventures of Jasper Woodbury program is a powerful approach to teaching mathematical problem solving. Through quality video dramas, students are presented with complex, realistic problems that call for the types of mathematical thinking required in real life. Links to science, history and social studies are evident as well... Solving this multifaceted challenge requires that students formulate goals, devise strategy, find relevant data (all the data needed are embedded in the video along with additional distractor data), and construct mathematical arguments. Perhaps most significantly, the video challenges make mathematics an object for discussion...

Teachers use related activities to extend and reinforce mathematical knowledge and skills... The nine existing stories are organized as triplets around three thematic and mathematical content areas: complex trip planning involving relationships between distance, rate, and time; constructing business plans, involving the use of probability and statistics; and way-finding, relying on the use of geometry (Lamon et al., 1995, p.2).

2. *Fostering a Community of Learners*

The conceptual basis of the Berkeley Fostering Communities of Learners (FCL) program stems from two sources. The first is based on research which has shown that learning is a matter of discovering and exploring fruitful ideas for oneself, so the program is designed to encourage students to be partially responsible for designing their own curriculum. The second comes from the well founded idea that disciplines develop from fundamental principles and so students are systematically guided into discovering these deep principles through the curriculum and through classroom structures... Students first participate in a 'benchmark' lesson on a curriculum theme... From this lesson students will generate as many questions as they can think of (usually 100 or more are produced). The teacher and students categorize these questions into approximately five subtopics ... About six students form a research group; each group takes responsibility for one of the five or so subtopics.

Using texts, trade books, magazines, newspapers, video and electronic mail consultations with outside experts, students write up summaries of what they are learning. As well, students engage in small group discussions of articles and texts relevant to the overall theme. Discussions are structured along the lines of four key strategic activities: summarizing, clarifying, questioning and predicting (ibid., p.4).

In this programme skills are explicitly taught focused on these four key strategic literacy activities; summarising, clarifying, questioning and predicting. Modified jigsaw methods and reciprocal teaching (Palinscar & Brown, 1984) are used to maximise student sharing of knowledge.

3. The CSILE Project

The CSILE Project (Computer Supported Intentional Learning Environments) developed at Toronto provides a rich computer environment aimed at creating a certain kind of school environment in which the focus is on problems rather than on categories of knowledge...

The standard CSILE classroom has eight networked computers per classroom, connected to a file server, which maintains the communal database for the whole school. The core of CSILE is the communal student-generated database which encourages students to articulate their theories and questions, to explore and compare different perspectives, and to reflect on their joint understanding. In CSILE, students work individually and collaboratively, commenting and building upon one another's understanding...

Articulating ideas in writing encourages students to formulate their theories explicitly, it facilitates memory, and it supports reflection and revision. Also the written records live on, creating resources for others and so knowledge is progressively transformed...

By writing a note in CSILE or by commenting on other students' notes, students become contributors to the knowledge of the class and so gain an overview of how understanding grows. Students working in CSILE classrooms become aware that a true measure of learning is understanding something that you didn't already know and consequently that learning is a matter of taking a deep approach to a question, studying for a long time and finding more and more questions (op. cit., pp. 5 - 6).

These projects provide insight into the potential of knowledge construction environments for information literacy learning. Lamon and her colleagues comment on the initial research:

(I)t took members of our research team a considerable amount of time to learn how to interact with the teacher in a way that worked. Both teachers had to make monumental changes to implement SFT (ibid., p. 15).

(T)he extraordinary levels of achievement that were so visible to us, parents, and school administrators was not necessarily evident on the standardized achievement tests (ibid., p.32).

Our initial attempts to create SFT classrooms have taught us some important lessons. The two most important ones stemmed from convincing demonstrations that (a) sixth grade students are indeed capable of extraordinary achievement and (b) attempts to create SFT classrooms is extremely time intensive and resource intensive (ibid., p. 33).

The CTGV (1991 - 5), Bubble Dialogue (op. cit., p. 43), and Cognitive Flexibility Hypertext projects are explicitly set in the context of constructivism. Can so broad and all-encompassing an approach as constructivism be used to provide a theoretical underpinning for information literacy learning? Fosnot emphasises the difficulty in 'making a leap to pedagogy' (1984, p. 169). She suggests that many of these projects merely pay lip service to constructivism.

Two points need to be made, both relevant to the potential of a constructivist approach in linking and enhancing the work done by the two discrete (RBL/ TBL) groups of professionals in the area of information literacy learning.

