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Information Literacy in the New Zealand Education Sector

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A relational model of information literacy (Bruce, 1997) has been used as a framework for examining national policies, teacher education, curriculum integration, and assessment issues relating to information literacy and lifelong learning. Initiatives by a range of stakeholders are included to illustrate shared responsibility and support for the educational goals. Successful development of the information and communications technology capacity in schools and extension of technological skills of teachers have yet to be matched in teacher education by explicit, systematic attention to the broader requirements of information literacy. National curriculum documents imply an intention to ensure that information literacy continue to be embedded in essential learning areas, but indications are that this is not translating evenly into teaching practice.

Introduction

The task of assessing progress in implementing lifelong learning and information literacy strategies in terms of national policies, teacher education, and curriculum integration and assessment is complicated by the degree of confusion that still surrounds the definition of *information literacy*. Indeed, although researchers agree that the outcome of information literacy is lifelong learning, they also agree that not only is the concept still evolving, but that it is a means to an end. And the nature of that end depends on the information needs of a society at the particular time in question (Candy, 2002; Langford, 1999).

Further, Candy (2002) notes that responsibility for information literacy development has to be shared by a range of organizations and agencies (e.g., educators, librarians, business organizations, and community agents). The various agendas and understandings of information literacy in these organizations are bound to influence the extent of collaboration between them and the shape of initiatives taken (Moore, 2002a, 2000b). In order to accommodate some of these differences, a conceptual framework is required that facilitates consideration of contributions from a variety of perspectives and provides coherence to the whole.

A Relational Approach to Information Literacy

Although information literacy is often discussed in terms of behavioral standards that lend themselves to educational assessment, for example, those published by the American Library Association (1998), the demands of policy development and resourcing may be better met by a complementary approach.

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Bruce (1997) developed an information literacy model expressed in terms of the conceptions of the predominant relationship between knowledge, information, and technology as experienced in tertiary workplaces. Her research participants were selected not only because their work was likely to result in heightened awareness of these relationships, but also because their conceptions of information literacy were likely to shape the experience of tertiary students, many of whom are destined to become educators themselves.

In brief, Bruce (1997) describes seven conceptions. I suggest here that individual attention to these would prompt a variety of courses of action by organizations responsible for developing information literacy. The conceptions are focused as follows.

1. using information technology for information retrieval and communication. "The information technology conception,"
2. finding information—knowing about sources and retrieval strategies. "The information sources conception,"
3. executing a process—"The information process conception,"
4. controlling information—filing, organizing, managing information—"The information control conception,"
5. building up personal knowledge base in a new area of interest—"The knowledge construction conception,"
6. working with knowledge and personal perspectives adopted in such a way that novel insights are gained—"The knowledge extension conception," and
7. "The wisdom conception" —using information wisely for the benefit of others. (p. 110)

At various stages of an information problem-solving task, each of these conceptions may predominate for a time. They are perhaps best thought of as facets of a single gem, each having its own implications for educational innovation, yet demanding coordination as a whole. The following discussion examines progress toward information literacy by examining national polities, teacher education, curriculum integration, and assessment as appropriate to each facet.

The New Zealand Education Context

New Zealand is a small country with a population of slightly over 4 million, 75% of whom live in urban areas. Compulsory education is provided largely through state-funded schools that are complemented by a variety of private schools that deliver the same curriculum to the same agreed standards (Ministry of Education, 2003a). In recent years, the number of cultures and languages represented in the general population has increased to the point that one in five young New Zealanders now identifies with more than one ethnic group (Statistics New Zealand, http://www.population.govt.nz/default.htm).

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The government's education goals recognize that there are four areas where the education system needs to deliver results:

- provide all New Zealanders with strong foundations for future learning,
- ensure high levels of achievement by all school leavers,
- ensure that New Zealanders engage in learning throughout their lives to develop a highly skilled workforce, and
- make a strong contribution to the knowledge base, especially in key areas of national development. (Ministry of Education, 2005a, p. 9, emphasis added).

Thus the concept of lifelong learning explicitly underpins and directs educational effort.

The New Zealand Curriculum Framework (Ministry of Education, 1993) is the overarching policy that guides teaching, learning, and assessment in all schools. It is flexible, however, in that it allows each school to develop its own curriculum and plan classroom programs, taking into account the goals and objectives of the local community and thereby accommodating the cultural diversity and specific learning needs of the population. For example, in a number of schools, the national curriculum is delivered through the medium of the language and cultural values of Maori.

