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Chapter One: Introduction

Since the mid-nineties the internet has had a profound effect on the way people access and use information. The speed, ease and convenience of being able to retrieve information from a single source have beguiled the information seeker from all walks of life, including students. This study investigated the information seeking and research behaviours of masters education students in the age of the internet. I wanted to discover how research students found the information they needed for their study, what sources they used for discovery and how they interrogated those sources. I compared students' perceived success in searching with the strategies they used, and assessed whether students were as capable and effective as they thought they were in areas such as online searching, information management and evaluation of online information. Difficulties experienced by masters students in the research process were also examined.

This thesis has examined the following questions:

- What influences the research behaviour of education masters students?
- How do masters students approach information seeking?
- How capable and effective are masters students in the way they find, manage and evaluate information?
- What difficulties do masters students experience in the research process?

Origins of this Study

My interest in student information seeking has arisen from my work as a librarian in a tertiary institution responsible for educating both pre-service and in-service teachers. On taking up employment with The University of Auckland I had come from a teaching background of eight years. It was not long after starting work at the University that I decided

it would helpful to further my studies in education. Concomitant with that was a meeting with other New Zealand education librarians where an important topic of discussion was the researching skills (or lack of them) of tertiary students. In addition, a number of major reports and books had also been published drawing attention to the online research behaviours of students (N. Foster & Gibbons, 2007; Online Computer Library Center, 2006; University College of London, 2008a).

The publication of reports such as the Google generation report (University College of London, 2008a) also matched a concern from academic librarians that their collections were being by-passed by students' use of the internet. By the end of the decade this concern had, to a large extent, been overcome as academic libraries responded to the challenge presented by the internet. Instead librarians became increasingly perturbed, not so much by the fact that students were using the internet, but that they were doing so with little apparent concern for the quality or veracity of the resources which were being retrieved. This spurred further efforts by libraries in the area of information literacy, part of their *raison d'être* since at least the 1980s.

Information Literacy in Tertiary Education

Information literacy is the underlying theme which runs through this thesis and provides the rationale for why this research was necessary. The term information literacy was adopted in 1974 (Zurkowski), but there has been confusion over the meaning of the term ever since. There has also been a lack of real buy-in by stakeholders, apart from librarians, and this has hampered the promotion of information literacy within educational institutions. The Society of College, National and University Libraries (SCONUL) recently described information literacy as "an umbrella term which encompasses concepts such as digital, visual and media literacies, academic literacy, information handling, information skills, data curation and data management" (2011, p. 3). SCONUL defined the attributes of an

information literate researcher in terms of both understanding (attitudes and behaviours) and ability (skills and competencies). Such a researcher would display both attributes in the areas of identifying the need for information, assessing their current knowledge and identifying gaps, constructing strategies for locating information, locating and accessing information, evaluating, managing and presenting their information.

This University has its own guidelines dedicated to information literacy which state, "The University of Auckland accepts that being information literate equips students with the essential attributes required to engage with information and to develop critical thinking and life-long learning capabilities" (University of Auckland, 2011). The importance of information literacy has also been recognized in the University's graduate and postgraduate profiles (University of Auckland, 2003, 2009a, 2009b, 2009c).

Collectively, the profiles imbue the student with:

- An ability to recognize when information is needed and a capacity to locate, contextualise, critically evaluate, synthesise, and use information effectively
- A capacity for critical, conceptual and reflective thinking
- A capacity for critical appraisal of relevant scholarly literature.

The graduate and postgraduate documents set the strategic imperative for information literacy within the University of Auckland. Over the past decade the library has made strenuous attempts to highlight the importance of information literacy and to have it integrated into the academic curriculum.

Information literacy in an institution responsible for the training of teachers acquires an added significance. The United Nations (Catts & Lau, 2008; Garner, 2006; C. Wilson, Grizzle, Tuazon, Akyempong, & Cheung, 2011) has made it clear that nations have a responsibility to ensure the establishment of information literacy criteria in their teacher

education programmes and has suggested a range of learning outcomes for trainee teachers which would ensure that they have the knowledge to teach information literacy skills to their own students (Moore, 2008). The issue of how information literate teachers in New Zealand are, and how they impart those skills to their students, has been the subject of recent research in New Zealand (Ladbrook & Probert, 2011; Probert, 2009). It is clear from these studies and from recent National Education Monitoring Project reports (Flockton, Crooks, & White, 2006; J. Smith, Crooks, & Allan, 2009) that both teachers and students lack adequate skills in the utilisation of information literacy competencies.

The Focus on Postgraduate Students

My interest in postgraduate students, known as graduate students in much of the literature, stemmed from my own status as a graduate student. In addition, there was an increasing strategic focus on this group from within my own institution. The literature on graduate research behaviour and information seeking has focused mostly on doctoral students, with comparatively few studies which have investigated masters students. Certainly, there has been no research in this area on New Zealand masters students.

The Structure of the Thesis

Chapter Two examines the literature in the field of information behaviour, information seeking and student research, mostly through the lens of the library and information science literature. The chapter opens by discussing the theoretical background of information behaviour and the complexity of the conceptual theories surrounding this field. It then highlights the recent literature on student information seeking, much of it published in the last ten years.

Demographic influences, such as age, gender, full-time or part-time study and distance, and their relationship to student information seeking are also examined, alongside student use

of technology for study. There is a section which draws attention to the role that expert people play in the student research process. What sources students use for their study and how they use them forms a significant part of the literature review along with an examination of any studies which indicate student proficiency in the areas of information searching, information management and information evaluation.

The methodology chapter explains the theory of mixed methods research and outlines the research designs used in both the questionnaire and the interviews. This is followed by an explanation of how the data was collected and analysed.

Chapter Four elucidates the findings of the research using the structure of the research questions to give it form. The chapter begins with an examination of the influences on student research behaviour. The influences are mainly demographic, but there are other influential factors such as people and time which surfaced in the interview data. What sources students use and how they use them is reported. How capably students use the sources, manage their information, and the difficulties they experience in the research process is also described. Finally, students' effectiveness in retrieving information and evaluation of online information is reported.

The discussion chapter highlights six major aspects from the findings of both the questionnaire and the interviews, and discusses these in relation to the literature. The discussion also puts the findings into the context of some strategic and policy areas. The major findings discussed in this chapter relate to the role of demographic variables in student information seeking and research, the role of people such as supervisors and librarians, the major sources of information used by students, the perceptions of student success measured against their reported actions, and finally, issues relating to information management and evaluation of information.

Finally there is a conclusion which includes the limitations of the work, some recommendations for the future and a reflective statement.

Chapter Two: Literature Review

The literature which formed the basis of this review has been derived mainly from the fields of information behaviour and library and information science (LIS). The theoretical background of information behaviour, its relationship to information seeking and where it intersects with LIS, has been examined in this review. In addition to the theoretical literature, this chapter also reviewed the empirical literature which discussed the influences on student information seeking and research behaviour, the sources used by students and their online behaviours. The review discussed the literature relating to the capabilities of students in online searching, and managing information. The chapter concluded with aspects of the literature which have investigated students' effectiveness in retrieving full-text items, evaluation of online sources and the relationship of evaluation to critical thinking.

Theoretical Background of Information Behaviour

The theoretical foundations of the way people look for (seek) information is found in the field of human information behaviour. Information behaviour has been described as "the entire range of human information behaviour including both active and passive seeking and use" (T. Wilson, 2000, p. 386). Case (2008) also argued that it included the active avoidance of information. The field of information behaviour is generally divided into three strands: information need, information seeking and information use (Parker, 2006). My research has focused on the information seeking and information use strands. The approach to information seeking has been investigated by examining the sources used by students and the searching behaviours and strategies used by students. The use of information has focused on how students manage and evaluate information. Figure 1 explains the relationship between information behaviour, information seeking and information searching.

The conceptual frameworks underlying information behaviour are rich and complex. Fisher, Erdelez and McKechnie (2006) identified no fewer than 72 metatheories, theories and models which have informed research in the past 30 years. More than half of these theories have come from the field of library and information science, and nearly a third from the social sciences. The remainder have come from the disciplines of computer science and the humanities. The result is a "confusion of many approaches competing for attention" (Bates, 2005, p. 2). The diversity of theory in the field of information behaviour and information seeking has meant that no one theory has had ascendency. There has been little debate from researchers about whether the lack of coherent theory has given credibility or otherwise to the ontological foundations of information behaviour. It is clear from analysis of the journal literature in the 1980s and 1990s that many articles were not "theoretically grounded" (Pettigrew, Fidel, & Bruce, 2001). There is no one over-arching theory of information behaviour, and the terms paradigm, approach, metatheory, conceptual framework and conceptual model have been used almost interchangeably.

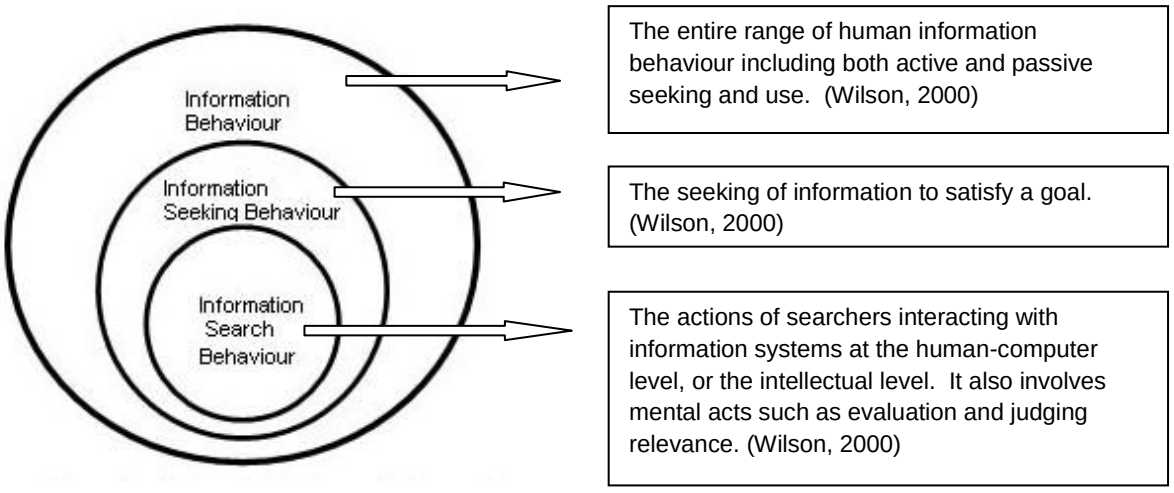

Figure 1. Wilson's 1999 nested model of information behaviour

*Note.*From "Models of information behaviour research" by T.D. Wilson, 1999, *Journal of Documentation*, *55*(3), 249-270. Copyright 1999 by T.D. Wilson. Reprinted and adapted with permission.

One of the dominant influences in the development of theory in information behaviour has been the emergence of an ethos centred on the individual; the idiographic approach driven by economic, technological, social and political changes which have swept through the twentieth and twenty first centuries (Bates, 2005). Many of the cognitive approach studies in information behaviour research have investigated how an individual thought or behaved in response to an information need (Choo, Detlor, & Turnbull, 2000; Dervin, 2005; Ellis, 2005; Kuhlthau, 2005; T. Wilson, 2005). Other approaches, like that of the social approach, used the individual as a starting point but emphasised the social context in which that individual existed.

The Cognitive Approach in Information Behaviour

The individual sat firmly at the heart of this approach. The approach focused on how an individual recognised and responded to an information need, and it delivered a set of constructs for understanding information behaviour. It arose chiefly in response to a call from Dervin and Nilan (1986) to move away from a system/resource approach to one which focused on "constructive, active users, subjective information, situationality, holistic views of experience, internal cognition, systematic individuality and qualitative research" (Pettigrew, et al., 2001, p. 43). The cognitive approach was similar to the cognitive perspective which was reflected in other social sciences, in particular, education. Since that time many theorists have situated their studies within this approach, or used it as a starting point to build on.

Researchers using the cognitive approach have recognised that despite the fact an information user was a unique individual certain common behavioural "rules" were evident and could be generalisable. A number of models (Ellis, 1993; Kuhlthau, 1991) have identified stages in the information search process. Kuhlthau went further and not only delineated a process but described the affective responses which beset the searcher – responses such as "uncertainty, confusion, optimism, frustration, relief and satisfaction."

(Pettigrew, et al., 2001, p. 50). By the late 1990s Wilson (1999) had incorporated a number of earlier models into his own revised general model of information seeking behaviour. The advantage of his model was that it demonstrated the "interrelated nature of theory in this field, whether drawn from other disciplines, or from within the research traditions of information science" (T. Wilson, 2005, p. 35) and allowed other researchers in the field to obtain a sense of where their research might fit into the complex field of information behaviour.

The model used in my research. From the various approaches to information behaviour, I have chosen to adopt the cognitive approach, and in particular, a model developed by T. D. Wilson (1999, 2000, 2005, 2006; T. Wilson & Walsh, 1996). Wilson's model, as seen in Figure 2, was useful for considering aspects of my research questions. The model helped to position the influences and the approach of much graduate student information seeking. It also explained how motivation and self-efficacy related to each other and to other aspects of the model. Where it was less helpful was in the areas of individual capability and effectiveness. Wilson would be the first to acknowledge this, saying as he did, that the model "remains one of macro-behaviour" (1999, p. 257).

Information Seeking

Information seeking has been widely researched for at least a century. In its early guise it centred on the use of information sources (documents) and systems, often in institutions. As the twentieth century moved on systems and documents became less important and a new person-centred ethos, which focused on "how individuals encounter and make sense of their environment," evolved (Case, 2008, p. 4).

It has been estimated that there are over 10,000 documents on information seeking which cover a number of disciplines (Case, 2008). Case described information seeking as

"...a taken-for-granted concept, a catchall phrase that encompasses a variety of behaviours seemingly motivated by the recognition of "missing" information" (p. 81). Within the information seeking field the largest focus of empirical work has been about how people find information in libraries. Many studies in information seeking have been conducted within the LIS field. They have ranged from small qualitative studies, which have looked at the how and why of individual information seeking behaviour, to large, longitudinal, quantitative studies which have focused on the patterns and use of resources. Studies in the LIS field have been extensively examined for my research, given the setting in which it was conducted, and because of the nature of my role within the institution.