Firstly, this work is essentially practitioner research, in the sense that it is developed in the real world, and then looks to theory for explanations. The difficulty may lie in making

the leap from pedagogy to theory, and enhancing the *pedagogy*, not vice versa as Fosnot suggests.

Secondly, constructivism is more helpfully regarded as an approach rather than a theory. Its usefulness lies in the umbrella it provides for inter/multi-disciplinary, inter-theoretical thinking. It provides a common conceptual language for likeminded professionals and researchers to compare, share and build on each other's work and research. This is expanded in Chapter 4.

If information literacy is to embrace new ways of learning and teaching in an information society, the work of these technology-based educators demonstrates approaches that take learning beyond the retrieval of information to 'knowledge construction'. Many of these 'knowledge construction' projects establish valuable precedents for the design of an information literacy pedagogy. These projects, along with the findings of three decades of resource-based learning research provides a diverse but robust base of practitioner experience. If convergences with the early resource-based projects are explored, what emerges is a common concern for providing students with the opportunity to exert greater control over their learning; for providing a context which is intrinsically interesting and supportive; for building in in-context coaching and guidance. The concerns and constraints, likewise, overlap, for example, concerns for transfer of skills, time, accurate assessment of learning, students' and teachers' skill levels, supportive policy, technical and professional environments.

The fact that the TBL initiatives are less open-ended and more tightly scaffolded and structured than traditional RBL 'projects' is of pedagogic value. Firstly it challenges the implicit assumption in both first and second generation RBL writings that there is a causal link between open-ended projects and information literacy learning (for example, Breivik, 1993, p.11; Farmer & Mech, 1992). Secondly, it signals a welcome synergy between two relatively discrete fields which both aim to help learners to construct knowledge from information with more critical discrimination and creativity.

Re-analysis of the RBL studies (see Appendix 1) reveals that, despite their library-centredness and lack of explicit theoretical grounding, the best of these studies (for example, Irving, 1985; Meek, 1983; Rudduck & Hopkins, 1984; Sanger, 1989; Tabberer, 1987), in their probing and honest analyses of problems and recommendations for action, suggest insights which reflect in the 'propositions' developed in the course of this study (Chapter 5). They provided a touchstone for analysing the propositions as they were explored by teachers in this study (Chapter 7). This facilitated the researcher's integrative, synthetic role as new synergies were discovered with each iteration:

If teachers report their own work in such a tradition, case studies will accumulate... Professional research workers will have to master this material and scrutinize it for general trends. It is out of this synthetic task that general propositional theory can be developed (Stenhouse, 1975, p. 157).

Irving (1985, p. 19) comments that "it is difficult to have a global view of the research problem and researchers who ought to be connected, and therefore building upon one another's work, remain apart - or worse, replicate their work through ignorance."

Projects like SFT are demonstrating that the careful design, scaffolding and evaluation of the *learning* environment - cognitive rather than physical - can trigger a new theoretical and professional synergy and pedagogic energy into information literacy. The value of knowledge construction environments (KCEs) designed to explore the constructivist themes of student control of learning, teacher/ mediated guidance and information-rich contexts lies in the broad and contextualised picture they create of the challenges for learners and teachers. These challenges are less technological than related to curriculum policy and planning, to assessment, to school and classroom management, to funding, to training teachers to teach in these complex environments, and to students' need for

cognitive and self-management skills to learn in these environments, to the inhospitality of current school environments to this type of learning (Cole, 1992, p. 32; Dick, 1991, p. 44; Jonassen, 1993; Perkins, 1991b, p.19). They are the same challenges explored by the best of the 'RBL' writers (above).

Jonassen (1993, p. 36) asks, "Yet, can these environments deliver on the promise that they hold in the current education milieu? Are learners prepared to make effective use of such complex learning environments? Will they revolutionize education as we know it?"

Summary

While rigorous research evidence of learning in these specifically denoted 'constructivist' environments is limited, there is consensus among educators (both RBL and TBL) on the concerns emerging. These include issues related to:

- **transfer of learning** (for example, Irving, 1982, p. 92; Martin & Buck, 1982, p. 88; 1991a; Spiro et al., 1991b; Thomson & Meek, 1985; Todd, 1995);
- **assessment** (for example, Cunningham, 1991; Irving, 1985, p. 13; Jonassen, 1991, p. 29; Norris & Sanger, 1984; Rudduck, Hopkins, Sanger, & Lincoln, 1987; Thomson & Meek, 1985);
- **entry and skill level required of learners** (for example, Hannafin & Savenye, 1993, p. 54; Hopkins, 1987; Laurillard, 1994; Perkins, 1991b, p. 19; Rudduck et al., 1987; Sanger, 1989; Tabberer, 1987)
- **teaching and technological skills required of the teacher** (for example, Hounsell & Martin, 1983; Norris & Sanger, 1984; Perkins, 1991b, p. 20; Reigeluth & Garfinkle, 1992, p. 17; Rudduck, 1991; Rudduck & Hopkins, 1984);
- the degree to which generative knowledge construction environments can be considered '**authentic**' **learning environments** (for example, Hay, 1993; Hopkins, 1987; Irving, 1990c; Perkins, 1991b; Salomon, 1996; Salomon & Perkins, 1996; Sanger, 1989; Streatfield & Markless, 1994).

In short:

The synergism between technology, restructuring, and teaching/learning will take place when restructuring occurs in the areas of teacher/student work space, teacher/student roles, teacher/student relationships, and in the active collaboration of students in their learning. Students will be empowered to take responsibility and ownership for their learning and THEN we will see the promise of technology to enhance and reform education. . . (Bagley & Hunter, 1992, p.26).

Hannafin suggests:

Hardware technology has far surpassed the sophistication of our associated design technology... It is apparent that new design notions must evolve if we are to optimize the capability of emerging technologies for learning (1992, p. 55).

It could also be suggested, based on this review of the existing theoretical and practical knowledge base, that information and communication technologies have far surpassed the sophistication of constructivist approaches and their associated pedagogies.

Given the fragility of the theory base, any attempt to create a pedagogical framework will be fragile. The value the effort, as suggested previously, resides in the attempt to contextualise information literacy learning, not just theoretically, but pedagogically in the in the New Zealand classroom. In particular, seeking convergences between RBL, TBL and KCE initiatives paves the way for the development of a theory-based constructivist information literacy pedagogy (Chapter 4).

CHAPTER 3

ACTION RESEARCH METHODOLOGY

Introduction

The purpose of the study was to develop and trial a theoretically-grounded pedagogy for improving information literacy learning. It was essential to select a method which accommodated the notion of change and improvement in practice. Action research offered the opportunity and flexibility to document and analyse 1) the development of both conceptual and pedagogic frameworks, 2) the trialling and further development of the framework with teachers, and 3) the development and improvement in curriculum-based information literacy learning, and to incorporate changes in each successive cycle. It also supported the constructivist approaches which were selected in the exploratory phase as appropriate for underpinning a pedagogy of information literacy learning.

The whole study was, therefore, conceived as an action research project. The study was designed as six cycles:

- **Cycles 1 and 2** : Exploratory phase, investigating origins and research precedents for information literacy learning;
- **Cycle 3**: Developing a conceptual framework;
- **Cycle 4**: Designing a pedagogic framework;
- **Cycle 5**: Trialling, amending and evaluating the Constructivist Information Literacy Learning (CILL) Framework;
- **Cycle 6**: Incorporating insights from previous cycles into an outline of implications for theory and practice.

Within Cycle 5, four Teacher Cycles were embedded in which teachers explored the concepts and the pedagogy, initially using the framework diagnostically, and in successive cycles, exploring and contributing more systematically to the design of the framework and the pedagogical strategies.

The purpose of the evaluation phase (Cycle 5 A - D) of the study was to:

- determine how teachers used the CILL Framework; how they perceived its influence on their teaching and student learning; how they interpreted the role of coach;
- work with teachers to document and discuss the changes made to the Framework during the action research cycles, and the reasons for making these changes;
- relate evidence of use to theoretical and pedagogical assumptions and propositions established in Cycles 1 - 3; examine the implications for information literacy learning within the New Zealand curriculum.

This chapter outlines, firstly, what action research is, and, secondly, why it was chosen as a methodology for this study.

In search of a method: The initial question was to ask which methodology would:

- acknowledge the synthetic purpose of the research, that is, ‘mining’ and ‘cross fertilising’ the four main strands - RBL/ TBL, constructivism, learning design, curriculum-in-action, to inform the development of a new conceptual model and pedagogic framework;
- help to bridge the acknowledged gap between educational theory and practice, described in a New Zealand context by Robinson (1993, pp. 15-17), to produce a study in line with Snelbecker’s ‘knowledge users’ definition (1983, p. 440) and ‘Greeno’s educational utility criterion’ (cited in Donmoyer, 1997, p. 34);
- generate deeper, richer data than previous RBL studies in a manner consistent with their ethos (honest description of problems) and their action/ classroom-research tradition, as well as being consistent with the more recent constructivist-oriented TBL studies and their shared tradition of participant observation/ action/ descriptive/ case study evaluation and research approaches);
- maintain a philosophical and pedagogical consistency with the constructivist approach which the exploratory cycles (1 and 2) suggested as appropriate for the pedagogy.