The curriculum centers on seven essential learning areas (health and physical education, the arts, mathematics, science, social studies, technology, language and languages) and eight sets of essential skills (communication skills, information skills, problem-solving, physical skills, numeracy, self-management and competitive skills, social and cooperative skills, work and study skills). Taken together, the essential skills can be interpreted as the critical components of information literacy, a point that comes into focus in *Digital Horizons* (Ministry of Education, 2003a), which guides implementation of the information and communications technology (ICT) strategy for schools.

Although schooling is compulsory from age 6, most children begin school at age 5, and many attend preschool. For the first 10 years of schooling, students study all essential skills and learning areas described in the *New Zealand Curriculum Framework.* During this period, students' achievements are internally assessed against the national outcome statements associated with each of the learning areas and essential skills. Assessment of students' performance beyond year 10 is administered by the New Zealand Qualifications Authority (NZQA, 2005), which conducts examinations and issues results and certificates. Most national school examinations are based on curriculum statements developed by the Ministry of Education (2003a).

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Progress Toward Lifelong Learning and Information Literacy

Information Literacy as Using Information Technology

This conception of information literacy has generated considerable activity in New Zealand and is perhaps where progress is most visible.

The overall mission underlying *Digital Horizons* (Ministry of Education, 2003a), the strategic plan to integrate ICT into all aspects of curriculum delivery, is to ensure that "All learners will use ICT confidently and creatively to help develop the skills and knowledge they need to achieve personal goals and to be full participants in the global community" (p. 3)

In this document, *information literacy* is explicitly defined in terms that extend the essential skills detailed in the *New Zealand Curriculum Framework* (Ministry of Education, 1993), drawing attention to the potential of ICT for developing higher-order thinking and information skills, as well as providing some behavioral indicators.

> Information literacy is the ability to locate, evaluate, manipulate, manage and communicate information from different sources. As learners become increasingly information literate, they develop skills in discrimination, interpretation and critical analysis. ICT offers opportunities for higher-order thinking and creativity in processing, constructing and conveying knowledge. (p. 5)

Furthermore, the link between information literacy and lifelong learning is made clear as the need to keep abreast of technological advances, adapt to changing workplace and social environments, and use information effectively.

The *Digital Horizons* strategy recognizes three phases to implementation and integration of ICT in the life of schools:

1. learning about ICT—exploring what capabilities it offers to educators;
2. learning with ICT—using ICT to supplement other teaching processes and resources; and
3. learning through ICT—developing new ways of teaching and learning with ICT fully integrated as a normal tool.

The New Zealand education system is now in the third phase, supported by (e)learning Framework for the Schools Sector (Ministry of Education, 2005b) released last year to supersede Digital Horizons. The framework aims to provide "an overarching mechanism for co-ordinating efforts of education providers across all levels of the education sector." It emphasizes collaboration and connection between schools, learners, and other stakeholders, reducing duplication of effort and optimizing use of and investment in resources. The following discussion, however, highlights progress made during the implementation of Digital Horizons.

Information Literacy as Use of ICT—Teacher Education

In 1999-2000, a large number of schools used government funding for professional development and network cabling, and almost all principals attended ICT planning workshops. In addition, a Maori and English bilingual Web site (Te Kete Ipurangi, http://www.tki.org.nz/e/tki/) was

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established to provide ICT resources and Web site links, professional development, and curriculum support. Te Kete Ipurangi continues to expand in response to the changing needs of educators. For example, the curriculum resources available on the site were produced by teachers participating in professional development clusters.

These clusters are self-identified groups of schools that aim to become online learning communities in which teachers' professional development is self-managed. The clusters focus on collaborative development and trial of learning activities that foster critical thinking and, by association, information literacy. The clusters are expected to establish a culture in which knowledge of best practice is shared and supported. A further goal is to create integrated policies, plans, and strategies for further development of ICT systems and technical support.

By 2001-2002, professional development was being funded for three years in 93 clusters of schools. Clusters completing the program are replaced, and in the 2006-2008 period, 40 new clusters will be funded. Places in the program are contestable and require that proposals from schools provide evidence of strong leadership, ongoing collaboration between the participating principals, and an emphasis on learning and pedagogy. *Digital Horizons* notes that the pedagogy underpinning information literacy and curriculum integration of ICT will demand student-centered learning, active, inquiry-based learning, collaborative work, creativity, critical thinking, and informed decision-making, as well as the transfer of some skills and knowledge (Ministry of Education, 2003b). In support of building teachers' familiarity with ICT, a program subsidizing the purchase of laptop computers was begun in 2001. The consultation document for the (e)learning framework reports that 27,000 teachers now have laptops (approximately 66% of all teachers). Furthermore, specific support for school administration, management, and professional development has also been provided through a dedicated Web site (LeadSpace) for principals and school leaders. A survey in 2003 found that most principals were aware of this facility and that at least 25% were accessing it weekly (Learning Centre Trust, 2003).