Library and information science. LIS is the result of a merger between two fields, information science and library science (Andrews & Ellis, 2005). The intersection between the two often occurs in the field of information behaviour, a sub-field of information science. A great many of the articles reviewed for my research have been located within the journals dedicated to libraries, and to information science, as well as information processing and information technology. The amalgamation of information science and library science and the interconnection of both with the field of information behaviour has meant that they share a common theoretical background. The cognitive approach has been a major lens shaping the recent research in both LIS and information behaviour. It "has reoriented research away from systems to emphasize questions about knowledge structures, human-computer interaction, information seeking and human information behaviour in general" (Vakkari, 1994, p. 32).

Information Seeking and the Research Behaviour of Undergraduate Students

Students have been one of the most widely studied groups in the information seeking literature, and the studies have ranged from those of young school age children through to students at university level. Case (2008) suggested the reason for that is because of the "voluminous research literatures on education and learning" (p. 301). The themes of the

studies have covered almost every conceivable aspect of information seeking from epistemological beliefs of students, to self-efficacy, critical thinking skills, affect, personality attributes, anxiety, serendipity in searching and the role of social and cultural capital.

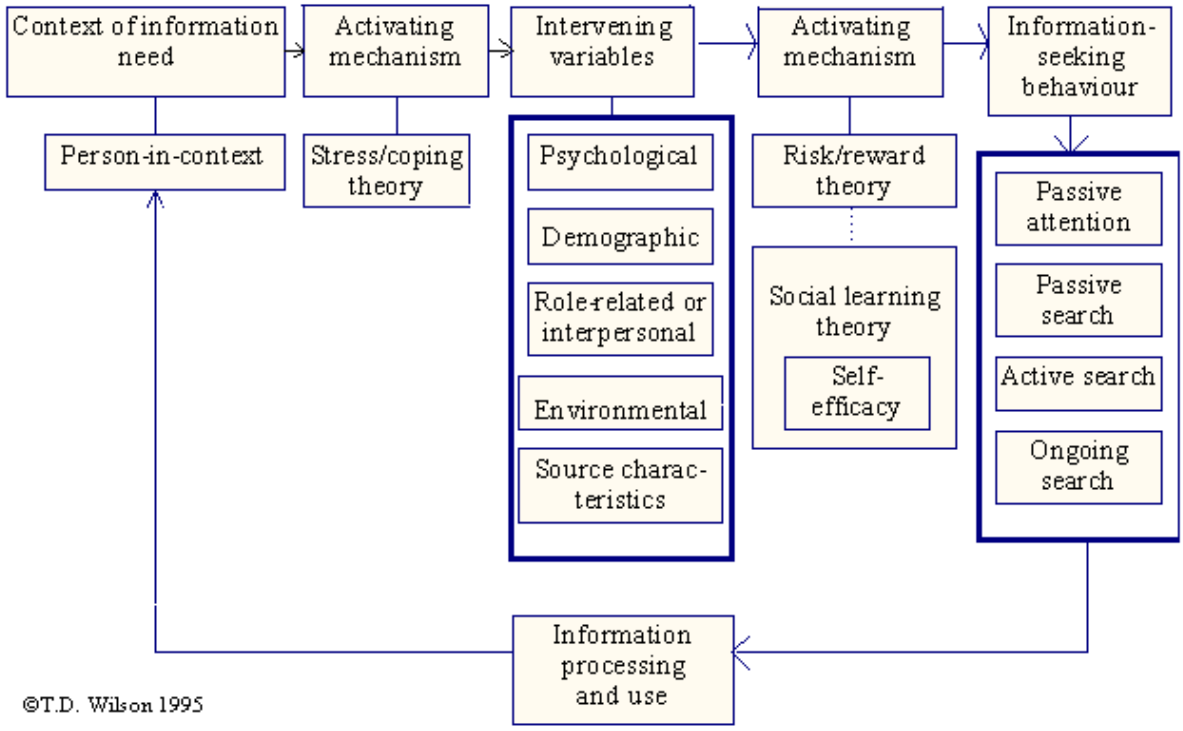

Figure 2. Wilson's 1996 model of information behaviour

Note. From "Models of information behaviour research" by T.D. Wilson, 1999, *Journal of Documentation*, *55*(3), 249-270. Copyright 1999 by T.D. Wilson. Reprinted with permission.

The majority of studies of university students have focused on undergraduate students (N. Foster & Gibbons, 2007; Head & Eisenberg, 2009; Head & Eisenberg, 2010; Online Computer Library Center, 2006, 2010; Rowlands et al., 2008; S. Smith & Caruso, 2010; S. Smith, Salaway, & Caruso, 2009). The most recent study, the Ethnographic Research In Illinois Academic Libraries (ERIAL) project, found:

> ...students search habits and information literacy skills to be lacking. The impact of the internet on this generation of students is unequivocal – students expect instantaneous,

> online access to sources, in large part due to their years of successfully searching the Web for their information needs. (Duke & Asher, 2012, p. 162)

Where scholarly databases were consulted, they were often misused.

It has been argued that the applicability of the ERIAL findings (Duke & Asher, 2012) are not likely to be generalisable to Australian and New Zealand universities because there has been better access to professional library staff for students, and research support has been embedded into programmes (Creagh, 2011). The arguments implied that Australasian students might not be exhibiting the same sorts of behaviours as their American counterparts; a claim that is difficult to substantiate given the limited amount of research into the student research process in Australasia.

The ERIAL study is the latest in a long line of research into university student information and research behaviour and corroborates others' findings on student reliance on search engines (usually Google), ineffective searching skills, and limited ability to evaluate sources (Connaway & Dickey, 2010; Duke & Asher, 2012; Online Computer Library Center, 2006; University College of London, 2008a).

Information Seeking and the Research Behaviour of Graduate Students

Studies of the information seeking and research behaviours of graduate students have not been as prolific as those for undergraduate students, but there is a growing body of research on doctoral students (Baltes & Hoffman-Kipp, 2010; Billups & Kite, 2010; Education for Change Ltd, 2009, 2010; Fleming-May & Yuro, 2009; R. Green & Macauley, 2007; Jiao, Onwuegbuzie, & Waytowich, 2008; Meerah, 2010; Sadler & Given, 2007; Secker, 2011; Streatfield, Allen, & Wilson, 2010; Vezzosi, 2009). Masters students, on the other hand, have been largely ignored; they have almost always been subsumed under the generic term graduate students. Only a few studies have related specifically to masters

students and their information seeking and/or research behaviour (Drennan & Clarke, 2009; Fidzani, 1998; R. Green & Bowser, 2002; Heinstrom, 2005; Junni, 2007; Moulding & Hadley, 2010; Nicholas, Huntington, & Jamali, 2007; Vakkari, 2000). Given that masters students are distinct from undergraduate and doctoral students, I wanted to see if there was evidence in the literature which supported the idea that masters students have different research needs to the other groups. There is, however, little to suggest that, and it is difficult to know whether this is because the issue has not been researched widely enough or because masters students are, in fact, more like early stage doctoral students.

The literature examined in the following sections of this review has focused on the research pertaining to graduate students (masters and doctoral students), and where possible highlighted the results in relation to masters students. Reference has been made to research involving undergraduate students where I have deemed this useful to the discussion or where studies on graduate students have been limited or non-existent.

Influences on Information Seeking and Student Research Behaviour

There has been consideration in the literature of a range of influences affecting student information seeking and research. The influences have included demographic variables such as distance, age, gender and mode of study; the impact of work on study; how information technology (including the internet) has affected information seeking; and how people such as supervisors and librarians have influenced students in the research process.

The influence of age on research behaviour. A number of studies have examined information seeking in relation to the age of university students undertaking academic studies, but these have mainly considered younger students (Education for Change Ltd, 2009, 2010; University College of London, 2008a; Weiler, 2004). In New Zealand students aged 40 and over make up 30% of all students enrolled in tertiary education (Scott, 2006), with a

similar demographic at universities overseas (Lauzon, 2011), but no studies have investigated the information seeking of older graduate students.

While there is some evidence that age has not been a factor in information seeking in relation to graduate students the research is dated (Bilal & Kirby, 2002). The study related to the use of a web directory for children (Yahooligans) and asked both children and students to perform a fact-based search. The nature of a directory search is very different to that of an internet search where keyword searching is more the norm (and less specific), so it is unlikely Bilal and Kirby's research can be considered relevant in the Google environment.

The influence of gender on research behaviour. The influence of gender has not been the primary focus of many studies in the information seeking literature according to Case (2008) and Maghferat and Stock (2010). Where gender has been studied as a variable in information behaviour in its own right, the indicators have been equivocal as to whether gender is a differentiating factor. In a recent literature review, Urquhart and Yeoman (2010) found eleven studies indicating there were differences in behaviour, and six indicating there were no differences in information seeking behaviour in relation to gender, and came to:

> the tentative conclusion that there seem to be differences between men and women in health information seeking behaviour, and that gender may be a moderating influence on attitudes towards technology ... and information seeking. The differences are not substantial and often only evident with larger samples. (p. 119)

There have been studies relating specifically to university students which have examined the influence of gender (Halder, Ray, & Chakrabarty, 2010; Hargittai & Shafer, 2006; Hupfer & Detlor, 2006; Marley, 2007; Rowlands & Nicholas, 2008; Steinerova & Susol, 2007; Weiser, 2000). Several of these have investigated internet information seeking, although not always in relation to academic study. In the use of electronic information resources for reading and publishing there were few significant differences in the frequency

of use, or preference for use, of electronic resources between men and women (Steinerova & Susol, 2007), although it was found that the internet as **first** source was slightly higher for men than women. Steinerova and Susol's study (2007) should be treated with caution, however, as only 16% of participants indicated they had internet access at home. Such low accessibility to the internet would have influenced participants' views on, and use of, the internet as an information seeking tool.

In research on the differences between searches conducted on the internet and the deep web (library databases), there were only small differences "between the choice of search sources and the grade of satisfaction with these sources" in relation to gender (Maghferat & Stock, 2010, Conclusion section, para.1). In contrast to this, Halder, Ray and Chakrabarty (2010) investigated the role of gender in information seeking in four Indian universities with regard to information seeking for study. They discovered that women scored higher in all seven identified domains, except for that of diversity in search. Although the internet was listed as a source in the questionnaire there was no other indication of use of electronic resources so the study has some limitations for my purposes given that New Zealand students are studying in a highly digitised environment.

The influence of work on research behaviour. One of the major changes to the tertiary environment in the last 20 years has been the massification of education. The greater availability of higher education has changed the profile of the typical student; a student is more likely to be working and studying. James (2007) reported that 42% of part-time students in Australia were working at least 38 hours per week; that is, full-time. While the high numbers of hours worked will impact on a student's capacity to study, there has been little research into the impact of work on academic achievement. Despite this, time has been found to be a significant constraint for many students (Barrett, 2005; Education for Change Ltd, 2009; Hoffman, Antwi-Nsiah, Feng, & Stanley, 2008; Prabha, Connaway, Olszewski, &

Jenkins, 2007). Time has also been the element in a student trait called satisficing. "When individuals satisfice, they compare the benefits of obtaining 'more information' against the additional cost and effort of continuing the search" (Prabha, et al., 2007, p. 76). In other words, they make do with what they have, whether or not this represents the best that could be obtained.

The influence of online learning on research behaviour. Students studying at a distance, or studying *flexibly*, continue to make up greater proportions of the student body (Kim & Bonk, 2006). The literature indicates that the information seeking behaviour of distance or flexible students is not markedly different from that of other students. Two studies have explored the information seeking of graduate **education** students (Liu & Yang, 2004; Malki, 2005). Both of these US based studies which involved 164 respondents came to similar conclusions. Malki found that students preferred to use course materials or the internet, and Liu and Yang discovered that the internet was the primary means of finding information for study. Both studies found that the primary driver for internet use was speed, convenience and ease of access. "The principle of least effort translated into their preference for online information source support and geographical and temporal convenience" (Liu & Yang, 2004, p. 34). Library databases also played a role in distance students' information seeking but these sources were secondary to the use of the internet.

The influence of information technology literacy on research behaviour. Information technology is a ubiquitous catch-all phrase that refers to the range of electronic technology necessary for students to use in relation to their study and their everyday lives. It encompasses mobile technologies (such as phones and tablets), computer applications (such as Word, Excel and PowerPoint), learning management systems, library electronic resources (including databases and e-books), email and, of course, the internet which includes social networking as well as searching. Recent large scale surveys of student use of information

have shown that use of new technologies amongst undergraduate students is widespread technology (Online Computer Library Center, 2010; S. Smith & Caruso, 2010). Graduate students use of information technology has not been subjected to the same degree of scrutiny, however a longitudinal study of Generation Y doctoral students (those born between 1982 and 1994) in the United Kingdom found that while over 90% of students had had exposure to web 2.0 technologies, most used it "passively" (Education for Change Ltd, 2010, p. 4); that is they were not creating content, but were reading blogs, wikis or internet discussion groups. Low or occasional use of microblogging (Twitter), e-readers, RSS feeds and podcasts by graduate students was also reported by a recent US study (Cassidy et al., 2011).

Despite the low use of emerging technologies, such as web 2.0 and social networking technologies, graduate students reported high levels of access to the internet from home (97% with broadband access), high ownership of computers (both PCs and laptops), mobile phones, and use of instant messaging (Cassidy, et al., 2011). The internet (Google and Google Scholar) was a key source of information and 69% of students found the information they sought in a full-text e-journal article (Education for Change Ltd, 2009). Neither Education for Change, nor Cassidy et al. investigated how skilfully students used information technology.

The skill of students in using information technology has been investigated by several researchers (Grant, Malloy, & Murphy, 2009; Perrett, 2004) who have reported that student perceptions of their skill often do not match their actual ability. Perrett found that more than half of the graduate students in an Australian university overestimated their skill in using word processing applications. The overestimation of skill was also noted in a study that compared business undergraduate students' perceptions of their computer skill in the use of word processing, presentation and spreadsheet software, with their actual skill. Grant, et al., reported that there were "some differences in the students' perception of their word

processing skills and actual performance, no difference in perception and performance for presentation skills, and a significant difference in perception and performance in spreadsheet skills" (p. 157).