There will always be a tension and trade-off between breadth and depth, exacerbated in a one-person part-time study with no institutional funding or support. Depth and richness of data was one of the driving missions. This signalled a small research group and the choice of a methodology which would not seek generalisability, confirmation of a hypothesis (there was none), or anything more than a richer, more complete, more three-dimensional picture of the contextualised trial of a theoretically and pedagogically coherent information literacy pedagogy.

The researcher’s ten year involvement in the rapid developments of action research in Australasia honed her appreciation of its power and flexibility and predisposed her towards it, but a number of other qualitative methodologies were considered and rejected, primarily because they met some, but not all of the requirements of the study. Action research allowed for documentation of teaching and learning *in action* that was:

- **participative**; involving research *with* rather than research *on* teachers; eliciting perspectives of classroom teachers (of necessity different from the researcher’s teacher educator perspective);
- **cyclical and iterative**; generating new and deeper insights by systematic iterations;
- capable of generating **rich data** to inform the situated evaluation of the model, framework and pedagogy;
- capable of **capturing action** - a broad contextualized, rich, evolving picture of teaching and learning; of action-into-theory; of theories-in-action; of teachers’ theory-building and theory-testing;
- capable of sustaining **multiple perspectives**; encouraging teachers to articulate and test their theories-in-action, and to help each other to explore collaboratively, conceptually and pedagogically, the potential of the framework to improve learning.
- deliberately **subjective and non-generalisable** - eliciting an accurate picture of the reality of their teaching and student learning *in the eyes of the teachers*; a picture which emphasised validity, veracity and authenticity *within teaching/ learning*;
- capable of **defining a participant role for the researcher** within the research as expert learner, relative to the teachers, and interpreter of the theory and CILL framework but novice learner in relation to their expert status as practising classroom teachers.

Action research also subsumed the issues raised in Wilson and Cole’s analysis of the development of new teaching models as a methodology in itself:

The development and tryout of practical teaching models would not normally come to mind as a methodology of 'research,' yet surely such design and implementation efforts yield important new knowledge...

Such 'bottom-up' approaches can complement the heavy influence of top-down learning theory as a basis for the design of teaching models... In summary, the development of teaching models constitutes a unique combination of theory construction and empirical testing. Theoretical abstractions must be carried to a new level of specificity as they become instantiated into an effective teaching program. At the same time, promising theory must be tested against the demands of real world settings. Thus the development and testing of teaching models helps triangulate findings from more traditional research methods and ensures a relevance to the practice of teaching (1996, pp. 602- 603).

Action research is explicated as a PhD methodology by Carr who describes it as “a theory-based, problem-centred, action oriented approach to inquiry” (1997, p. 7). He adds, “Because the research involves complex and dynamic problems, exploring the social processes about learning about situations is directly linked with the acts of changing those situations” (ibid., p. 7). Toulmin concludes that action research is a ‘democratic method’ which “represents a field of research with an increasingly bright future, which we can attack with intellectual confidence and without any need for methodological apologies” (1996).

What is action research?

McKernan’s (1991, p. 4) definition of action research illustrates its relevance to this study:

Action research is carried out by practitioners seeking to improve their understanding of events, situations and problems so as to increase the effectiveness of their practice.

McKernan sees action research as ‘rigorous, systematic enquiry’ (ibid., p. 5; see also, Zuber-Skerritt, 1993, p. 46). Zuber-Skerritt sets action research in its historical context:

The process of action research was first conceptualised by Lewin (1952) and further developed by Kolb (1984), Carr and Kemmis (1986), Kemmis and McTaggart (1988), Altricher et al (1989), Oja and Smulyan (1989), Winter (1989), Elliott (1991), McKernan (1991) and others. In brief, it is a spiral of action research cycles consisting of four major phases, planning, acting, observing and reflecting...(1993, p. 46).

It is congruent with the purpose of the study - to develop a contextualised pedagogy - to employ a method which involves teachers as participants. It is intended to be research *with* teachers, not research *on* teachers. Atwell suggests that “process-observational research, conducted in the full, messy context of the life of a classroom, gives us rich description of people in action” (cited in Patterson, Santa, Short, & Smith, 1993, p. viii). Zuber-Skerritt says that action research:

(D)iffers from traditional experimental research in that it is intended to yield not only information, but also action and practical improvement. It does not begin with a clear question or hypothesis which requires a yes/ no answer and must be replicable, as is the case in experimental research; instead, action research begins with a vague question which is only gradually clarified and requires a complex answer depending on the situation and the people involved (1993, p. 55).