Information Literacy as Use of ICT—Building Technological Capability

The Learning Centre Trust's (2003) survey found that in primary schools, the ratio of computers to students was 1: 7 and in secondary schools was 1:4. In addition, 60% of the schools responding to the survey could be described as fully networked. Later survey data were not available at the time of writing, but the situation is expected to have improved. Not only have schools continued with purchasing plans for new computers, but principals responding to the survey were well aware of a program that provided lower-cost, recycled computers. Forty-three percent of primary school principals were considering using this program in the future (Learning Centre Trust).

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Lifelong learning and information literacy require community initiatives in addition to those found in schools. A program that aims to provide socially and economically disadvantaged families with home computers has been operating since 2000. Parents of students in schools identified by the Ministry of Education as serving communities with low incomes are invited to join a program that provides a recycled computer, six months of free Internet access, free training, and technical support. Preliminary research results are encouraging, for example, with the principal of one pilot school claiming that "Computers in Homes had produced some of the most life changing behavioural results of any school programme in existence" (Das, 2003, p. 4).

Access to ICT has been further enhanced by city councils through the implementation of public library policies that typically recognize that "Education, information and recreation services ... are an important and complementary support for formal education services." (Wellington City Council, 2004, p. 1). Access to library databases and Internet facilities is available to library patrons of all ages. The most recent Census reported that 47% of New Zealand households had a computer and that 37% had access to the Internet (Statistics New Zealand, 2001). Furthermore, Howell (2004) reports that New Zealanders are among the heaviest Internet-using populations in the Organization for Economic Cooperation and Development (OECD).

An improved network infrastructure was put in place in 2004 to facilitate communication between schools. The Ministry of Education and Telecom NZ implemented a service agreement that makes high-speed, secure network facilities, e-mail, and videoconferencing available to all schools at discounted rates (Schoolzone at http://www.telecom.co.nz/content/0,3900,202506-200369,00.html). The number of schools taking advantage of this service is expected to increase over time.

From the above, it is apparent that the Ministry of Education, working closely with schools, business, and community concerns, has focused on building ICT capacity to support lifelong learning and information literacy. However, evidence of achieving these long-term educational goals requires more time.

Information Literacy as Using ICT—Effects on Teaching and Learning

About two thirds of principals who responded to the Learning Centre Trust survey (2003) believed that ICT was improving the efficiency and quality of curriculum delivery, but that evaluation did not center on measurable changes in learning outcomes. They believed that teachers were gaining familiarity and confidence with ICT, but principals thought they had yet to move into a phase of creatively integrating their use of ICT across the curriculum. This view is supported by the Education Review Office (ERO, 2005a, 2005b) surveys of *(e)learning* in representative samples of 121 primary and 48 secondary schools. Both reports conclude that development of

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school-wide, cross-curricular integration of (e)learning was still at an early stage. (The ERO uses the term (e)learning to emphasize the critical thinking and information literacy central to independent learning, as distinct from the use of ICT to motivate learning.)

The literature suggests that the development of teachers' information literacy and confidence with a range of information technologies and resources is crucial to students' development of the same abilities (Doyle, 1994). Although not evaluating teachers' information literacy as use of ICT per se, the ERO reports indicate that the ICT professional development clusters are having a positive effect. Although most schools in the sample had developed policies and strategic plans for (e)learning that would provide a clear direction for future development, cluster schools were more likely to have made progress in integrating ICT into curriculum programs. However, although 88% of secondary schools had provided ICT professional development opportunities for teachers, in only 60% did ERO (2005a) find evidence that teachers had the knowledge and skills to integrate (e)learning effectively.

There also appears to be a gap in primary schools between effectively promoting engagement in (e)learning (apparent in 68% of schools sampled) and actually fostering critical thinking and information literacy. Only 44% of primary schools were rated as effective on this level, and in some schools, ICT was being used merely to keep students busy. The report concludes, "Pedagogical skills and ICT skills overall were not being transferred into teaching practice in many [primary] schools" (p. 12). A similar conclusion was reached for secondary schools, where only 56% were found to have clear (e)learning goals related to their teaching programs. Such pedagogical issues are a focus of the *(e)learning Framework* currently under development by the Ministry of Education.

Finally, the two ERO reports did not focus on ICT in isolation from other teaching contexts that support lifelong learning. Thus school libraries received some comment, as they provide access to digital information sources as well as print. Primary school libraries are usually operated by "teachers with library responsibility" who may have no library qualifications and few hours allocated to the task (Moore, 1998). Thus, not surprisingly, ERO (2005a) reports that the "primary school library's potential to support (e)learning was sometimes under-recognised and not provided for" (p. 10). In contrast, most secondary schools, which usually have qualified library staff, were found to realize this potential to greater effect. However, in small secondary schools, "the whole school environment and the school library were more likely to be less effective in supporting information literacy" (ERO, 2005b, p. 12).