Libraries demand significant levels of skill in the use information technology. Research has linked students' attitudes to computers to the well-known phenomenon of library anxiety (Bawden & Robinson, 2009; Jiao & Onwuegbuzie, 1998, 2002; Jiao & Onwuegbuzie, 2004; Jiao, et al., 2008; Katopol, 2005; Kuhlthau, Heinstrom, & Todd, 2008; Kwon, Onwuegbuzie, & Alexander, 2007; Onwuegbuzie & Jiao, 1998; Onwuegbuzie & Jiao, 2004). Library anxiety "is a type of anxiety which leads to a sense of powerlessness when beginning an information search in a library, and in feelings of being lost, unable to find one's way around, and afraid to approach the library staff." (Bawden & Robinson, 2009, p. 185). Jiao and Onwuegbuzie (2004) argued that it was not specific library technology that engendered feelings of library anxiety, but the students' relationships to computers generally. The results of this study should not be generalised, however, as the students were 94 African-American graduate students enrolled in a "black" college and university in the eastern United States. Given the comparatively high number of Pasifika students at my own institution, it would be interesting to discover whether ethnicity is an influence on information seeking patterns, and whether library anxiety is a feature for these students. Neither of these issues has been investigated in the literature.

The influence of search engines on research behaviour. The internet has been a pervasive influence on student information seeking and research behaviour almost from its beginning in the mid-1990s. My literature review has confined itself almost exclusively to literature written after this point because the impact of the internet, and subsequent changes to the way scholarly information can be accessed electronically, dates from this time.

The Google generation report sought to identify the information behaviour of the Google generation (those born after 1993) and to determine whether the way they were looking for information might influence their future behaviour as researchers (University College of London, 2008a). The report identified several trends which have been corroborated by other studies (Duke & Asher, 2012; Head & Eisenberg, 2009; Online Computer Library Center, 2006, 2010). Firstly, reliance on the internet (Google) as the first port of call was widespread – 87% of undergraduate college student information searches began with a search engine. Heavy reliance on Google was a feature from young school-age searchers through to doctoral students and researchers at the start of their academic careers (Education for Change Ltd, 2009; Haglund & Olsson, 2008). The reliance on the internet is a pervasive element which is repeated consistently throughout the literature. The effects on information seeking have been well documented, but what has been less well articulated is the effect on scholarship. Concerns have been expressed about the inability of younger internet users to accurately evaluate information but beyond that there have been no studies which have tried to connect the use of the internet as an information seeking tool with the **quality** of scholarship.

The influence of supervisors and librarians on research behaviour. Among the studies with graduate student participants, are a number which have examined the role that other people play in the student research process (Barrett, 2005; Education for Change Ltd, 2009; Fleming-May & Yuro, 2009; George et al., 2006; Haglund & Olsson, 2008; Junni, 2007; Vezzosi, 2009; Williamson, Bernath, Wright, & Sullivan, 2007; Wright, Williamson, Bernath, & Sullivan, 2005). Supervisors were found to have a pivotal role both in terms of guidance about research, especially in the early stages, but also as providers of information sources and as support in using technology such as research specific software (Education for Change Ltd, 2009; George, et al., 2006).

Peers also have a role to play, especially in relation to providing a forum where students can "bounce their ideas off other students," (Williamson, et al., 2007, Findings section, para. 8) and for the sharing of resources (George, et al., 2006).

Graduate students used librarians for support in the research process much less often than they used academic staff or peers. The low level of use of librarians has been a consistent finding in a number of studies (Barrett, 2005; Fleming-May & Yuro, 2009; Harrington, 2009; Randall, Smith, Clark, & Foster, 2008; Sadler & Given, 2007). Researchers have explained the low use of librarians by suggesting that graduates feel they ought to be independent and know how to use the information sources. A more likely explanation was that they were unaware of what librarians were able to offer them.

Student Approaches to Information seeking

For the purposes of my research the approach to information seeking was defined as both the sources students use to find information, and the strategies or behaviours students use to interrogate those sources.

Sources of information used by students. The literature suggests that the sources are mostly electronic – whether the internet or library databases. Many studies have noted the reliance of students at all levels on internet search engines, mostly Google (Baldwin, Gadd, & Balatsoukas, 2010; Education for Change Ltd, 2009, 2010; Fleming-May & Yuro, 2009; George, et al., 2006; Griffiths & Brophy, 2005; Head, 2008; Head & Eisenberg, 2009; Junni, 2007; Liao, Finn, & Lu, 2007; University College of London, 2008a; Weiler, 2004). In a recent publication, the Joint Information Systems Committee synthesized the findings of twelve recent studies which were "commissioned and/or supported by non-profit organisations and government agencies" in the United States and the United Kingdom (Connaway & Dickey, 2010, p. 1). The subjects of these studies were in the main academic

users – students and researchers. Google was found to be the key tool which was used to locate and access e-journal content.

The use of Google presents a challenge to academic libraries given their prominent advocacy of information literacy. Researchers have indicated that critical evaluation of internet information is a skill yet to be widely adopted by most student internet users (Griffiths, 2003; Gross & Latham, 2009; Junni, 2007; Metzger, 2007; Rowlands, et al., 2008).

The preference for Google and Google Scholar has been apparent even among doctoral students (Education for Change Ltd, 2010); 30% of students used Google or Google Scholar as their "main source of information used" (p. 15). Only eight percent said their institutional library catalogue was their main source. The Researchers of Tomorrow study is a key piece of research in the study of graduate students and how they manage the research process (Education for Change Ltd, 2009, 2010). Now, in its second year of a three year study, it is a useful benchmark against which to look at other studies of graduate information seeking. The limitation of the study is that it is only dealing with younger doctoral students; its strength is its currency, the fact that it is being undertaken in a jurisdiction similar to our own, it is geographically wide-ranging, and it is using a mixed methods approach.

In comparison to the Researchers of Tomorrow study in the United Kingdom (Education for Change Ltd, 2009, 2010), 100 graduate students (36% masters and 64% doctoral) from Carnegie Mellon University in the United States were interviewed about their research habits (George, et al., 2006). The participants were from a range of disciplines including sciences, humanities, engineering, computer science, business and arts. The study examined a number of aspects of the student research process – the influences of people, internet use, searching techniques, and library use of both printed and online resources. The findings reported that the majority of students (77%) described the internet as their primary

source for searching especially in the early stages. The main reasons for using the internet were convenience, speed and currency. Fifty-five percent of all students said the university library played an important part in their research. This was the same across all disciplines except for computer science. Ninety four percent used the library's online databases to gain access to online journals and full-text databases. However, 42% of these students reported that a lack of knowledge of existing resources hampered them in their information seeking often citing difficulties using the library website or specific databases. Use of the physical resources of the library was also high - 82% reported using books.

By contrast, Junni (2007) found that the internet was not the most popular way of finding information. She analysed 219 masters theses reference lists and conducted interviews with 48 masters students from two universities, one in Finland and one in Sweden. The students were studying in the fields of economics, psychology and mathematics. Citation chaining (following references from other publications) was the most popular method of finding information, especially at the beginning of literature searching. Citation chaining was no doubt carried out by means of library databases and the internet, but this was not made clear in the article; Junni appeared to use the generic term "internet" for both the WWW and for library databases, or access to library databases through the internet. Student use of "general search engines on the Web" (p. 9) was ranked seventh out of nine sources, a reason she attributed to information overload, and the difficulty of finding reliable scholarly information on the internet.

In an analysis of the reference lists of the theses from 1993 to 2003, Junni (2007) found the average number of references had increased, and noted that the percentage of scholarly journals referenced had increased from 23% in 1985 to 37% in 2003. The average age of references had decreased. While students used the internet to scope their field of study many did not end up using the internet search engine references in their theses, mainly Junni

surmised, because they had access to high quality, free academic literature through library databases.

Studies such as those of Education for Change (2009), George, et al., (2006) and Junni (2007) have reflected the findings that have also been reported by other researchers in recent years in regard to graduate students (Barrett, 2005; Fidzani, 1998; Fleming-May & Yuro, 2009; Gabridge, Gaskell, & Stout, 2008; Head & Eisenberg, 2009; Liao, et al., 2007). The internet has dominated the way students go about searching for information, including those students who are working at an advanced level. Internet use, nearly always Google, is the underlying theme which links all these studies. Google drives behavioural approaches to seeking information which is having far reaching consequences for academic libraries, with their heavy investment in scholarly databases. More and more libraries are investing time and resources into thinking about how their investment can be surfaced in internet search engines; library users are dictating through their usage behaviour how they want to be able to retrieve the information they need.

One issue still remains outstanding, however; increased usage of new technology has not improved information literacy (University College of London, 2008a, 2008b). Whether this continues to be an issue in the future is a moot point not raised in the current literature. It is possible that further changes in technology might mean that scholarly information may easily be able to be identified in general internet search engines. To a certain extent this is already happening with Google. Libraries are also attempting to create *metadata* for their material which will allow search engines to pick up their information. Changes in the scholarly communication process may also mean that in future more is published in open access fora, although the move towards this has been slow.

Online searching behaviours of students. Digital access to information is the norm, whether through Google or library databases. The Google effect has made its presence felt not just in the macro picture, but also in the minutiae. Several studies have delved into the exact nature of student behaviour when using digital sources (Heinstrom, 2006; Nicholas, Huntington, Jamali, & Dobrowolski, 2007; University College of London, 2008a; Williams & Rowlands, 2007).

Browsing has been a feature of information seeking for many years, and is, according to Case (2008) "the central (and oldest) concept among a variety of terms used to denote informal or unplanned search behaviours" (p. 89). In more recent times it has been associated with information seeking patterns related to digital information. Marchionini (as cited in Choo, et al., 2000) developed an electronic browsing model which consisted of eight processes. However, the model is somewhat linear and does not take account of the peripatetic nature of much online browsing which has been noted by more recent studies (Heinstrom, 2005, 2006; Nicholas, Huntington, Jamali, et al., 2007). As part of his model of information seeking behaviour Ellis also identified an activity he called browsing – "semi-directed searching in an area of potential interest." (2005, p. 138). Neither Marchionini nor Ellis provided examples of what browsing looked like in practice; that has been left to studies which have been based on the analysis of log data from specific databases (Asunka, Chae, Hughes, & Natriello, 2009; Kim, 2009; Nicholas, Huntington, & Jamali, 2007; Nicholas, Huntington, Jamali, Rowlands, & Fieldhouse, 2009; Nicholas, Huntington, Jamali, & Watkinson, 2006; Nicholas, Rowlands, & Jamali, 2010; University College of London, 2008a, 2008b; Warwick, Terras, Galina, Huntington, & Pappa, 2008).

The study of log data, files which show the requests made by individuals to a server, have shown how information technology has brought about a change in information seeking behaviour. The change has moved from directed and targeted searching e.g. using citation

chaining, following up on specific authors or titles, to browsing, searching, surfing and bouncing (briefly visiting a site and then bouncing out). The log data studies of the previous paragraph have allowed researchers to determine particular types of searching behaviour in relation to digital databases. The usefulness of the log data studies is that they provide evidence of actual behaviours, not reported behaviours. The Google generation report identified characteristics of web searching in young people. "In general terms this new form of information seeking behaviour can be characterised as being horizontal, bouncing, checking and viewing in nature" (University College of London, 2008a, p. 9). The Google generation study, and the part of it that specifically investigated student information seeking (University College of London, 2008b) identified a number of online behaviours. Firstly, the "bouncing" behaviours noted in the Google generation also applied to students, and to academic staff. "Everyone exhibits a bouncing/flicking behaviour, which sees them searching horizontally, rather than vertically" (University College of London, 2008b, Conclusion section, para. 1). Users of academic sites might only view one or two pages and then bounce out and never return.

Nicholas, et al. (2007) discussed bouncing behaviours in both positive - "sophisticated forms of behaviour where the users know precisely what they want" (p. 1101) and negative terms - a "neutral form of behaviour adapted to instant access, huge digital choice and the ease with which users can move across the information landscape" (p. 1101). It is clear that the authors felt uneasy with the outcomes of bouncing behaviour even though they were unable to definitively identify why people indulged in it. There were indirect remarks about "citizens being overwhelmed by digital information" (p. 1100) and there were concerns around "digital inequalities' (p. 1101), but in the end the authors were unable to be prescient about the likely impact of such behaviour.

Aside from bouncing and flicking, other kinds of searching behaviours have been identified. In a survey of 305 masters thesis students, Heinstrom (2005, 2006) found three main types of searching technique. Students were either fast surfers, broad scanners or deep divers. The fast surfers "skimmed the surface of the information wave" (2005, p. 239) and wanted information quickly and effortlessly, seldom exploring the quality of the information. They were the "satisficers," happy to get the job done quickly and with the least amount of effort (Case, 2005; Connaway, Prabha, & Dickey, 2006; Prabha, et al., 2007). The broad scanners searched in a wide range of sources often in an unstructured way and were likely to find information serendipitously (A. Foster, 2003). Deep diving students wanted "quality rather than quantity" (Heinstrom, 2005, p. 242), used precise searches and searched in reliable sources. What cannot be ascertained from Heinstrom's article is what proportion of the 305 students fitted into each category. Much of the literature has suggested that many students are fast surfers so it would have been useful to have known what proportion of the masters students fell into this category.

Research Capabilities of Students

However much discussion has taken place about the mechanics of what students do when they are looking for information for their studies, there is an equally important aspect which tends to find more of a home amongst the library and information science literature than elsewhere. That is the concept of capability or competence – just how good are students at finding the information they need and how do they manage that information?

In 2001 Marc Prensky coined the term "digital native". By this he meant the generation of young people who had been born and brought up under the umbrella of the technological revolution. These young people, he argued, were fundamentally different to the generations that had gone before them, the "digital immigrants." The digital natives' use of technology defined their relationships with the world and impacted on the way they thought and behaved,

and even, he surmised, changed the ways their brain worked. It was no surprise then, that it was argued that the digital natives' facilitation with technology also affected their ability to find and use information in a fundamentally different way to their predecessors.

Recent studies have questioned Prensky's assumptions that familiarity with technology necessarily flows through into expertise in digital information seeking (Kennedy, Judd, Churchward, Gray, & Krause, 2008; Oblinger & Hawkins, 2006; University College of London, 2008a). "There is no evidence in the serious literature that young people are expert searchers, nor that the search skills of young people has improved with time" (University College of London, 2008a, p. 22). Some of today's graduate students may well be digital natives but the research indicates that there are gaps in students' abilities not just in finding information, but in evaluating and critically appraising the information they have gathered.