The notion of ‘teacher as researcher’ is fundamental to action research (Altricher, Posch, & Somekh, 1993; Carter, 1998; Dadds, 1995; Elliott, 1984; 1990; 1993; Elliott & Adelman, 1973; Lomax, 1991; Stenhouse, 1975; Wong, 1995).

I believe that when teachers become more involved in action research, they experience a greater sense of professionalism and develop a more authoritative voice about the efficacy of particular practices within the classroom (Emihovich 1998, p. 64).

Like Stenhouse and McKernan (1991, p. 1), Kemmis and McTaggart set action research firmly in the context of the curriculum:

Interest in action research in Australia stems from two main sources: the growth of school-based curriculum review and development, and a growing professional awareness among teachers seeking new ways of working and understanding their work. The responsibility for improvement of the curriculum rests more heavily on practitioners than ever before (1988, p. 7).

Action research and constructivism

Action research is congruent with constructivism in its emphasis on the construction of knowledge, meanings and understanding by participants. Action research is, likewise, consistent with the constructivist approach to the design of the framework. Like constructivism and information literacy learning, action research is learner/ participant-centred, and focuses on the *process* of enhancing understanding. Like constructivism, it is set firmly in the post-positivist paradigm.

Stenhouse's process definition of curriculum was seen as pertinent to the study (1975, p. 95). Stenhouse was one of the founders of the action research tradition through his pioneering work involving teachers as researchers on the Humanities Curriculum Project and as Director of the Centre for Applied Research in Education at the University of East Anglia (Rudduck & Hopkins, 1985). He expounds the links between classroom-based research, teachers as researchers, and a process approach to curriculum as professional development. He provides a rationale for the use of action research in this study:

The process model is committed to teacher development. If teachers are to pursue understanding, develop and refine their criteria of judgement and their range in their subject, they must be able and they must have time and opportunity for professional development... And more research and development is needed to forge teaching procedures which embody survival techniques compatible with the personal and intellectual development of both pupils and teachers (Stenhouse, 1975, p. 95).

This study follows the same practitioner-based, classroom-based research tradition of the work Stenhouse and his team undertook, and also of the large number of British resource-based learning studies undertaken in the 1970s and 1980s. This was not coincidental. Many of the early studies were undertaken by Stenhouse's colleagues and associates, for example, Jean Rudduck, David Hopkins, Dai Hounsell, Jack Sanger, Graham Gibbs. Work on 'deep' and 'surface' learning (for example, Entwistle 1988; 1991; Entwistle & Ramsden, 1983; 1991) influenced contemporary 'learning strategy' and curriculum writers like Hounsell, Ramsden, Candy, Biggs, Rudduck, Hopkins and Laurillard. This reinforces the coherence and consistency of the links between the theoretical underpinning of the study and the research methodology.

Another point of congruence with constructivism is that action research is an umbrella approach subsuming a variety of post-positivist methods, but not excluding the use of techniques usually associated with an experimental or quantitative paradigm (McKernan, 1991, p. 57; Rudduck, 1985). It has been described as a "family of activities in curriculum development, professional development, school improvement..." (Grundy & Kemmis, 1982, p. 84). This, in itself, can be a double-edged sword. It can, and often has, in New Zealand, been used to describe any activity involving feedback from teachers

or 'teacher reflection'. Likewise, constructivism in New Zealand has become the focus for acrimonious accusations of 'woolliness' in science education (Matthews, 1995).

Kemmis and McTaggart stress the systematic, cyclical, planned, critical and rigorous nature of action research, and say action research is "*not* the usual thing teachers do when they think about their teaching. Action research is more systematic and collaborative in collecting evidence on which to base rigorous group reflection" (1988, p. 21). These fundamentals will be adhered to in this study, but 'critical' is used in Stenhouse's sense (1975, p. 94) rather than a socio-political emancipatory sense.

Zuber-Skerritt asks "how do students and professionals learn? How do they acquire new knowledge? How important is the context in which they work? What motivates them to learn, etc?" and sees these questions as germane to the dialectic epistemology underpinning action research (1992a, pp. 33 - 35). These questions are central to this research.