ERO was due to release an evaluation report focusing on school libraries in October 2005, but the report was not available at the time of writing. Given the policies being implemented by city councils, students' experiences of public libraries are likely to build expectations for access to ICT and infor-

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mation services that may be in advance of those offered in some schools, but as shown below, a pilot program is under way that has potential to address this issue.

The Information Sources Conception

The information sources conception implies that three conditions are required to demonstrate support for lifelong learning and information literacy. Learners need to be able to access information systems with confidence, have knowledge of a variety of resources, and be able to apply appropriate retrieval strategies. This aspect of information literacy has historically been addressed through library skills programs in schools and user education in tertiary libraries. However, the ineffectiveness of teaching library skills in isolation from the curriculum has long been recognized (Marland, 1987). The existence of well-developed school library programs that integrate support for literacy, inquiry, and all aspects of information literacy with curriculum activities is associated with academic success for students regardless of socioeconomic factors (Lance, 2000). Thus any discussion of progress toward information literacy should include the role of libraries in teaching and learning. This is particularly the case because the concept of information literacy originated in the library profession (Zurkowski, 1974). In the following section, I turn attention to the role of the National Library of New Zealand in connecting people with information sources, both in support of curriculum delivery and for lifelong learning.

Knowledge of Sources and Retrieval Strategies—Building Capability

The National Library of New Zealand has a critical responsibility for information storage and development of retrieval systems. In the future, it is expected increasingly to "influence the work being undertaken by the education, research, science and technology sectors" (National Library of New Zealand, 2005, p. 9). It is collaborating closely with government and cross-sector organizations and agencies to ensure that information is made available through digital networks and that necessary access and retrieval skills are developed. For example, an increasing proportion of the New Zealand heritage collections is being made available online, and the country's "digital memory" is being preserved in perpetuity. One example is a project in which more than 20,000 historical images have made available online in a searchable database called Timeframes (http://timeframes1.natlib.govt.nz/).

The National Library is also collaborating with stakeholders to develop a strategic framework to provide direction for public libraries. These and other initiatives are the focus of the Next Generation National Library (National Library), which connects with lifelong learning and information literacy goals through provision of access for all New Zealanders to national and world publications and to bibliographic and full-text information (http://www.natlib.govt.nz/).

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More specifically, the National Library (2005) is directly involved in providing access to information for teachers and students through the School Library Service. Although each school is responsible for developing and managing its own library collection and information networks, the School Library Service maintains a Schools Collection that reflects the information demands of the national curriculum. Teachers can borrow resources appropriate to particular age groups and curriculum areas for class work.

The National Library and the Ministry of Education (2002) have published guidelines for school libraries that center on information literacy, reading, information resources, access, services, and the library as a learning place. A network of school library advisors is available to assist in implementing the recommendations of the guidelines. Furthermore, schools may apply to join the Focus Programme, in which a school-based planning team works for a year with a school library advisor to write a strategic development plan for its information services. It has been said that a year is too short a period to support schools through implementation of such plans, but in this program, targeted professional development is undertaken by groups of teachers covering everything from library management to information literacy and its integration into the curriculum. Anecdotal evidence is that explicit information literacy education is in high demand among participating schools.

The quality of the information system underlying library services is a factor in the development of the skills encompassed by the sources facet of information literacy. The School Library Service is currently implementing a national centralized cataloguing system (SCIS) that will overcome present inconsistencies between schools in library records and organization. This will facilitate development of information retrieval skills that will transfer more smoothly between schools, across education sectors, and into public and tertiary libraries.

All this suggests that the capacity of schools to meet the information demands of teachers and students is being increased through the Ministry of Education, School Library Service, and public library cooperation. However, providing access to resources is not sufficient to ensure that they are used effectively.

Knowledge of Sources and Retrieval Strategies—Preservice Teacher Education

Students' ability to retrieve appropriate information sources and to build an understanding of the information environment in part depends on the knowledge that teachers bring to inquiry tasks, especially where no librarian is available. ICT clusters may have extended digital resource knowledge through inservice teacher education, but what of preservice teacher education?