Online searching capabilities of novices and experts. Since the online environment is the place where most students find the information they need, their capability in terms of using online sources is essential in dictating how effective or successful they are in retrieving what they need. There is a body of novice-expert literature which relates to online retrieval, some of it related to the internet and some related to scholarly databases, or both. The literature on novice-expert searching outlines the characteristics of each group. Experts usually formulate longer queries than less experienced users, they use Boolean operators, and are likely to make successive searches when the information is not immediately found. Most importantly, they plan their searches (Aula & Nordhausen, 2006). Novices avoid the use of complex searches, or the use of advanced search options, and have "no overall strategy for their information search and showed no consideration of a structured approach to searching using pre-defined keywords" (Baldwin, et al., 2010, p. 20). Novices frequently use the back key and use fewer numbers of search engines (Tabatabai & Shore, 2005).

In a model of web searching the key difference between novice and experienced searchers was found to be in the planning (Navarro-Prieto, 1999). Three general patterns of web searching were identified, a top-down approach, a bottom-up approach and a mixed strategy. The top-down approach involved searchers searching generally and then using the links within the search results to narrow down the search – a sort of scattergun approach and generally not very efficient. The bottom-up strategy was where searchers used keywords they already had access to, such as those they might find in an assignment topic. This approach was used by more experienced searchers who were more focused on finding facts. The mixed strategy was a combination of both conducted at the same time, often with multiple windows open. Again, this was a strategy used by experienced searchers.

Another model of information search expertise was identified in a yearlong study at the University of Hong Kong which involved 12 graduate students, including two masters students (Chu & Law, 2008). The model identified four stages of information search expertise moving from Novice through to Proficient. This progression was, however, only achieved after "tailor-made and systematic training" (p. 168) over the course of the year. Expertise was not attained through familiarity or use, but through instruction.

While not discussing the literature in terms of novices or experts, Markey (2007a, 2007b) defined the characteristics of typical online searches when she reviewed 25 years of published research findings on searching online systems. While she did not focus exclusively on the academic use of online systems, much of the literature came from that domain. Most online searchers expressed high levels of user satisfaction; they used a few short search statements (two to four words) or searches that were "syntactically naive and limited in scope" (McKay & Buchanan, 2011, p. 260). Few searchers used the advanced features of an online system, or made use of Boolean operators. Failed searches were due mainly to the

poor choice of search terms. The use of a controlled vocabulary to assist searching, or any other indication of a plan for searching was rare.

The nature of typical searches was also examined by McKay and Buchanan (2011) who compared searches done in a library catalogue, an online research database and Google Scholar. They examined 3,743 searches over two selected days at Swinburn University of Technology in Australia. They found that the most popular searches were for titles, authors and keywords. Searches were unsuccessful because of typographical errors, because a searcher entered the entire citation into a search box, or because the source they were looking in did not contain that particular type of information. McKay and Buchanan did find, however, that searchers made adjustments to their search strategies according to what source they were using. "This suggests that rather than being purely naive, searchers tactics are rather parsimonious, a result previously only seen in domain experts and expert searchers" (p. 269).

Self-efficacy and student online searching. Much has been written about the role of self-efficacy in learning since Bandura (1997) first introduced it as part of his social cognitive theory. Self-efficacy represents a notion of competence as well as a belief in being able to perform an action in any specific context (Holden, Barker, Meenaghan, & Rosenberg, 1999). The belief is not related to actual skill level, but to perceived skill level and contributes to an individual's ability to persevere and to focus on tasks. It also increases motivation which influences performance or achievement.

Student self-efficacy in relation to online searching, involving both undergraduate and graduate students, has been examined by researchers (Monoi, O'Hanlon, & Diaz, 2005; Nahl, 2004; Nahl & Tenopir, 1996; Peng, Tsai, & Wu, 2006; Ren, 2000; Waldman, 2003). A link between information retrieval failure and low self-efficacy was discovered by Ford, Miller

and Moss (2001) in an investigation of the individual differences in internet searching of 64 masters students. This reinforced the findings by Nahl and Tenopir (1996) which indicated that higher self-efficacy affected the efficiency of the search. Frequency of use of library electronic resources was also associated with higher levels of self-efficacy (Ren, 2000).

Student belief in their ability to successfully find information for their study was tested by Perrett (2004). Doctoral and masters students rated their own ability to find information and were then asked questions to determine if their self-assessment was correct. In both database and web searching, Perrett discovered that just over 50% of students correctly assessed their own abilities - 55% in databases searching, and 53% in web searching. For nearly half the students, however, their perception of their ability to find information did not match reality.

In a similar study, Gabridge et al. (2008) asked graduate students how successful they thought they were over a range of tasks and then reviewed the efficiency of their performance using an expert interviewer. Graduate students rated themselves 86% **successful** in searching for a known item, and the expert interviewer agreed and rated them 86% **efficient**. However, while 80% of students felt they were successful when asked to search for information on a topic using keywords, they were only rated 40% efficient by the interviewer.

The theme of over confidence in the ability to find information has been noted elsewhere. Sieber (2009) found an "absence of relationship between self-evaluation and objective testing" (p. 224), when she examined the perceptions of medical students about their IT skills, and Hargittai and Shafer (2006) noted that simply having access to the internet was not "coterminous with effective use" (p. 444).

Student capability in managing information. Managing information is also an aspect of the information literate student. The literature on the topic of managing personal information for study suggests that this is mostly poorly done. Students have poor "mental

maps of their research data, which are necessary for it to be structured and organised in an orderly fashion" (Genoni & Partridge, 2000, p. 227). Their inability to conceptualise where individual pieces of data fitted with the whole and the poor indexing of the information meant that often a particular piece of information could not be retrieved again, even though the student knew they had it somewhere.

In supporting the findings of Genoni and Partridge (2000), Williamson, Bernath, Wright and Sullivan (2007) found that although more students were using electronic tools for managing their information than in Genoni and Partridge's study, "they were not always aware of the full capabilities of the software." (p. 59). At the University of Rochester graduate students expressed difficulties managing drafts and versions, synching drafts between multiple computers, and keeping files and drafts backed up (Randall, et al., 2008). Many students still printed out their information which compounded the problem as there were both electronic and print versions which had to be managed.

Effectiveness of Student Information seeking and Information Management

While self-efficacy can enhance student perceptions of success, it does not determine whether students are effective either in their information seeking or other aspects of the research process. Though students often expressed confidence in their ability to find what they needed for their study, there were a number of factors which seemed to challenge their effectiveness. The factors considered here are students' ability to find full-text, information overload and the evaluation of online sources.

Effectiveness in finding full-text documents. In the United Kingdom a JISC commissioned study of 429 undergraduate students attempted to discover how research content was discovered, accessed and used by students for their studies; it also asked students what problems they encountered in using research in their learning (Hampton-Reeves et al.,

2009). One of the problems students had was in getting access to the full-text of online material. Gaining access to the actual content is one of the most basic measures of information retrieval effectiveness. Difficulties in finding the full-text of articles were also noted by Cockrell and Jayne (2002) in their web usability study, and by Hoffman, Antwi-Nsiah, Feng and Stanley (2008). Students, both undergraduate and graduate, showed confusion about where to look for articles through their library website, many trying to locate articles in the library's catalogue. The researchers also noted that students tried to use their internet searching habits when they wanted to search the library databases; they were impatient when an "improperly constructed search" (p. 129) returned no results, were inclined to give up easily and did not do simple things such as "scrolling down to information that was displayed lower on the screen" (p. 129). Dixon, Duncan, Fagan, Mandernach and Warlick (2010) showed the "circuitous path" (p. 177) that was typical of the trail students followed when they were unable to locate the full-text of an article in Google Scholar. The problems in finding the full-text have been linked to library web usability; studies have reported that usability features hinder the ability of students to easily access the information they need. Lack of effectiveness in searching may be caused as much by the system itself, as by students' inability to navigate the system.

Information overload and its relationship to effective searching. Information overload has been a recurring problem discussed in the literature (Case, 2008) and, in the digital environment, it has often been exacerbated by keyword searches. Most keyword searches are simple, unrefined and produce large numbers of results; effectiveness in searching would help to ameliorate information overload. Hampton-Reeves, et al., (2009) found:

> Users overwhelmingly use keyword searches to discover the existence of research content which are inputted into a mixture of tools usually including internet search

> engines, library catalogues and specialist subject databases... The biggest problem faced by users is the sheer volume of information available on most subjects... they do not have the skills to adequately assess and synthesise all the materials that they can find through a keyword search. (p. 46)

An investigation of Australian research students noted that in an environment where there was access to large amounts of information, students found it difficult to know when to stop looking for information, and were often unsure at what point this should happen (Williamson, et al., 2007). Some students used supervisors' guidance, or techniques such as re-finding information they had already found to indicate when they should stop.

Evaluation of information sources and critical thinking. The University College of London study (2008a) suggested that for the Google generation at least "little time is spent in evaluating information, either for relevance, accuracy or authority" (p. 12). Given the reliance on internet search engines by students, the ability to verify information for authority, currency and accuracy is an important aspect of effectiveness in the research process. There is very little literature which examines how, or if, graduate students evaluate online information. Some research (Grimes & Boening, 2001; Head, 2008) on undergraduate students has suggested "students have trouble evaluating information and do not have a critical attitude towards information on the WWW" (Walraven, Brand-Gruwel, & Boshuizen, 2009, p. 245). The OCLC study (Online Computer Library Center, 2006) found that 83% of students of students who evaluated an electronic source did so by using personal knowledge or common sense, in other words a purely subjective criterion. This finding was not supported, however, in a large study of nearly 8,500 undergraduates which found that over three quarters (77%) of students used currency as a criteria, 73% used the author's credentials, and 71% used the URL or web domain for evaluating web content for their course work (Head & Eisenberg, 2010). Slightly lower percentages (67% for currency and

40% for author's credentials) were used by students when evaluating library sources whether print or online.

When Laverty, Reed & Lee (2008) examined the web evaluation strategies of 254 pre-service teacher trainees they found:

> evaluation criteria were not applied consistently or even critically. Less relevant sites were selected when others could not be found. There was a marked preference for sites that provided point-form or brief information. Sites that met critical website criteria but did not provide immediate full text, such as a link to a scholarly journal or professional journal article that could have been checked in the library catalogue, were not pursued." (Discussion section, para. 1)

Graduate students "often expressed a certain wariness of materials found on the net" (Wright, et al., 2005). While some students were confident enough of their own subject knowledge to dismiss the unreliable information, others were uncritical of material found on the internet and tended to think all of it was "valid" (p. 148). The researchers concluded that "research students with well developed information technology skills do not always have the necessary expertise and confidence in finding, evaluating and managing information, nor do they always recognise their lack of expertise" (p. 150).

A number of researchers have commented on the failure of students to recognise their own lack of expertise, or on the over-estimation of their search skills (Fast & Campbell, 2004; Gabridge, et al., 2008; Perrett, 2004; Weiler, 2004). The ubiquity of the internet and the fact that it is used in so many spheres of students' lives seems to have engendered high levels of self-efficacy. Students have transferred what they know about information seeking from their personal lives into their lives as students and this has "altered the way students read research content" (Hampton-Reeves, et al., 2009, p. 8), and not for the better. Many studies have noted the impact on critical thinking that internet use produces (Alexander,

2010; Heinstrom, 2005; Moon, 2005; Rowlands & Nicholas, 2008; Rowlands, et al., 2008); there has been a move from "depth of reading to width of reading" (Hampton-Reeves, et al., 2009, p. 8) which is "detrimental to [the] critical use of research" (p. 10).

The critical use of online information, especially in regard to the internet, has been investigated in terms of students' epistemological beliefs (Hofer, 2004; Mason & Boldrin, 2008; Mason, Boldrin, & Ariasi, 2010; Strømsø, Bråten, & Britt, 2011; Whitmire, 2003, 2004). Whitmire found that "more advanced epistemological believers were better able to evaluate information sources and recognize authority" (p. 109), however Hofer's research made it clear that "students appear to have very limited understanding of how knowledge in a field evolves, what counts as authoritative, and why" (p. 54). Hofer found that few students understood the peer review procedure or how to "independently determine criteria for knowledge validation" (Mason & Boldrin, 2008, p. 386).

Conclusion

While demographic influences such as age, gender, work and distance have impacted on information seeking and the research process, overall these variables have been subsumed by the pervasive use and influence of the internet. The literature has suggested that the internet has not only influenced information seeking, but that it might also be influencing how students use and analyse information for their studies. The internet is the elephant in the room of academic scholarship, and despite the large number of studies which have examined its use by students, none have examined how use of the internet impacts on the quality of student output. Even those studies which have analysed citations have been used only to support collection management practices of libraries (Kushkowski, Parsons, & Wiese, 2003).

Alongside the internet, supervisors have been found to have an important role for graduate students both in terms of sources of information and academic mentoring. Librarians have played a very limited role in the graduate research process.

There have been questions raised about student capability and effectiveness. Although many students expressed satisfaction with their information seeking abilities, there is evidence that the way they search induces a surfeit of responses (information overload) and that they have poor mental models of both the information landscape generally and the retrieval systems in particular. In addition to this, studies which have looked at how students manage the information they so easily acquire, have suggested that many students are operating at a baseline level.

Overall, much of the international literature on student information seeking and research has presented a remarkably coherent picture. However, it is not known whether this picture is represented in New Zealand. It has been suggested that the teaching and student support offered by academic libraries in New Zealand (and Australia) is somewhat different to that in other jurisdictions; that there is far more integration of student research skills into the curriculum (Creagh, 2011). If this is the case, it would be expected that New Zealand students would not be following the patterns that have been found in the literature. My research seeks to prove whether this is the case or not, by examining the influences on student research behaviour, the approach (information sources and online strategies and behaviours) students take to information seeking, and by examining their capability and effectiveness in relation to finding, managing and evaluating information.

Chapter 3: Methodology

Specific Aims of this Research

This research project focused on the information seeking and research behaviours of masters education students. It started out as a simple desire to know whether the trends reported in the international literature on student information seeking were reflected in the New Zealand context and developed into a broader inquiry which investigated graduate student capability and effectiveness in the areas of online searching, information management and evaluation of information.