Action research: models and traditions

Two distinct Australasian traditions have emerged within the field of action research. Both take Kurt Lewin's work as their starting point. Carr and Kemmis (1986) favour a "critical-interpretive-activist philosophy, which has much in common with the new critical theory in philosophy and the social sciences informed by Habermas..." (McKernan, 1991, p. 14). They have defined three types of action research, *technical*, *practical*, *emancipatory*. 'Technical' aims at increasing the effectiveness of performance, involving the use of an outside 'expert'; 'practical' action research includes transforming the participants' consciousness and understanding, while 'emancipatory' action research presupposes the participants' personal/ social/ political/ ideological emancipation (Carr & Kemmis, 1986).

While Zuber-Skerritt sees a natural evolution, within most action research projects, from technical to emancipatory (1993, p. 47), Carr and Kemmis say that only critical-emancipatory action research is 'true' action research (*op. cit.*, p. 203). They set emancipatory action research firmly into a critical interpretivist paradigm, influenced by Habermas' dialectic approach, and based on the assumption that 'praxis' or informed action is designed to help practitioners emancipate themselves.

For the purposes of this study, which attempts to examine the use and usefulness of a constructivist curriculum tool, the critical-emancipatory approach to action research is inappropriate. It is unwarranted to assume that, in order to discuss the use made of a curriculum tool, teachers must be part of a collaborative self-critical community "emancipating themselves from the institutional and personal constraints which limit their power to live their own legitimate educational and social values" (Kemmis & McTaggart, 1988, p. 23) and examining their political, social and pedagogical ideologies in the light of political and social oppression and coercion. The technical, practical or emancipatory typology seems better related to studies based in critical theory.

This study seeks to work *within* the existing political and social context of education, within existing national curriculum policies, improving learning for the learner and teaching for the teacher, broadening teachers' professional understanding, certainly, but not requiring them to challenge their personal ideologies. While this study asks teachers to think critically about the application of the CILL Framework in their classrooms, and while it recognises that their responses will reflect their identity as people with political, social, professional and ideological perspectives, it is set firmly in the constructivist approach of thinking critically about how learners construct their knowledge and understandings and can be assisted to be more effective in doing so. It recognises what Rudduck suggests, that "Many teachers in their period of professional training have not acquired the intellectual tools they need in order to view knowledge and problematic"

(Rudduck, 1991). As such, it builds on the research done by Stenhouse and his associates to discover more about how people learn and can be helped to learn better.

This study identifies, instead, with a parallel tradition of action research. The second interpretation of action research follows the classroom research tradition of Stenhouse, and Kolb's (1984) work in experiential learning (see also Altricher et al., 1993; McKernan, 1991, p.21; Zuber-Skerritt, 1992a). It emphasises the exploration and improvement of professional practice, and links explicitly with the notion of the 'reflective practitioner' (Bunning, 1994; Russell & Munby, 1991, p. 164; Schon, 1983; Zuber-Skerritt, 1992b). It also links with the notion of 'double loop' learning (Argyris & Schon, 1974, p. 3; Passfield, 1992), with Action Learning (Argyris & Schon, 1974; Bunning, 1994; McGill & Beaty, 1992; Passfield, 1992; Revans, 1982; 1991; Zuber-Skerritt, 1992b) and, more recently, Organisational Learning and the organisation-wide application of 'double loop' learning (Argyris, 1991; Limerick, Passfield, & Cunnington, 1994; Senge, 1990).

This model of action research is particularly appropriate for the contextualised nature of school-based curriculum research. Growth in curriculum is synonymous with school learning (for example, Elliott, 1984). It acknowledges that curriculum planning is seldom solely the responsibility of the individual teacher. It is shaped by national curriculum documents, by the school's curriculum policies and planning procedures, and by syndicate or departmental curriculum planning procedures as well as how it is interpreted by the individual teacher and students at classroom level. Curriculum is, by definition, collaborative and participatory.

Zuber-Skerritt distinguishes between action research as a philosophy, the theory underpinning action research, action research as a methodology and action research as a technique (1992b; 1993). This distinction is useful because it highlights the fact that the differences between the two traditions apply at philosophical, ontological, epistemological and theoretical levels, more than at levels of method and technique. At the latter two levels there is consensus that action research involves the participation (to some extent) of researchers and 'subjects' as participants in the systematic planning and documentation of a spiral of cycles which include planning, action, observation and reflection steps in each cycle (for example, Kemmis, 1988, p. 10; McKernan, 1991, p. 28; Zuber-Skerritt, 1993, p. 47).