According to Cameron and Baker (2002), consensus is lacking about the body of essential knowledge and skills required in initial teacher education. Their literature review concludes, "It has proved impossible from the

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research reviewed to characterise the nature of course content in programmes of initial teacher education, so a clear picture of the explicit curriculum cannot be drawn" (p. 25). Thus approaches to or assessment of the inclusion of information literacy in preservice teacher education cannot be compared. However, Marshall (2005a, 2005b) provides some insight in a sector report that examines the capability of the tertiary sector itself to support (e)learning. Having put the case for developing information literacy, particularly in relation to research skills, Marshall comments, "Generally, there appears to be a presumption that the [tertiary] students will acquire the necessary skills themselves, perhaps through the services of institutional libraries, and will know when they need to use that service" (2005a, p. 34). He also notes, "What appears to be missing is resources to help [tertiary] teaching staff support students in acquiring information literacy and research skills effectively" (2005b, p. 54). This raises questions about information literacy understandings among tertiary staff.

A survey of tertiary-sector Web sites confirms Marshall's (2005a, 2005b) view that academic librarians are endeavoring to address the information literacy needs of students through user education and may indeed be doing so somewhat more effectively than other student support services. Some, however, implement information literacy only as bibliographic knowledge, whereas other universities (e.g., Otago, Wartho, 2004) espouse the behavioral standards disseminated in the Australia and New Zealand Information Literacy Framework (Bundy, 2004). These are different from, but compatible with, those published by the American Library Association (1998), which are cited in *School Library and Learning in the Information Landscape: Guidelines for New Zealand Schools* (Ministry of Education and National Library of New Zealand, 2002). Such standards form an important link to assessment of information literacy abilities, but the courses offered by tertiary libraries do not attract all students, nor do they attract any academic credit. One initiative that does provide information literacy support to both tertiary lecturers and students is the information coach project at Waikato University, in which some lecturers and librarians collaborate in (e)learning programs to develop information source knowledge and retrieval skills among students engaged in inquiry (Ivey, 2003).

Although at least two universities offer master's-level courses that examine information literacy theory and practice, these tend to attract in-service rather than Pre-service teachers or those pursuing careers in the information profession. One must, therefore, conclude that information literacy, other than as use of ICT, has a low profile in the education of new teachers, and so the profile of knowledge of sources and retrieval strategies in the school curriculum is also likely to be low.

Knowledge of Sources and Retrieval Strategies—Effects on Teaching and Learning

Although the ERO primary school report (2004a) indicates that many school libraries, particularly in rural areas, were not supporting (e)learning

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and information literacy to the desired level, it does report that access to information has improved. Many schools had "upgraded their libraries and had installed networking facilities, online catalogues and access to online databases and full-text resources to supplement print-based library collections," and "automated library catalogues were seen as greatly assisting students' access to information" (p. 13). A similar improvement is not reported for secondary schools, although these probably adopted ICT in library service provision earlier, as they generally have better developed library facilities and are staffed by information professionals.

One innovative project with the potential to affect students' learning in this *sources* facet of information literacy is being tested by the National Library, Ministry of Education, and four large public libraries. An online reference service for all New Zealand school children connects students with a librarian in real time for a personal guided search and discussion of the relevance of resources found. The librarians use an agreed-on information literacy approach through which participants learn retrieval skills and build knowledge of resources available online and in public libraries (for more details, see http://www.anyquestions.co.nz/en/anyQuestions.html).

Isolating the teaching and learning effects of knowing about sources of information and retrieval strategies is rather artificial, as the critical issue concerns the extent to which this knowledge is applied during the entire information process.

The Information Process Conception

This facet of information literacy focuses on the information problem-solving process common to both primary school projects and doctoral theses. The thinking underlying the process is highly demanding of metacognitive abilities that are themselves associated with higher levels of academic performance (Moore, 1992).

Models published since the 1980s usually emphasize six to 10 steps that include variants of defining information needs; information seeking, location, and retrieval; organization and analysis; and synthesis, presentation, and evaluation of process and product (Moore, 2002b). The model most frequently applied in New Zealand schools is action learning, but Slyfield (2001) indicates that some schools, particularly primary schools, have developed their own models. Her survey found that at least a few teachers in most schools were using an inquiry process model of some kind to guide curriculum design.

The Information Process—Building Capability, Teacher Education

That these models are typically applied by only a few teachers in each school indicates that although the process conception of information literacy has been promoted by several agencies in New Zealand since 1985, little progress appears to have been made. Moore (1998) found that few primary teachers were able to break the inquiry process into component information

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skills or to describe any models that would assist them in teaching strategies to students. Probert (personal communication, August 24, 2005) indicates that a pilot survey currently being analyzed suggests that the situation is similar in secondary schools.