A major part of my research has concentrated on the way students use online sources of information. The University of Auckland Library has subscriptions to over 800 databases online, more than 87,000 journals. Given the high cost of subscriptions it was an opportunity to assess whether, and how, the databases and e-journals were being used. There is evidence that even early stage scholars – PhD students, early career academics – rely heavily on Google (Education for Change Ltd, 2010; Fleming-May & Yuro, 2009; Haglund & Olsson, 2008), so my research was trying to ascertain whether masters students followed the same pattern.

My research questions, however, directed my investigations not just to what sources students used, but also to how skilfully they searched. Part of my hypothesis surmised that demographic variables such as age, gender, full-time or part-time status and whether students were mainly on or off campus might impact on student use of online resources. The questions my research seeks to answer are:

- What influences the research behaviour of education masters students?
- How do masters students approach information seeking?

- How capable and effective are masters students in the way in they find, manage and evaluate information?
- What difficulties do masters students experience in the research process?

Finally, I wanted to get an impression from the students about how successful they thought they were and to ascertain from the data collected whether their perceptions were supported or otherwise. At the end of the research I wanted to evaluate library support to masters students and, if necessary, make changes to that support based on the evidence of my findings.

Mixed Methods Research

Like the theoretical background of information seeking, the philosophical foundations of mixed method research (MMR) are complex. Although the antecedents of MMR hark back to the 1950s, it is generally accepted that the beginnings of MMR arose in the 1980s (Creswell & Plano Clark, 2011). Mixed methods research has not been without its critics, but at its core it is "premised on the idea that the use of quantitative and qualitative approaches in combination provides a better understanding than either approach alone" (Cresswell & Clark, 2007, p. 18). Despite the apparent commonsense of this, the paradigmatic debate has been anything but straightforward.

MMR has been largely dominated by the so-called qualitative-quantitative debate running from the mid 1980s until the late 1990s. This was because there seemed no real way to reconcile the difficulties of using differing methods within one study given that "the various methods are linked to different inquiry paradigms" (Greene & Caracelli, 1997, p. 7); philosophically there seemed no way to "fit" mixed methods into existing conceptions.

By 1997 Greene and Caracelli had proposed the dialectical position which essentially argued that it was time to retire the qualitative-quantitative debate and recognise that the

various paradigms had their own merits which could and should not be "reconciled" (p.7). There was a way each could create "a dialectical discovery of enhanced understandings, of new and revisioned perspectives and meanings" (p. 7).

Latterly, Tashakkori and Teddlie (2010), in an overview of contemporary issues in MMR, distilled nine different characteristics of MMR from contemporary writing. They drew together the philosophical viewpoints of commentators over the past ten years. One of the characteristics of MMR is methodological eclecticism – " selecting and then synergistically integrating the most appropriate techniques from a myriad of QUAL, QUAN and mixed methods to more thoroughly investigate a phenomenon of interest" (p. 8). Another characteristic is paradigm pluralism – "the belief that a variety of paradigms may serve as the underlying philosophy for the use of mixed methods" (p. 9). Finally, there seemed to be a rational solution to the paradigm conundrum, not withstanding that Tashakkori and Teddlie make it clear that their characteristics only "represent a place to start the dialogue" (p. 8).

A mixed methods project was undertaken for this research project because a quantitative approach alone would not reveal enough about the intricacies of individual information seeking. From the outset of the research I decided that further elucidation of the quantitative data would best be obtained by semi-structured interviews.

While MMR within the field of education is not uncommon, within the field of library and information science, it is comparatively rare. Fidel (2008) examined 465 articles published in four journals which were "prominent, well-established, international in scope and general in their coverage" (p.268) between 2005 and 2006. Of the 465, only 39 used both qualitative and quantitative methods, and of these, only 22 (5% of the total) met the criteria of quantitative/qualitative integration. Fidel explained this on the basis that

researchers either did not need to use MMR or (more disconcertingly) that they did not know about it.

The 'what' and 'how' of the research questions (What influences the research behaviour of education masters students? How do master students approach information seeking, and how capable and effective are master students in the way they find manage and evaluate information?) pointed to the need for more than one kind of approach. The questionnaire was primarily designed to elicit the factual details of information seeking, whether that be ascertaining skill levels, determining frequency of use of resources, or gathering information related to information searching and evaluation of resources. The purpose of the interview was to elaborate on aspects of the questionnaire but it was also designed to elicit how motivation and affect might impact on the way individuals looked for information.

Research Design

Approximately 40 MMR designs have been identified in the literature (Ivankova, Creswell, & Stick, 2006). My research intersects both the field of educational research and that of library and information science and uses a mixed methods approach, specifically a mixed methods explanatory sequential design (Creswell & Plano Clark, 2011).

The features of an explanatory sequential design are a quantitative phase followed by a qualitative phase, the latter being used to inform, explain and elaborate on, the former. The design is generally held to be "straightforward to implement" (Creswell & Plano Clark, 2011, p. 83), but has the disadvantage of requiring more time to execute due to the sequential nature of the data collection.

The quantitative stage is recognised as being the more significant using the explanatory sequential design. The connection between the two processes occurs in the period of time

between the data collection from the quantitative phase, and the data collection of the qualitative phase, and in the subsequent analysis and drawing together of the findings. The rationale for this method of research is that the quantitative data allow for a general exploration of the question of how graduate students seek and manage information for their studies, and the qualitative data enable specific aspects of that information to be explained. In my research the aspects that were explained, or examined in more detail, were the use of search terms, how students tracked further information, issues around information management, the need for ongoing or further training, and some of the affective aspects of information seeking such as resilience and perceptions of success.

The Research Instruments

Two research instruments were used in my study. A postal questionnaire (see Appendix A) was followed by semi-structured interviews (see Appendix B).

Design of the questionnaire. The questionnaire was designed to elicit responses which would help answer the general research question: What influences the research behaviour of education masters students? Much recent literature has focused on the impact of the internet, particularly Google, on academic research and part of the questionnaire was designed to find out whether this was a dominant feature of information seeking for New Zealand postgraduate students.

Nine of the 21 questions asked for demographic information and required respondents to select the correct value which related to their age, gender, period of time since last study, year of masters study, full-time or part-time status, on campus status, the name of the degree they were studying towards and the place where they did most of their study.

One question asked respondents about their overall technology use. A seven point Likert scale (with values from *Never* to *Daily*) was used to determine how frequently

respondents made use of a range of information technologies (13 variables) such as mobile phones, email, text messaging, internet, spreadsheets and social networking sites. The purpose of this question was to gauge the extent of use of technology for work, study and recreation, on the assumption that the more often respondents used technology in their everyday lives, the more likely they would be to feel comfortable with the use of information technology for their studies. A positive response to information technology use was important to establish because most research behaviour is dominated by the use of online resources.

Two questions centred on the ownership and possible uses of handheld internet capable devices. Respondents were asked to choose a single response option for ownership. If they owned such a device they were asked, in a range of response options, what possible library-related functions they would use. The aim of the question on usage was to ascertain whether there was interest from students in being able to access some library services through mobile devices.

Respondents were also asked to rate their skill in using information technology systems related to their study –student IT systems, the library website, use of databases, the internet and bibliographic management tools such as EndNote. A five point Likert scale with response options from *Unskilled* to *Very Skilled* was used. There was also a *Do Not Use* response option. The skill question was a key question in demonstrating student self-perceptions of their skills using information technology. Another question in the questionnaire also asked students whether they usually found what they were looking for; students were asked to answer the question with a response option range from *Never* to *Always.* The significance of this question was that it was designed to show how successful students thought they were in their information seeking. In addition, respondents were asked what they did with information once they found it. There were 11 variables which included

options such as *read online, borrow from the library, print out, download, add to an electronic reference list*. Students were asked how frequently (a five point Likert scale from *Never* to *Always*) they performed these actions. This question was asked, in part, to help ascertain the levels of sophistication of information handling.

Two questions asked respondents to think about the strategies they used to find electronic information, and how they evaluated information they found online. Respondents were given choices for the strategies they used for online searching (eight variables) and for how they evaluated online information (13 variables). Each question was a five point Likert scale ranging from *Never* to *Always*. There was also a *I am not sure what this means* response option for each question. Four experienced subject librarians were also asked to rank the options presented to the respondents and their responses were contrasted with those of the students in relation to online searching strategies and online evaluation of information.

The last question was designed to probe the difficulties students experienced in their information seeking and in the research process. The question was worded slightly differently for taught and research students, on the basis that there might have been differences in approach between those working on an assignment (a directed task) and those working on a dissertation or thesis (a self-chosen, self-directed topic). The variables were framed in terms of a difficulty response, ranging from *Difficult* to *Very Easy*. Taught students were asked to respond to 11 difficulty statements and research students to 12 statements (see Table 1). Seven of the statements were the same for both groups and the remainder were specific to the group. The common variables asked about difficulties in selecting keywords, deciding which sources to use, searching the library catalogue and databases, finding full-text items, managing the results of searches, using correct referencing, and writing in an academic style.

Table 1

Statements Indicating Degrees of Difficulty in the Research Process

Statement It is difficult when:	Taught students (*n*=22**) and** research students (*n*=36):
	I have to select the keywords and vocabulary to use in my searching
	I have to decide which research tools I should use
	I need to search the library catalogue and databases
	I have to find the full-text of an online item using the library Catalogue or databases
	I need to evaluate resources/search results
	I need to manage the results of my searches
	I have to write using correct referencing & avoiding plagiarism
	I have to write in an academic style
	Taught students only:
	I don't have enough information from the lecturer
	I have to figure out what each lecturer wants
	I have to narrow down a topic and make it manageable
	Research students only:
	I have to choose a topic and create the conceptual framework for my research
	I have to frame the research question
	I have to synthesize the information I have found into a cohesive argument

Administration of the questionnaire. A questionnaire of 21 items was sent to all 2010 education masters students enrolled at the Faculty of Education, University of

Auckland, in semester one (107 students). So that the questionnaires could be posted out I requested permission from the Dean of Education (Appendix C) and the manager of the Education Student Centre (Appendix D) to access the database of student names and addresses. This process was explained to participants in the Participant Information Sheet (PIS) (Appendix E).

A reminder letter was sent out two weeks later. Included with the questionnaire was the PIS, and an additional document which students were asked to fill out if they were prepared to participate in a follow-up interview (Appendix F). Participants were then asked to return the questionnaire and the willingness to participate document in a stamped addressed envelope which was supplied.

Postal surveys were used as the means of collecting the questionnaire data. The decision to use post was based on my perception, gained through teaching a number of library skills classes to postgraduate students that many of the students would fall into the older age group and would not be so comfortable with an online survey. As it turned out, many of the respondents did fall into the older age group, although unfamiliarity with technology was not an issue. The decision was also based on my supervisors' experience. Both supervisors had had experience with online and postal surveys, and they felt a postal survey might garner more responses. This view was supported by researchers such as Mavis and Brocato (1998), and later Nulty (2008), who consistently found a higher response rate to paper course evaluations than online ones. This is interesting because in the 10 years between Mavis and Bracato's study and that of Nulty, one would have expected that attitudes towards electronic surveys would have changed, given the ubiquity of information technology in everyday life. Shih and Fan's (2008) meta-analysis of 39 studies compared response rates from both electronic and paper surveys, and concluded that paper surveys still had a consistently higher response rate, especially amongst groups such as doctors and teachers. In all, 58 responses

(54%) were returned. This percentage is over the 48% norm for students found by Green (1997) in her meta-analysis of mail survey response rates.

On receipt of the surveys a research assistant opened the envelopes, numbered them and separated the surveys from the willingness to participate forms, thus ensuring the anonymity of the participants. At the same time on the reverse of the willingness to participate forms the research assistant noted demographic data such as age, gender, first language, time since last study, full-time or part-time status, number of times on campus, and the type of degree being studied. The survey responses were then entered into PASW (SPSS v.18) for statistical analysis. I confirmed the accuracy of the data entry (which had been entered by a third party) by checking just over 20% (n=12) of the questionnaires. Much of the raw data was clean. There were few instances of incomplete or ambivalent responses. Where questions were not answered, the decision was made to leave these values blank.

The questionnaire sample. Fifty-eight students responded to the questionnaire. Over 86% of the respondents were female and more than 69% of them were aged 40 and over. They were homogeneous in their first language – nearly 93% stated that English was their first language. Generally, the respondents were older, female and spoke English; as can be seen from Table 2, students who did not speak English as their first language, did not participate in the questionnaire.

Table 2 shows the demographic characteristics of the questionnaire sample and compares that to the total masters cohort in five of the sixteen variables. It should be noted, however, that the total masters cohort statistics were not available until semester two by which time the composition of the cohort had changed slightly – it had dropped to 102 students.

Table 2

Demographic Characteristics of Respondents to Questionnaire and Total Masters Cohort

Demographic	N=	% respondents to questionnaire	% total masters cohort
Female	50	86.2	72.5
Male	8	13.8	16.6
Age 40 years and over	40	69	60.6
Age under 40	18	31	39.1
English as first language	52	92.9	73
Last studied 6 years or less	50	90.0	
Last studied 7years or more	5	9.1	
Full-time	20	34.5	
Part-time	38	65.5	
Ist/2nd year of masters	36	62.1	
3rd/4th year of masters	22	37.9	
On campus	13	22.4	
Off-campus	45	77.6	
Master of Educational Leadership	1	1.7	
Master of Professional Studies	13	22.4	
Master of Education	44	75.9	

Most respondents (76%) were studying for the Masters of Education, 22% were studying the Master of Professional Studies and 2% the Master of Educational Leadership. Degrees can be undertaken as either as a taught papers only option, taught papers with a 60 point dissertation, or a 120 point research masters thesis. For the purposes of this thesis those studying only by taught papers were designated as taught students, and those undertaking

papers with a dissertation, or a thesis were designated as research students. Table 3 shows the percentages of taught and research students.

Table 3

Percentage of Taught and Research Respondents to Questionnaire

	% Taught students	% Research students
2010 Masters cohort (*n*=107)	34.5	63.8

Most respondents indicated that they were studying part-time (66%) and 78% were only on campus once a week or not at all. Sixty-nine percent of the respondents indicated they had last studied at a tertiary institution within the last one to three years or were currently studying. In summary, the respondents were mostly studying part-time and had limited time on campus. Of the 48% who indicated they were on campus once a week, it is assumed this was because they came in for lectures once a week. Clearly most students were working as teachers and managing their studies. Most of them were familiar with the university environment and indicated they had studied in the recent past, or were continuing their studies.