There are two further terms used by all action research theorists and practitioners whose interpretation in the action research process is influenced by ontology and epistemology. These are 'participatory' and 'collaborative'. In both traditions action research is seen to be participatory in the sense that "it is research through which people work towards the improvement of *their own practices*... involves people in *theorising* about their practices" (Kemmis, 1988, pp. 22 - 23). However, in the critical-emancipatory tradition, the thematic concern is often elicited by the group and may "change as it is described more closely and as the action strategy exerts its effect" (ibid. , p. 20). The researcher's role is dictated by this interpretation of 'participation'. In the second tradition, the thematic concern may, as it has been in this study, be selected by the researcher without compromising the role of the participants in contributing to the discussion and design of the cycles. This is based on a recognition of a far more pragmatic purpose for the action research than self growth and emancipation. The distinction, in terms of the role of the researcher and the outcome of the research, becomes more clear when an action research study done in the critical-emancipatory tradition is studied.

It was mentioned above that more than sixty research projects were done in the 1970's and 1980's in the Stenhouse/ classroom-based tradition. One of the researchers was Jack Sanger. A more recent project is set in the critical-emancipatory action research tradition, and provides a fascinating contrast to his earlier *Inside information: evaluating a curriculum innovation* project (Norris & Sanger, 1984). The more recent project was called the *Teaching, handling information and learning* (THIL) project (1983-1986). Its

major focus was "providing an overview of the information handling strategies and needs of the developing learner" (Sanger, 1989). "The THIL project used an action research model of inquiry, drawing teachers together from every phase of education to investigate practices within their own classrooms and institutions... The project thus became a 'linked federation' of mini-projects undertaken by the teachers and researchers, all of whom met regularly to examine their individual work critically, in group meetings". These group meetings provided fascinating insight into teachers' teaching and its influence on learners and learning, but they revealed little about the stated focus of the project. 'Information handling' seemed to be synonymous with teaching and what happened in classrooms. Few practical strategies were identified to help *students* to learn to use information more creatively or critically. However, in illustration of Zuber-Skerrit's notion of evolution, the insights derived at the conclusion of Sanger's study are remarkably consistent with the insights developed in relation to the 'context' dimension of CILL.

The CILL study, in the eyes of the critical-emancipatory tradition might well be challenged as action research, on the grounds that the researcher's role is framed, openly and explicitly, in the role of coach, to maintain the stated focus of the study and participate in the process of improving teachers' teaching and students' information literacy learning.

Similarly, in the interpretation of the shared term 'collaborative', the two traditions need to be distinguished as they translate philosophy into action. Kemmis & McTaggart describe the relationship of individual and social change induced through action research as a collaborative process of social change:

Action research is a form of collective self-reflective enquiry undertaken by participants in social situations in order to improve the rationality and justice of their own social or educational practices, as well as their understanding of these practices and the situations in which these practices are carried out (1988, p. 5).

Action research recognizes that we are social beings, and that we are members of groups - active participants in the living, local and concrete process of constructing the language, activities and relationships which constitute and reconstitute the culture of the groups of which we are members. To change the culture of our groups (let alone of whole institutions or society more broadly), we must change ourselves, with others, through changing the substance, forms and patterns of language, activities and social relationships which characterise groups and interactions among their members. In action research, we aim to do this collectively and collaboratively, as a matter for conscious individual and group decision (ibid., p. 17).

The current study has no such agenda. 'Collaborative' is simply, in line with the Stenhouse tradition, interpreted as a group of teachers, working with the researcher as facilitator/ coach, to use and adapt a curriculum tool in a systematic, participatory process. The aim is simply to see whether, working collaboratively to share and develop knowledge, the CILL Framework can be developed to facilitate an information literacy pedagogy for teachers and learners in the context of the New Zealand curriculum.

Summary

Farmer concluded that "The Information Age requires that the concept of literacy be expanded to include information literacy - the ability to locate, evaluate, synthesize, organize, and apply information..." (1992, p. 103).

It is the researcher's contention that the demonstration of high levels of information literacy exercised within a flexible process of 'rigorous, systematic enquiry' (McKernan, 1991, p. 5) called action research in itself explores Beeby's 'new ways of teaching, learning and understanding' and signals that these new ways of teaching, learning and

understanding may, in turn, require and translate into new approaches to research. Action research lends itself to the notion that research is not a formula but the choice of the lens for a camera. The question is which other methodology might have been better suited to photographing in time-lapse motion, the evolution of a learning process, as subjects played with a new pedagogic tool, with the subjects themselves contributing the analysis and script?