A typical approach to teacher education on this facet of information literacy has been to enroll in a school-based course in which groups of teachers develop and test inquiry activities and report on progress in terms of teaching, resources, and students' learning outcomes. Slyfield (2001) reports that about a third of schools have participated in these courses, and in primary schools the groups tend to be larger, 41% of staff compared with 20% in secondary schools. This provides a community of adult, supportive learners. However, case study research by Moore and Trebilcock (2003) indicates that over time, school-wide gains may be undermined by factors such as changes in staff, other curriculum pressures, lack of allocation of responsibility to sustain the focus, and few concomitant developments in the learning culture of the school. This study identified eight dimensions along which development is required to create lasting change, and it drew attention to the gestation period needed for the integration of ICT and information literacy into the curriculum. Each school studied had been working toward this goal for eight years, but none had achieved as much as hoped, despite a high level of commitment from the principal and the efforts of a full time teacher-librarian. One factor was that implementation was not being evaluated in terms of students' learning outcomes attributable to teaching through ICT and information literacy as a process. This is reminiscent of the more recent ERO findings about lack of linkage between policy and pedagogy.

Information Literacy as a Process—Effects on Teaching and Learning

As yet no large-scale, long-term studies in New Zealand have examined the effect of teacher education on information literacy as a process. The available spontaneous feedback gives an impression of participants' excitement as understanding of information literacy increases and the potential is uncovered. In particular, exposure to Kuhlthau's (1996) model of the affective aspects of the inquiry process generates recognition as teachers realize that their own feelings of doubt and confusion during inquiry assignments are normal.

Adoption or adaptation of an explicit process model provides a cognitive map of inquiry that provides scaffolding for learners of any age, and small-scale studies show that children from 5 to 17 years of age are more enthusiastic, confident, and able to complete inquiry or research tasks. They are also more engaged in learning when steps in the underlying information process are made explicit (Moore & Page, 2002). However, evidence that these effects are sustained over time is anecdotal, and it has yet to be demonstrated that as a specific result of this pedagogical approach, understanding of research processes develop as children progress through

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school. The rhetoric suggests that they should and that what can be taught changes as a result (Shapiro & Hughes, 1996).

Evidence of improvement in particular information skills is seen in the snapshot findings of the National Education Monitoring Project (NEMP), which conducts annual surveys of educational achievement among 3,000 students in 260 schools, applying a four-year cycle that focuses on various parts of the curriculum. Skills are assessed at two levels—year 4 (age 8-9) and year 8 (age 12-13) —under a variety of conditions. Over five days, children work on tasks individually with a teacher, independently, and in collaborative groups to provide a robust picture of abilities (NEMP, http://nemp.otago.ac.nz/i_about.htm).

Information skills were last assessed in 1997, and the library and research aspects of information literacy are being studied again this year, but the extent of prior exposure to information literacy-based teaching is not taken into account. Despite this, it has been found that students between 4 and 8 years of age do improve in their ability to locate information using catalogues and reference books, but concerns were raised about their ability to define information needs, ask appropriate questions, and use information analytically. The current monitoring effort may detect changes in information skills that can be attributed to increased availability and use of ICT in classrooms and at home.

One interesting cultural point is that in 2001, NEMP focused attention on the information skills of Maori students, finding that the tendency to seek information in a library or on the Internet was influenced by the language of curriculum delivery. Students in Maori-language immersion schools were more likely than those in English-language schools to seek information from a teacher. This reflects the fact that print and digital sources in Maori are limited, and so development of information literacy is constrained by the predominant language of publication (http://www.minedu.govt.nz/print_doc.cfm?documentid=8711).

At the level of individual schools, Slyfield (2001) found that in 93% of secondary schools and 98% of primary schools, information skills were monitored, but application of formal tests was not as prevalent as unspecified methods of monitoring by teachers and the students themselves. More formally, the National Certificate of Educational Achievement (NCEA) includes achievement standards that require application of research skills. However, not all secondary schools have elected to teach research-specific units across the curriculum, partly because assessment demands that the generic, as well as the domain-specific, skills be explicitly taught in each subject. This results in a degree of repetition that is unacceptable to many students (Baines, personal communication, August 24, 2005). Further, Probert's (personal communication, August 30, 2005) current pilot survey suggests that where general standards require research, many teachers may not associate *research* with *information literacy.* She found that few were explicitly teaching students the skills needed to tackle research assignments.

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In general, students gaining NCEA Level 2 or 3 certification have "typically shown themselves able to integrate knowledge and skills to solve familiar problems [and to] access and use available sources of information" (NZQA, 2005). Thus although information literacy as a process is not explicitly mentioned in documentation, it is implied.

The Information Control Conception

Information control in learning. This facet of information literacy goes beyond organizing and analyzing information for a particular learning activity. Rather, it considers future information retrieval needs for problems that may be less well defined than those usually encountered in assignments.