Design of the interview schedule. During the ethics process a list of indicative questions was submitted to the ethics committee. Many of the original questions were retained, but several new questions aimed at discovering how resilient students were in online searching and some further exploration around aspects of the research process were incorporated.

The interview questions related to:

- Embellishment of the information seeking process – in particular influences on information seeking, be they people or other demographic influences such as distance. There were questions which asked participants how they tracked further information, how they decided which search terms to use and what made them stop searching. Participants were also asked what their preferred first source was, and what the easiest source was for them to use.
- Affect. This was linked with issues of resilience. How did the participants feel about the process of finding information – was it 'easy', how long were they prepared to keep looking? How successful did they think they were in their information seeking and how effective did they think they were?
- Managing information. Participants were asked how they managed the information they collected; did they have a system or use a bibliographic citation manager such as EndNote? If not, why not?
- Training – did participants feel they needed more training in finding and managing information? If so how would they like it delivered and when? Did they know about or use subject librarians?
- Evaluating information. Students were asked how they evaluated online information and whether they would use information from Google or Google Scholar.

Interview procedures. I conducted semi structured interviews of 50-60 minutes with six of the participants who had completed the questionnaire and indicated a willingness to be interviewed. The interviews took place in October 2010, 6 months after the survey had been sent out. Participants in the interviews signed a consent form prior to, or at the time of the interview (Appendix G). Five of the interviews were conducted in person at the library, and one interview of a distance student was conducted on the telephone. All participants received a copy of the interview questions at least a week prior to the interview.

Collection of interview data was carried out by means of a digital voice recorder. I also made brief notes during the course of the interview. The digital data was then sent to a third party, who had signed a confidentiality agreement (Appendix H), to transcribe.

The interview participants. The interview participants were purposively selected on demographic characteristics from a total of 26 people (just over 24% of those who had responded to the questionnaire) who had responded positively to a request to be interviewed when the questionnaire was sent out. The demographic characteristics for selection of interview participants are noted in Table 4.

Table 4

Demographic Information Used to Select Interview Participants

Age	Full-time or part-time	On or off campus
50+	Full-time	On
	Full-time	Off
	Part-time	On
Less than 39 years	Full-time	Off
	Part-time	On
	Part-time	Off

The six interview participants were chosen on the basis of age, whether they were full-time or part-time, and whether they were mainly on or off campus. Their ages ranged from 35 to 62 years. All spoke English as their first language. One participant was also a distance student being resident 125 kilometres from Auckland. Table 5 shows the demographic characteristics of the interview participants.

Table 5

Demographic Characteristics of the Interview Participants

Candidate	Age	Gender	Full-time/part-time	Degree	On/off campus
Anne	50	Female	Full-time	Master of Education Dissertation	On campus
Betty	62	Female	Full-time	Master of Education Thesis	Off campus
Carol	41	Female	Full-time	Master of Education Dissertation	On campus
Dee	39	Female	Full-time	Master of Education Thesis	Off campus
Ella	47	Female	Part-time	Master of Professional Studies Dissertation	On campus
Fiona	35	Female	Part-time	Master of Education Dissertation	On campus

All participants were female, but given that 73% of the total masters' cohort in 2010 were female, and that 86% of the questionnaire respondents were female this did not seem to be an aberration.

All of the participants were research students. None of them represented the 35% who had indicated in the questionnaire that they were undertaking a masters degree by taught papers only. All the interview participants were engaged in substantial pieces of empirical research, even though two of them would not be undertaking that research until 2011 i.e. up to that point in their study they had only completed taught papers.

Data Analysis

Mixed methods data analysis. Conventional wisdom (Sandelowski, 2000) suggests that data analysis in mixed methods research should be conducted separately. "Linking the results of qualitative and quantitative analysis techniques is accomplished by treating each data set with the techniques usually used with that data" (p. 252). They are "then combined at the interpretive level of research" (p. 252). More recently, however, Bazeley (2009) has commented on the trend of "integrating data specifically through analysis, rather than as a conclusion to analysis," (p.205) and cites 11 strategies used by mixed methodologists to achieve this. The change from integrating qualitative and quantitative studies at the "interpretive level" and integrating them at the analysis level has evolved because of a perception that it allows for more complex problem solving. In addition, "such integration encourages serendipity, stimulates theoretical imagination and initiates new ideas" (p. 205).

My study has not specifically integrated the data at the point of data analysis. Integration has been achieved primarily during the design and interpretation stages, although my research does conform to the sequential mixed model typology developed by Teddlie and Tashakkori (2009). Their model explained analytical integration in terms of a questionnaire, followed by interviews; most of Teddlie and Tashakkori's interview questions were developed a priori, however, analysis of the quantitative data did produce some additional interview questions, as was the case in my research.

It appears the issues surrounding integration in mixed methods are still fluid, and as Bazeley (2009) says "there is the simple need for 'ordinary' researchers to be prepared to fully use the opportunities for integration that their data present to them" (p.206).

Analysis of the questionnaire data. Exploration of the data began by examining frequencies to obtain information on the characteristics of the sample. In particular,

percentages were obtained for the categories within the demographic data. Age, for example, had four different response options and percentages were obtained for each of these. The demographic data related to the influences on student research behaviour. Because of unequal distributions, or small numbers, a number of variables were re-coded, specifically questions relating to age, number of times on campus, and time since last study.

Question 13, which related to student skill using information technology, had a response option, *Do not use*, which was not part of the Likert scale. Question 13 was re-coded to remove the effect of that response. Questions 17 and 18 had a similar value, *I am not sure what this means*. Both questions 17 and 18 were re-coded to remove the effect of that response. In addition, the key indicator question, question 15 which asked students how frequently they found what they were looking for, was re-coded into successful and unsuccessful students.

Means for each of the questions were established. The means of each variable was then compared with the demographic variables of age, gender, time since last study, full-time or part-time status, year of degree, on or off campus, and type of degree using analysis of variance tests. Finally, in the two questions relating to searching strategies and evaluation of online information, ranking by expert users (librarians) was compared to the ranking given by students (novice users).

Thematic analysis of the interview data. Participants were identified by the pseudonyms Anne, Betty, Carol, Dee, Ella and Fiona. Once data had been received back from the transcription agency it was entered into nVivo. The data was then coded under four major a priori themes relating to the research question – influences, approach, capability, and effectiveness.

Thematic analysis was the method used to analyse the qualitative data. It "involves searching across a data set...to find repeated patterns of meaning." (Braun & Clarke, 2006, p. 86). Thematic analysis best suited my research because much of what was being investigated had already been the subject of extensive inquiry by other researchers internationally (Newby, 2010) and many of the themes of my analysis were provided by the literature.

There has been controversy around the use of thematic analysis. Bryman (2008) makes the point that thematic analysis does not have "an identifiable heritage" (p.554) and that while many studies claim to have used thematic analysis it is not a clearly "identifiable approach" (p.554). As Bryman points out, it did not even merit a separate mention in the early editions of his book. Despite the debate, there are proponents that argue that thematic analysis should be considered a method in its own right (Boyatzis, 1998; Braun & Clarke, 2006; Fereday & Muir-Cochrane, 2006) so long as the analysis explicitly discusses the choices made by the researcher. In other words, there needs to be a degree of rigor in the analysis which includes explanation of the processes and more precision in the use of language (Braun & Clarke, 2006).

The analysis of my data was similar to that of Fereday and Muir-Cochrane (2006) who used a hybrid approach using both inductive and deductive approaches. "The primary purpose of the inductive approach is to allow research findings to emerge from the frequent, dominant or significant themes inherent in raw data, without the restraints imposed by structured methodologies" (Thomas, 2003, p. 2). It is the bottom-up approach as opposed to the top-down approach of deductive analysis (Web Center for Social Research Methods, n.d.). I combined both the inductive, or data driven approach and the theoretical or deductive approach used by Crabtree and Miller (1999) and usually demonstrated by use of a template (King, 2004; Newby, 2010).

My use of the deductive approach was guided by the four over-arching themes of my research which were drawn from the research question – influences, approach, capability and effectiveness and were placed a priori into the template. The sub-themes were then devised from initial close analysis (listening to and reading the interviews) of the interview data (inductive), and using some of the issues that arisen in the literature review (deductive). A template (see Appendix I) was drawn up and nodes matching the themes and sub-themes were created in nVivo. Table 6 shows a summary of the major themes and sub-themes used in the coding.

Table 6

Summary of Coding used to Analyse Interview Data

Major themes	Main sub-themes
Influences	• Demographic characteristics
	• Information technology literacy
	• Study context
Approach	• Information sources
	• Searching behaviours
Capability	• Using the library
	• Research process
	• Handling & managing information
Effectiveness	• Searching behaviours
	• Evaluating sources

Subsequent to the coding in nVivo, the transcripts were reanalysed on a semantic level (Braun & Clarke, 2006). The initial coding had examined data on the basis of "explicit or surface meanings" (p.84). The subsequent analysis was interpretative and attempted to link patterns and themes, to make intellectual connections both to the themes themselves and to the literature. Some responses categorised to particular themes, such as training needs, were quantitised to establish the relative emphasis of those themes across the participants.

The link between the "essential/realist" (Braun & Clarke, 2006, p. 85) epistemology of my thematic analysis and the cognitive information behaviour model (Ellis, 2005; Kuhlthau, 1991; T. D. Wilson, 1984) noted in the literature review, is essentially the individual – their "motivations, experience and meaning" (Braun & Clarke, 2006, p. 85).

Trustworthiness of the Study

Like everything in MMR, the issues of validity and rigour are not straightforward. There is even debate around the term "validity" itself, with some researchers (Creswell & Plano Clark, 2011) advocating retention of the term, while others argue it is terminology associated with quantitative research and should not be used (Onwuegbuzie & Johnson, 2006).

Creswell and Plano Clark (2011) identified a number of threats to the validity of explanatory sequential designs and ways to mitigate those threats. Such threats span data collection, data analysis and data interpretation and can include issues in the selection of participants, in the choice of quantitative data to follow up on and the incorrect sequential interpretation of the data.

In terms of data collection, my research has attempted to minimise these threats by using the same participants in the qualitative and quantitative parts of the study. This is important in an explanatory sequential design because it allows the information gathered in the quantitative stage of the research to be verified and explained by the participants in the qualitative stage. The relationship between both groups must be close so that the explanations add authenticity to the quantitative data.

Secondly, the quantitative stage of my research provided a larger group than the qualitative stage. This enabled participants for the second stage to be selected on the basis of useful demographic data which would add credibility to the results of the quantitative data.

Too small a participant group in the first stage would have limited the choice of participants for the second stage.

In terms of data analysis, the notable findings from analysis of the quantitative data were followed up in the qualitative stage. This ensured the elaboration of key points from the questionnaire and provided an example of how the methods in this study were mixed.

Potential threats to the validity of the interpretation were addressed by ensuring the data sets were interpreted in sequence and that the interpretation served to answer the research question.

Finally, a coding consistency check was made by an experienced colleague. She was given a section of raw data and asked to use the coding template to code that data. While the lengths of the chunks of data identified by the two coders varied, nearly three quarters of those chunks were coded to the same categories by both coders

Ethical Issues

A number of ethical issues arose in the course of this study, arising primarily from my membership of the masters cohort being studied, and being a member of staff at the Faculty of Education. Issues of conflict of interest, privacy, and researcher influence were identified in the research proposal. Ethics approval was granted until 12/05/2013 (Appendix J).

Informed consent. Informed consent was explained in the PIS which was sent out with the questionnaire. Participants gave implicit informed consent by filling out and returning the questionnaire.

Anonymity and confidentiality. Participants in the interviews could not be guaranteed anonymity, and because the interviews were recorded and transcribed it was not possible to give an absolute guarantee of confidentiality. The lack of a guarantee of

confidentiality was explained in the PIS and attempts to circumvent it were made by way of a transcriber confidentiality agreement.

Interview participants were selected from participants in the anonymous questionnaire who had expressed a willingness to be interviewed. This was managed by participants filling out a separate form and returning it with the questionnaire. On arrival the questionnaires were opened by a research assistant and the questionnaires and the willingness to be interviewed forms were separated. The research assistant, who had signed a confidentiality agreement (Appendix K), noted demographic details on the reverse of the interview form, but at no time was I able to link a specific questionnaire to any of those who had indicated a willingness to be interviewed.

Conflict of interest and the influence of the researcher. The potential conflicts were mitigated by the fact that my membership of the faculty was more remote than that of an academic staff member. I am a general staff member who reports to the management of the University of Auckland library, not to the Dean of Education. In my role as librarian I have no influence or access to student course work or to grades. My primary contacts with participants in the study were working as a subject librarian on the Information Desk in the library, and being a member of a masters cohort project trialled by the faculty in 2010 and led by Professor Lorna Earl. The aim of the group was to ensure successful completion of masters dissertations and theses. From participation in this group four of the participants in the interviews were known to me. Because of my links to the group being studied, the PIS explained to participants that their names would not be used in any publication or report.

A degree of bias in the data must be assumed. Firstly, the interviews took place in the library. Secondly, my role as library manager was known to the respondents and the

interview participants. Knowledge of this may have unconsciously affected how some of the respondents and participants answered the questions.

Chapter Four: Findings

This chapter discusses the findings from the data collected during the course of my research. Findings from the questionnaire and from the interviews have been reported separately. The format of this chapter is based on the structure of my research question. The findings in relation to the influences on research behaviour are integrated into the findings from the research questions dealing with the approach to information seeking, and the capability and effectiveness of students in finding, managing and evaluating information.

Questionnaire Findings

Student approaches to information seeking. Student approaches to information seeking were examined through the use of the sources they used, and the strategies and behaviours they indicated they used while searching them.

Sources of information used by students. By far the most frequently used sources were textbooks or course readings – 84% of the sample indicated they frequently/always used these. Nearly 40% of taught students and just over 60% of research students frequently/always used textbooks or course readings as a source of information. Other demographic variables played no part in the frequency of textbook or course reading use. Table 7 ranks the information sources in order of frequency of use.

The library's electronic resources, Google and Google Scholar were the most popular online sources. Just over 79% frequently/always used the library online resources, followed by 67% who used Google and the nearly 66% who used Google Scholar. The percentage of those respondents who frequently/always used the library electronic sources, Google and Google Scholar remained consistent for taught and research students. Approximately one third of taught students and two thirds of research students frequently/always used them. In

addition, over 90% of those who reported they used Google daily in their everyday lives, also reported themselves as skilled or very skilled at using it.