Sprinthall, Schmutte & Sirois (1991, p.88) question the status of action research in relation to 'traditional' positivist, empirical research, suggesting that, "Strictly speaking action research isn't a type of research approach...", but conclude that, "(i)t is, rather, research designed to solve problems that have a *direct applications* in the setting in which the research is conducted". Precisely.

That this type of research can be both accessible to teachers and scholarly is evidenced in the recent Harvard TfU (Teaching for Understanding) action research study (Wiske, 1997). Howard Gardner, one of the participants in the TfU action research project, in an interview, outlined the rationale for using action research in TfU and other projects. His explanation perfectly mirrors both the process, the strengths and weaknesses, of using action research in this study. Given that, the only question is whether it achieved veracity and validity within its own terms of reference.

If you're trying to test a hypothesis, usually descriptive or qualitative methods are not very successful. On the other hand, if you are trying to understand what it's like to learn about something new, the experimental method is usually pretty impoverished. At present, a lot of the work that we're doing really involves action research. We go in with our own conceptions and expectations, but we're not simply observing teachers and students. We're actually involved... Sometimes, even in co-teaching, we are coaching the teachers.

When you get involved in action research, you realize there are certain limitations on the kind of conclusions you can draw because, in a sense, you are part of the treatment. But if you are trying to conduct educational innovation, it's just impossible to give somebody a book and say "do it"; it doesn't work that way. You have to roll up your sleeves, help and coach, learn from mistakes, discuss, use feedback and so on. So you're a little bit more like an anthropologist, actually living in the bush along with other people; you have to tolerate that degree of ambiguity or messiness in order to be able to do the studies at all (quoted in Fernie, 1995, p. 43).

Summary of the process and research plan

Cycles 1 and 2 set the context for the study. In accordance with the iterative tradition of action research, findings of earlier cycles were used to inform and enhance the experience of subsequent cycles. These evolving insights included those derived, firstly, from distinguishing between information literacy and information literacy learning, and, secondly, extrapolating negative characteristics from the early resource-based learning studies, translating these into hypothetical positive characteristics by asking the questions:

- what would information literate students be able to do in a school context?
- under which conditions are students most likely to become information literate?

This made it possible to frame pedagogic propositions which could be related to research, theory and practice to ensure a theoretically coherent approach to the design of the CILL Framework (Cycles 3 and 4). The research design of the four teacher action research cycles (embedded within the researchers' six cycles) is described more fully in Chapter 6. The implementation and evaluation of these four teachers cycles is outlined in Chapter 7, and the insights derived from all six cycles are analysed in Chapter 8.

Table 1: Summary of the process and the research plan

Cycle	Phase	Deadline
ONE	EXPLORATORY PHASE: establishing a context for information literacy - within the information society and within the New Zealand education system and the New Zealand school curriculum	
TWO	EXPLORATORY PHASE: Defining information literacy as a state and as a pedagogy; investigating its origins in practice and theory; relating work done in the field of resource-based learning to work emerging in the field of constructivist technology-based learning in 'knowledge construction environments' and hypothesising characteristics of successful information literacy learning.	October 1996
THREE	DEVELOPING A CONCEPTUAL FRAMEWORK - using the three assumptions (coach, control, context) and the ten propositions which emerged from Cycle two, and testing them against existing theories and theorists, notably Vygotsky, Bandura and discovery, experiential, generative and situated learning theories and models.	December 1996
FOUR	DESIGNING A PEDAGOGIC FRAMEWORK - using the three assumptions (coach, control, context) and the ten propositions.	January 1997
FIVE	<p>TRIALING THE CILL FRAMEWORK</p> <p>CYCLE 5A and B - explaining the Framework and encouraging teachers to explore the concepts in relation to their teaching and student learning - particularly the assumptions - and make diagnostic use of the 'props'</p> <p>CYCLE 5 C - emphasis shifts to strategies (teaching and learning) necessary for successful information literacy learning, and evaluation of classroom attempts to implement the framework.</p> <p>CYCLE 5 D - individual interview using semi-structured questionnaire to clarify how the Framework is used, verify trends and inferences.</p>	<p>1997</p> <p>weekly group audioconferences of 1 - 1.5 hrs Feb - July</p> <p>fortnightly audioconferences of 1 - 2 hrs July - Nov</p> <p>individual audioconferences of 1 - 2 hrs Nov - Dec</p>
SIX	<p>NUD*IST CODING and ANALYSIS OF DATA - relate evidence to Cycles 1 - 4 and develop insights and revised CILL Framework; begin first draft of thesis.</p> <p>WRITE THESIS</p>	<p>1998</p> <p>1999</p>