From the published literature, it is difficult to assess the degree of attention being paid to developing learners' skills in filing, organizing, and managing information. It seems to be taken for granted that they will gradually learn these skills as they manage homework. However, the use of ICT, particularly with shared space for files, is likely to raise awareness of some information control issues. Beyond the basics, it is also likely that those students involved in creating Web sites will be learning about the demands of creating information architectures and retrieval systems.

The other obvious exposure to information organization and retrieval for students is seen in the library. The school library guidelines aim to ensure that the "school library is a managed centre of professional expertise and support for the school community" (Ministry of Education and National Library, 2002, p. 22). There is certainly evidence that students in both primary and secondary schools may be exposed to information control concepts as library assistants. However, this is insufficient to allow a smooth transition to employment contexts where documents must be shared, records must be kept, and organization of print and digital documents must be coordinated.

Information Literacy as Information Control for Administration and Teaching

Information control may have a higher profile with principals and teachers in terms of administration and management.

One goal of *Digital Horizons* was to ensure that ICT was used for effective administration and communication in the school community. This goal appears to have been achieved in that ERO (2005a, 2005b) found that most school leaders had experienced improvements in access to information, which was leading to better administration. School Web sites, intranets, and the use of e-mail both within and beyond the school were similarly contributing to better time management and sharing of information between teachers, as well as developing community profiles. In parallel, ICT is providing better information transfer between schools and the Ministry of Education, and this should provide a foundation for meeting the requirements of the new Public Records Act, 2005. It may be that professional development opportunities will arise from the introduction of this Act, and

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as a result, knowledge of information literacy as information control may trickle down into the classroom.

In the above conceptions, information and ICT predominate over knowledge, but in the remaining facets of Bruce's (1997) model, conceptions focus on how information is transformed through learning. This brings greater attention to curriculum integration issues.

The Knowledge Construction Conception

This conception of information literacy accords with longstanding educational philosophy in New Zealand. It underpins the current Curriculum Project in which statements that support the *New Zealand Curriculum Framework* (1993) are being reviewed in order to "clarify and refine outcomes, focus on quality teaching, strengthen school ownership of the curriculum" and further develop communication and partnerships with families and communities (http://www.tki.org.nz/r/nzcurriculum/). This process involves wide-ranging consultation that can be described as *school-based curriculum development* representing an alternative to top-down or centralized curriculum decision-making (Bolstad, 2004).

Information literacy as knowledge-construction is most apparent in the draft Curriculum Project statement that addresses five key competences. Although this statement is some way from approval or adoption, the intention is clear. Competence in using knowledge and information is described as

> pursuing and accessing funds of knowledge and information and using them in a reflective, effective and responsible manner. It involves creative, critical and logical thinking, metacognition, self-awareness, reflection and judgement. Using knowledge and information includes researching, organizing and evaluating knowledge and information for real world purposes. (Wright, 2005)

This implicit emphasis on information literacy is reinforced (again only implicitly) in the draft statement for science, which overtly refers to building knowledge, skills, and attitudes; understanding the developing nature of science, its processes, and ways of developing and organizing knowledge; and applying knowledge and skills to make informed decisions about implications and applications of science in everyday life. However, information literacy is not implied in the other draft curriculum statements at this stage.

Working from the basis of the *Curriculum Framework* (1993), the survey of information literacy in New Zealand schools by Slyfield (2001) found that although almost all responding schools claimed to include information skills in English and social studies classes, primary schools were far more likely to include them across the curriculum. They were also more likely to report including information skills in science and health programs. Secondary school history and geography curricula build on the primary school social studies program with structured and well-supported development of inquiry skills. However, because information literacy is rarely

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explicitly identified as a pedagogical concept and because responsibility for monitoring advances does not seem to have been allocated in schools, progress toward lifelong learning and information literacy is hard to detect across the curriculum.

The Knowledge Extension Conception

In this facet of information literacy, the focus is on making connections between information and existing knowledge to create new understandings. Information literacy outcomes in this context have yet to be assessed in New Zealand, but many projects, usually in partnership with business and community agencies, create a proving ground. For example, in 2004, 24,000 primary students engaged in learning through simulations of running their own societies in a program known as PrEP. A variety of young enterprise programs encouraging senior students in business interests are run nationally every year, and many partnerships between schools and tertiary education providers introduce learners to real-life problem-solving. For example, the Digital Opportunities site (http://www.digiops.org.nz/) provides an overview of several pilot projects. The two initiatives discussed below are selected to illustrate how ICT and information literacy come together to extend knowledge.