Table 7

Mean Scores for Frequency of Use of Information Sources

Source of information	N	Mean (5 point scale)	SD
Textbook/class readings	58	4.26	.870
Library online resources like e-books, databases, articles	58	3.97	.794
Search engine like Google	58	3.79	.874
Academic search engine like Google Scholar	58	3.67	1.033
Lecturer or supervisor	58	3.31	.842
Peer/colleague	57	3.18	.826
Website of organisation/person including publishers	58	2.84	1.023
Library visit	57	2.77	1.018
Buy a book	58	2.64	1.055
Online community encyclopaedia like Wikipedia	58	2.53	1.173
Reference/subject librarian	58	2.40	.917
Online scholarly encyclopaedia like Britannica	58	2.09	1.097

Table 8 presents data where the mean response of the demographic variables showed a difference of more than .5. The biggest difference in the frequency of use of textbooks and readings was noted between those who had last studied less than six years ago compared to those who had studied seven or more years ago. Students involved more recently in academic study made more frequent use of books and readings, a finding which seems surprising and would bear further investigation. Overall, however, the demographic variables did not affect the frequency of use of sources.

Table 8

Mean Scores of Demographic Variables Over .5 Impacting on Frequency of Use of Sources for Study

Demographic factor	Source	Demographic category	N	Mean (5 point scale)	SD
Age	Search engine like Google	Under 40	18	4.17	.786
		40 and over	40	3.63	.868
Last studied	Textbook/course reading	>6 years	50	4.40	.700
		7+ years	5	3.20	.1.643
Full-time/part-time	Subject librarian	Fulltime	20	2.75	1.020
		Part-time	38	2.21	.811
	Buy book	Taught	20	3.05	1.146
		Research	37	2.38	.924

People featured strongly as sources of information for study. By far the most frequently used were lecturers or supervisors (41% of students frequently/always used them), followed by talking with a friend or peer (28% frequently/always used them). Use of a reference or subject librarian was low with only 10% of respondents indicating they consulted a subject librarian frequently/always – in fact over 55% had never/infrequently used a subject librarian as a source of information for study. There was a statistically significant difference ($p = .032$) in terms of the frequency of use of subject librarians as a source for study. Means of 2.75, (SD1.020) for full-time students, and 2.2, (SD .811) for part-time students indicated that fulltime students made greater use of subject librarians, despite the low overall use of them as an information source.

Just over 20% of respondents frequently/always visited the library to browse the shelves; nearly as many bought a book and an equal number indicated that they frequently/ always used the website of an organisation. Demographic variables did not influence

whether people visited the library, but taught students were more likely to buy a book than their research counterparts (M = 3.05, SD 1.146 compared to M = 2.38, SD .924).

Online searching behaviours of students. My research did not specifically look at online searching behaviours in the way that the log data studies noted in the literature have done. Searching behaviours can be logged by recording keystrokes, and time spent in specific databases or websites, techniques beyond the capability of a questionnaire. However, it was possible to get some indication of search behaviours in two areas. One question addressed the issue of what respondents did when a search result produced too many results, and another asked them at what point they stopped looking for information.

Nearly 82% of the respondents frequently/always narrowed their searches in the face of too many hits on a specific search. Full-time students (M = 4.39, SD .608) were more likely to narrow their searches when confronted with too much information than were part-time students (M = 3.92, SD .795), where the means were calculated on a 5 point Likert scale.

While 16% said they frequently/always quit searching as soon as they had found relevant information, over 40% indicated they continued to search once they had found the information they needed. The fact that 40% of students continued to search once they had found the information they wanted is extraordinary, and will be discussed in the next chapter.

Findings on the research capabilities of students. Student capability was examined on the basis of self-reported skill in online searching, using information technology for study, managing information and difficulties students expressed in the research process.

Online searching skills of students. Respondents were asked what strategies they used when searching online, either in library databases or on the internet. They were given a choice of seven variables and were asked to specify how frequently they used these

strategies. The strategies were: search for general background information on a topic; formulate sub-questions; use words from questions as search terms; determine the best places to search for this information; start by typing words into a search engine; determine new search terms during the search process and use the option "advanced search." Respondents were also invited to suggest other strategies they used. One respondent did this. They were also given an opportunity to make it clear if they did not understand the meaning of the strategies that were presented to them. This feature was used by one respondent in five of the variables. The effect of the response option *I am not sure what this means* on the Likert scale (ranging from *Never* to *Always*) was removed by re-coding those variables which had been responded to in this way.

Most respondents used *words from their questions as search terms*. Nearly 77% indicated they did this frequently/always. The second most common strategy was to *start by typing words into a search engine* (76%). Seventy-two percent of respondents frequently/ always decided what the best places to search for information online were, and 66% noted that they frequently/always changed their search terms while searching online.

Far fewer respondents indicated that they often used advanced search features (51%) or formulated sub-questions online (39%), tactics designed to increase relevancy in searching. At least two respondents did not know what an advanced searching option was. One respondent indicated that they did a Google search to look for synonyms when searching online.

Research students (M = 3.95, SD .941) responded higher than taught students (M = 3.33, SD 1.138*)* on a five point Likert scale which indicated how frequently they changed search terms during the search process.

Skill using information technology. Table 9 presents a ranking by means of student reported skill in using a range of information technology tools. Three quarters of respondents rated themselves as skilled/very skilled at using systems such as email, the online student enrolment system, the learning management systems and printing and copying facilities within the University. The self-reported high level of skill suggests most students have no problems negotiating these systems. When asked how skilled they considered themselves using common computer applications such as Word, Excel and Access, 83% considered themselves skilled/very skilled, again a very high percentage.

Respondents were also asked to rate their skills in using the library's website for catalogue searching (including finding books, requesting books and transferring books between campuses). In this respect their reported skill was not as high – 64% considered themselves skilled/very skilled at using the catalogue, and 67% rated themselves skilled/very skilled at article searching through the library's website. In addition, nearly 57% of respondents reported they were skilled/very skilled in using specific education databases such as ERIC and ProQuest Education. Analysis of variance testing of these three variables, skill in searching the catalogue, skill in searching for articles through the library website, and skill in using specific education databases, against demographic variables showed no significant statistical differences. Overall, high percentages of students regarded themselves as skilled at using these tools for their study.

Although 65% of respondents reported themselves skilled in searching library sources, these figures are not corroborated by a later question which asked the taught students and the research students (in separate questions) to choose the degree of difficulty they experienced when they needed to search the library catalogue and databases. The wording of that variable was almost exactly what respondents had been asked in terms of their skill levels, and yet when put into the context of "difficulty," it is clear that far more students had problems than

the skill-based question would indicate - only 48% of taught students and 36% of research students found searching the catalogue and databases easy/very easy.

Although respondents generally considered themselves skilful searching the catalogue (64%) and in article searching (67%), over 36% of taught students and 28% of research students said they had difficulty deciding which research tools (such as databases and journals) to use. This is interesting given that 79% of them said they frequently/always used the online resources (e-books, e-journals, databases and articles) of the library. It would have been expected that if a large number of students were using the library resources as they indicated, then fewer of them would have had problems deciding which sources they should use.

Table 9

Mean Scores for Skill Using Computer Systems, Programmes or Sources of Information

Skill:	N	Mean (5 point scale)	SD
Using internet to search for information	58	4.24	.709
Using generic computer programmes like Word, Excel	58	4.14	.826
Using University IT systems	58	3.86	.945
Using library website for Catalogue searching	58	3.67	.866
Using library website for article searching	58	3.66	.983
Using specific education electronic databases like ERIC /ProQuest Education	58	3.40	1.138
Managing references and using tools like EndNote	58	3.02	1.249
Finding/using datasets online	58	3.00	1.228
Finding resources outside university like interloan	58	2.86	1.083
Keeping up-to-date using alerting services	58	2.43	1.339

The areas where students felt least skilful were in keeping up-to-date using electronic alerting services and RSS feeds, and in finding resources outside of the library system (inter library loan). Here, the percentages of those who considered themselves skilled/very skilled dropped to 21% and 31% respectively.

In contrast to the use of the library catalogue and databases, 88% of respondents considered themselves skilled/very skilled at effectively and efficiently searching the internet. This statistic tallies with the high number (91%) of respondents who used the internet several times a week or every day in their daily lives, and the 67% who frequently/always used the internet as a source for their study.

In a comparison of demographic variables (age, gender, time since last study, full-time/part-time, year of study, on/off campus, taught or research student) with the variables relating to skill using the internet, frequency of using a search engine like Google, frequency of using Google Scholar and frequency using the library online sources, the only statistically significant difference ($p = .032$) was found in the use of library online sources. Those students in their first and second year ($M = 4.14$, $SD .639$) showed a higher means for use of library online sources than did those students in their 3rd or 4th year ($M = 3.68$, $SD .945$).

Managing information (including referencing and writing). A little over a third of respondents (36%) considered they were skilled/very skilled at managing their references and using tools such as EndNote to help them. This was equalled by the 35% who considered themselves somewhat unskilled/unskilled. When respondents were asked about the degree of difficulty they had in managing the results of their searches 36% of the taught students found it easy/very easy to manage their results, while 24% of the research students did so. To sum up, those students that considered themselves skilled at managing their references also reported it was easy to manage their search results.

Amongst research students there was a statistically significant difference ($p = .029$) between those who had last studied less than six years ago and those who had last studied seven or more years ago, when it came to reporting difficulties they had managing the results of their searches. The mean for those who had last studied less than 7 years ago ($M = 3.04$, SD .587) was lower than for those who had last studied 7 or more years ago ($M = 3.75$, SD .500). Given that the latter group had been away from study for longer, it is not surprising that they had more difficulty managing references; however they represented a very small number of the sample.

Research students also expressed more difficulties when it came to referencing. Close to 40% found it difficult/somewhat difficult to use correct referencing and avoid plagiarism, while 27% of the taught students did so. A quarter of research students, and 18% of taught students said they had difficulty writing in an academic style as well.

In an attempt to ascertain the level of sophistication in information handling respondents were asked what they did with the information once they found it. Table 10 shows the mean scores for information handling. Just over 84% of respondents said they frequently/always downloaded the information for later use and 72% said they frequently or always printed it out. Only 48% said they frequently/ always added it to a reference list such as EndNote which suggests respondents prefer to use a print copy than to store a copy in EndNote.

Table 10

Mean Scores for Frequency of Use of Methods of Handling Information

Method of handling information	N	Mean (5 point scale)	SD
Download information	58	4.16	.768
Print information	58	3.88	.900
Read/work with information online	58	3.50	.996
Borrow information from the library	57	3.47	.826
Make handwritten notes from information	56	3.32	1.064
Make electronic note from information	57	3.32	1.038
Photocopy information	57	3.21	1.031
Add information to reference list like EndNote	58	3.03	1.486
Bookmark information	58	2.62	1.226
Read information in the library	57	2.12	.983

Difficulties with the research process. Taught students indicated a number of significant difficulties in the research process and much of it focused on the role of their lecturers. Well over half the taught students (55%) found not having enough information from the lecturer either difficult/somewhat difficult. This percentage is supported by the 50% who found it difficult/somewhat difficult to figure out what the lecturer wanted in the assignment. Over 40% of taught students also reported they had difficulties narrowing down a topic.

Research students also had difficulties with aspects of the research process, albeit they were of a different nature. They expressed difficulties choosing a topic and creating a conceptual framework for it. Just over 61% claimed this was difficult/somewhat difficult. Framing the research question was difficult for even more of the research students – 75% found this difficult/somewhat difficult. The need to synthesize information into a cohesive argument presented a problem for over 55% of research students.

Of the demographic variables affecting research students in regards to areas of research difficulty, there was only one of any statistical significance. Those who has last studied seven or more years ago expressed greater difficulty framing the research question (M = 3.25, SD .957) than those students who had last studied less than six years ago (M = 3.25, SD .680).

Effectiveness of students' information seeking and information management. The objective testing of effectiveness in information seeking was not part of this research. Effectiveness for my research was defined by students' own perception of their success in information seeking. Their perceptions were then weighed against how they said they selected their key words, evaluated the information they found, and their ability to actually find the full-text of what they were looking for.

Respondents were asked to assess how frequently they had found what they were looking for, or something of equal relevance, by the time they got to the end of a search session. Over 74% considered that they frequently found what they were looking for, and 10% said they always found what they looking for. Students obviously felt that they were successful at being able to find what they needed for study.

The success variable was re-coded from four responses (*infrequently, sometimes, frequently, always*) to two. The *infrequently* and *sometimes* responses became the unsuccessful group and the *frequently* and *always* responses became the successful group. This was done to increase the numbers in the unsuccessful group for the purposes of analysis. Even so, this only brought the unsuccessful group to 16% (n = 9), while the successful group was 84% (n = 49) of the sample. As can be seen from Table 11 the percentages of taught and research students who considered themselves successful were about the same.

Table 11

Perceptions of Success of Taught and Research Students as a Percentage

	Percentage Successful	Percentage Unsuccessful
Taught students	80.0 (*n*=16)	20.0 (*n*=4)
Research students	86.5 (*n*=32)	13.5 (*n*=5)

Well over 90% of those who were successful in searching, also considered themselves skilled in searching the library catalogue, library databases, and using specific electronic education databases.

When it came to choosing keywords and vocabulary for searching, over 44% of the taught students and 59% of the research students found this easy. A third of both groups found it neither difficult nor easy, and 19% of taught students and 9% of research students found this difficult. Most students reported that they started by typing words into a search engine (76% frequently/always did this). In fact this was the most common strategy used for online searching among those given in the questionnaire and was unaffected by demographic variables.

Over three quarters of respondents frequently/always used words from their questions as search terms. Far fewer students attempted to use more complex strategies such as formulating sub-questions to refine their searches – only 39% frequently/always did this. About half of them frequently/always used the advanced options in searching. Advanced search strategies should produce a more relevant search result and relevant search results would indicate effectiveness in searching.

Table 12 compares the rankings given by subject librarians (experts) with those given by the students for online searching strategies. The item ranked 1 was considered the most effective by the subject librarians.

The biggest difference between the two groups was in the placing of the first ranked variable. Starting a search by *typing words into a search engine* was ranked low by the subject librarians, but was ranked in first place by students. In fact, there was only one point of agreement between the two groups across the seven variables – that of ascertaining the best place to search for information.