A cluster of small rural schools is working in partnership with the Waikato Institute of Technology using laptop computers, interactive whiteboards, data projectors, and an integrated intranet and extranet called Knowledge NET in an initiative called the Kopu Project. Teachers use an inquiry model of learning to construct Internet-based microquests. The project was established in two schools before being extended to another five, and it is hoped that when parents and caregivers are involved in monitoring and contributing to the children's learning, they too may engage in formal learning (http://www.digiops.org.nz/projects/current-projects/kopu/).

The second project highlighted has been established longer (www.forestsoflife.net.nz) and is the result of a partnership between Ensis, Massey University, Revero Web Specialists, and two intermediate schools. Ten- to 12-year-olds use laptop computers, GPS, digital sensing devices, microscopic digital cameras, and other high-tech tools in the field to capture data from the forests. The students publish photographs, ideas, works of art, scientific data, and other outcomes of their project work to the *Forests of Life* schools' Web site and a digital herbarium. This project integrates learning across the conventional boundaries of science, technology, social studies, and the arts as students plan and implement a variety of projects.

The ERO (2005a) report found that a major positive outcome of (e)learning was an increase in confidence and pride. This was evident as students presented their work to assemblies, other schools, and parents using digital or video cameras, PowerPoint, and school Web sites. The motivational and self-esteem factors of initiatives such as those described above enhance learning by promoting creative extension of knowledge and lifelong learning.

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The Wisdom Conception

This final facet of information literacy touches on how information is valued and knowledge is applied.

At present in schools, acceptable use policies and Internet safety issues may provide the most obvious example of applying this conception. The effects of censorship from the application of filters, plagiarism, and intellectual property issues also require attention if students are to understand their responsibilities and use information critically in an information society and fit well with the intent of the social studies curriculum. However, it is difficult to assess how far understanding of this aspect of information literacy has progressed for teachers or students.

Conclusion

The concept of information literacy is still evolving, and Bruce's (1997) relational model prompts appreciation of the number of fronts on which developments are taking place. Although information literacy as use of ICT is a cornerstone of education that leads to lifelong learning, a consideration of each facet of Bruce's model in turn shows that there are no grounds for complacency.

The *Digital Horizons* strategy has largely achieved the aim of building technological and professional capability, but achievement of (e)learning goals in terms of information literacy is not far advanced. Indeed, the information literacy underpinnings of the *Curriculum Framework* are in danger of slipping from sight in the current Curriculum Project and (e)learning framework development.

Some teachers engaging in the School Library *Focus Programme* and participating in ICT cluster projects are requesting professional development on information literacy as part of school library development. This seems almost to be a natural progression as they move from learning about and with ICT to learning through ICT and shifting to a desire to promote higher-order thinking in accordance with the ERO reports (2005a, 2005b). However, no evidence in the literature reviewed indicates that in-service or Pre-service teacher education systematically addresses information literacy or its development as schooling progresses.

It is of concern that ERO identifies a gap between the percentage of schools offering professional development opportunities and the percentage of schools then judged to have teachers with the knowledge and skills to integrate (e)learning effectively. It is of even greater concern that tertiary educators do not appear to be taking responsibility for developing information literacy among their students. Although it is laudable that librarians are taking up the challenge, the courses they offer attract no academic credit and are not taken by all students. This is exactly the same criticism that was levelled at ineffective library and study skills courses in secondary schools in the 1980s (Moore, 1992). Until this problem is addressed, it is unlikely that teachers will be well placed to ensure that stu-

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dents leaving school are equipped with levels of information literacy suited to the workplace.

On a more positive note, New Zealand appears to be developing partnerships between stakeholders that aim to ensure that school leavers have begun the journey toward information literacy and lifelong learning. The Ministry of Education, National Library, public libraries, businesses, and communities are working together in a variety of ways. Lacking is an overall vision to coordinate the efforts, but this is to be addressed in the current (e)learning framework development. To foster this development, adoption or adaptation of process models and measurable standards for information literacy such as those in the Australia and New Zealand information literacy framework would assist teachers in understanding the goals of information literacy. This would enable them to participate in developing appropriate monitoring tools such as information literacy rubrics and portfolios.

Educators in New Zealand are moving toward greater application of research evidence in policy development. Although the NEMP studies and ERO reports provide some indicators of information literacy progress, longitudinal research is required to monitor the effects of teaching for information literacy both on students' learning outcomes and on the curriculum changes it affords. Furthermore, information literacy initiatives need to be seen in the context of whole-school change, as they result in new ways of thinking about information, knowledge, technology, people, and learning. Essentially, information-literate school communities are learning organizations where the processes of handling, seeking, and creating information are seen as central to education, using whatever technologies and resources are currently available.

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She chaired the APEID seminar workshop on lifelong learning and information literacy in Tokyo in September 2005 and was a lead expert in the K-12 sector discussions at UNESCO's colloquium on information literacy in Alexandria in 2005.

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