One skill which indicates whether a student has been effective in their search is whether they can retrieve the full-text of the item they are searching for. While respondents considered they were successful in their searching, many of them reported difficulties in retrieving full-text – over 45% of taught students and 22% of research students found this task somewhat difficult/difficult. These statistics contradict the findings of an earlier question which asked respondents how skilled they were at using the library website for article searching – 30% of taught students who said they were skilled, also found it difficult to find a full-text item and 63% of research students who said they were skilled found it difficult to find the full-text.

There were also issues around effectiveness in the managing and handling of information. Over 16% of taught students who reported themselves skilled in managing references later noted they found it difficult to manage results of their searches. Over 28% of research students did the same. This is despite the fact that when respondents were asked what they did with the information once they had found it over a quarter of taught students and nearly three quarters of research students said they frequently used EndNote. So while there was high usage of EndNote, at least amongst research students, and many of them

reported themselves as skilled at using it, well over 25% of them said they found it difficult managing their results.

Table 12

Ranking of Online Searching Strategies by Subject Librarians and Students

Online searching strategy	Ranking by subject librarians	Ranking by students
Using words from assignment or research question	1	2
Determining new search terms during the research process	2	4
Determining the best places to search for information	3	3
Using the advanced option	4	6
Formulating sub-questions	5	7
Typing words into a search engine	6	1
Searching for general background information on a topic	7	5

Note. Student ranking obtained from means of variables which indicated frequency of use

Evaluation of information sources. Some of the terminology used in the questions which asked respondents how they evaluated the sources they used presented a problem; to the statement *I examine the URL to evaluate information,* ten respondents chose *I am not sure what this means* as their response. Lack of understanding may have been because the term URL was unknown to them, or because they did not understand the concept of examining a URL to determine the reputation of a particular website.

When the question around evaluation was re-coded to exclude the *I am not sure what this means* response, one method dominated all others when it came to evaluating the trustworthiness and credibility of information – nearly 95% respondents frequently /always scanned through the information found, and 91% used more than one source to answer their question. After that nearly 77% said they frequently/always carefully read the information

found. Table 13 ranks the frequency with which students used specific strategies for evaluating information.

In Table 14 experienced subject librarians were also asked to rank the strategies for evaluating online information. There were clear discrepancies between what subject librarians thought were effective strategies compared to what the students said they did. Scanning through the information found, the top choice of over 95% of respondents came seventh on the subject librarians' list, and the top choice of the subject librarians, examining the rest of the website, was ranked eighth by the students. There was also a major difference between the two groups in using the URL as a tool to help evaluate information, perhaps not surprising given that a number of students did not understand the meaning of the term URL. In fact, the only points of agreement between the two groups were around *carefully reading the information found* and *quitting searching the moment relevant information is found*, this latter variable was ranked last by both groups.

Table 13

Mean Scores for Methods Used to Evaluate Electronic Information Sources

Method of electronic source evaluation	N	Mean	SD
Using more than one source to answer question	56	4.48	.991
Scanning though the information found	57	4.37	.587
Narrowing search when too many results are found	55	4.07	.766
Carefully reading the information	56	4.02	.924
Deciding whether information is fact/opinion	55	3.65	1.190
Managing the information so it can be easily found again	56	3.59	1.058
Using the top list results found	56	3.52	.809
Examining the rest of the webpage to judge reliability	55	3.47	1.152
Examining the number of results found	51	3.41	1.186
Examining results on subsequent pages	52	3.31	1.020
Examining URL to evaluate information	44	2.89	1.351
Examining date of last page update	54	2.83	1.178
Quitting search as soon as relevant information is found	55	2.73	.952

Although such a large number of respondents indicated they evaluated online information, a significant number of them also indicated that they found it difficult either evaluating what constitutes a credible source (taught students), or evaluating search results and reviewing keywords (research students). Nearly 20% of both groups found evaluation of online sources difficult. There was a statistical significance ($p = .029$) for research students between those who studied less than 6 years ago ($M = 3.04$, $SD .587$) and those who studied seven or more years ago ($M = 3.75$, $SD .500$) suggesting that those who had studied more recently had more difficulty evaluating their sources, an unusual result.

Even though respondents indicated they used more than one source to answer their question, and scanned through and read the information they found, fewer of them checked the currency or source of the page, or looked at the rest of it to judge whether the information was reliable.

Interview Findings

Influences on student research behaviour. The influences on information seeking and the research process which were investigated for this study were the participants' use of technology in their everyday lives, the people who influenced them, distance, information overload, the balance between work and study, and students' own motivation.

Using information technology in everyday life. All participants used information technology as part of their everyday lives, both for recreation, social contact, study and work. They recognised the pervasive nature of information technology especially in their lives as teachers. At the very least they used email, the internet, and mobile phones (mostly not internet capable). One had been the head of ICT at her previous school and was a regular Facebook user; others were familiar with a range of technologies from Skype through to online learning management systems, and digital tools such as cameras and digital

Table 14

Ranking of Evaluation Strategies for Use of Electronic Sources by Subject Librarians and Students

Evaluation strategy	Ranking by subject librarians	Ranking by students
Examine the rest of the website for reliability	1	8
Examine whether information is fact or opinion	2	5
Carefully read the information found	3	4
Use more than one source to answer the question	4	1
Examine the results on subsequent pages	5	10
Examine the URL to evaluate information on the site	6	11
Scan through the information found	7	2
Examine the date of the last update	8	12
Narrow a search when it produces too many results	9	3
Manage the information so it can be easily found again	10	6
Use the toplist results	11	7
Examine the number of results found	12	9
Quit searching the moment relevant information is found	13	13

voice recorders. All students but Betty considered themselves proficient using information technology. Feelings around the use of information technology were positive and it was clear that it was simply an extension of their busy lives. Statements such as Anne's represented the general feeling, "I've used the computer as an important part of my life for quite a long time now, probably 20 years." Confidence in using technology day to day, spilled over into strategies for using unfamiliar technology. Anne, for example, made use of the help buttons

and tutorials provided in SPSS to teach herself when she came up against problems. Carol found adapting to new technology was easy "as long as it's got purpose."

Google played a prominent role in each participant's use of technology – but apart from one participant, it was not widely used for study. Google was regarded as the go-to place for finding out everyday information, and booking holidays, looking up words, helping with lesson planning, but was regarded with a degree of suspicion as a source of information for study.

One participant, however, used Google consistently – both for study and in her personal life. Anne demonstrated some eclectic uses for Google as regards her study, often using it to experiment with search terms, or to assist with her writing by finding definitions and synonyms, or even whole phrases – "I know what I want to say... but you know they're inappropriate academic words, and so yeah, you go looking for and 99% of the time I will find what I'm looking for." Anne used Google as a complete study tool not just in her information seeking.

People who influence student research behaviour. Other people strongly influenced the participants, particularly in their research behaviour. Sometimes it was colleagues or peers or mentors, but more often it was supervisors or lecturers. Supervisors, as can be expected, played a pivotal part in the research process. They had varied roles – some providing guidance on searching and the use of software, others recommending readings or courses, assisting with data analysis, giving feedback, or being "the guide on the side."

The participants often expressed ambivalent feelings about the role their supervisors played in their research – on the one hand they acknowledged the help given, particularly in relation to suggestions about readings or paths of inquiry to follow. On the other hand, at least two of the participants expressed a desire for supervisors to take a more active role in

guiding them through the process, while simultaneously acknowledging that the frustration they experienced at that point in their study had also been beneficial.

> But it was very frustrating, because I just fell in the grey and I just felt really cloudy for a couple of months, and I was just getting really frustrated with it... But my supervisor said something really good for me, because I said to her, I'm just reading all this stuff and I'm just reading and reading and getting more stuff to read and I've said, "Sometimes I'll read something and feel like it was a waste of time," and she said, "Well there's no such thing as wasted reading" (Dee).

Four of the six participants had been members of a supported masters cohort group that had been piloted by the faculty in 2010. Three of the participants mentioned the support they had had from other members of the group, or from academic staff who ran the cohort. Responses were positive and it was clear that for those who were working mostly in isolation, the opportunity for meeting and discussing their research in a semi-structured forum was beneficial. The cohort was also supported by an online website which could be used for discussion and the hosting of information and readings.

At least one participant had received guidance from a friend who was a doctoral student, and another relied heavily on the support given by colleagues who were working in the area directly relevant to her research. Librarians also influenced a number of the participants, mostly providing advice around literature searching, bibliographic management or using library services. Five of the six had either met with a subject librarian, emailed the library, talked with a librarian on the phone, or attended a library course.

Studying by distance. One student was a distance student. She lived two hours away from Auckland and visited her supervisors on campus anything from two to four times a month depending what stage she was at. At other times, she was in email contact with them. Distance was definitely a contributing factor to the way she managed her information seeking

and her studies. Ease of access to resources was a primary driver for her – she made heavy use of online databases, specifically the library's aggregated education databases, and was a registered flexi student. The library flexible service couriers physical items to students at a distance, or scans and emails articles or book chapters to them. Overall, she commented that accessing the source material was "easy."

Information overload. While no participants exhibited the kind of library anxiety which was described by Jiao and Onwuegbuzie (2004) i.e. anxiety driven by unfamiliarity with information technology, four participants made comments about information overload. Carol's comments were typical "...cos sometimes you get so much information that you just don't know where to start, and how to cull, and what to bother reading." Three of the participants expressed the enjoyment they experienced doing the reading, but this was countered by the huge amount of information they were sifting through. Betty said she "honestly felt like drowning."

The biggest problem was cognitive overload, rather than information overload. While all participants recognised that being confronted with huge quantities of information was difficult, what presented a bigger problem was how that information could be moulded into a coherent, scalable framework. Two participants made mention of a mental model proposed by the masters research cohort mentor, Professor Lorna Earl. Lorna had suggested that the literature review should be regarded as a funnel moving from the general to the specific. What seemed to be a problem was the ability to gauge how wide the funnel should be at the top and then what direction to take to get to the narrow part of the funnel at the bottom. The glut of information at the top of the funnel often made the decision about what specific direction to follow difficult and in many cases frustrating and confusing:

> So I said well you need to go with the big picture, but my big picture was too big. And I probably would have really appreciated more guidance with supervisors then, at the early stages, like when I had all this sort of outline of my lit review. (Betty)

Two students were not actively engaged on their dissertations; they were completing taught papers prior to undertaking their dissertations, and had only general comments around the amount of information available to them, guided as they were by course reading lists:

> ...cos sometimes you get so much information that you just don't know where to start, and how to cull, and what to bother reading. And just the amount of information has been difficult in some ways to manage. (Carol)

Work and study. Ella explained the sense of time pressure she felt to get her masters finished. Her comments were also echoed by the other participants:

> I think that when you teach full time, and you do study, I think everyone understands that it is actually really hard to do, cos you spend nearly all of your time at weekends, either looking for information or trying to do assignments in between marking. (Ella)

While four of the participants were full-time and two were part-time, all felt the pressure of time. Three of the four full-time students were on scholarships which gave them time away from teaching to complete their studies – in most cases this was less than a complete year and they were running against the clock. Betty noted that she had to cull 10,000 words from her literature review and "that caused a lot of angst for me, because I was thinking time's going. I'm being paid for this year on study leave and I'm not gonna get through."

Three of the participants had dependent children – one had a pre-school child, one a primary aged child and the third had teenagers – as well as being teachers. One of those with children was also a solo parent. All three with children noted the difficulties of balancing child care with study and work. Having dependent children often affected where and at what time of the day they worked – usually the kitchen table at night, although this was partly tempered by whether they were studying full or part-time. Carol often worked at night once

her child had gone to sleep, so she wanted to access electronic information. She even made sure she had internet access when she went away on holiday. Those who were studying part-time made use of school computers and printers in their workplace.

Anne, whose work place was at the university and whose husband was also studying, found herself immersed in her study both at work and at home. She felt this to be an immense advantage. Both her children were grown up so she had "the full spread of time to balance my time across with nothing else terribly much that's actually arguing with that."

Motivation for study. All participants were highly motivated to complete their studies. Many were studying because they wanted to make a difference and were passionately interested in their subject. This drove the type of qualification they were studying for. Betty explained her motivation this way:

> I wanted to do the thesis, because I personally believe that the knowledge that I'm finding is really important, and I wanted to actually get it so it could be published. And that was the main reason, because I don't think they publish dissertations.....My passion is helping teachers with professional learning.

Dee "wanted to make some sort of contribution back to our school and back to our students," and Anne noted that "...you're not gonna change the world, but you want to feel like it's got some edge to it that's actually gonna contribute some little thing."

Others were aware that in the future they might like to undertake a doctorate, so this dictated why they undertook a dissertation or thesis rather than taught papers. All were open to the idea that doctoral study was a possibility. Fiona had got to the masters stage by originally undertaking an Info Link course, then she "got the bug...and it all just snowballed."

Participants were genuinely interested in the research process and enjoyed the intellectual stimulation of study, despite the difficulties:

> ... so I enjoyed it because there was lots of reading. Like I said, it's always a challenge narrowing it down... and also making sure I didn't get sidetracked. I loved collecting the information. The data analysis I found really interesting. (Carol)

Dee, who was studying at a distance, noted the difficulties of staying motivated when studying in isolation. For her this was the most difficult part of her study; as she got further into her study and her enthusiasm waned, she had to draw on her own willpower to keep her focused and moving forward.

Student approaches to information seeking. Student approaches to information seeking were examined through the sources of information used by the students, and the behaviours exhibited while searching.

Sources of information used by students. All six participants were strongly influenced in their information seeking by the use of electronic resources – both internet and library databases. When asked what would be the first source they would consult for their studies, five out of six turned to an electronic source. Three students used the library's aggregated education database set (multi-database), one turned to Google Scholar first, and one to the course book of readings. Only one student indicated that Google was their preferred first choice. Unsurprisingly, they also selected these sources as the easiest source for them to use, as outlined in Table 15. The definition of easiest was left to each participant to interpret for themselves, and their interpretations covered such areas as ease of access to the full-text, the variety of other links available (Google), and the ability to see a précis of an article. Betty's comment was typical, "But I like Google Scholar. I find it's very simple. It gives me references. It gives me other articles, there's a whole range of things there." For Dee, who worked at a distance, ease of access was a primary determinant in where she went to find information.

Those who used the library multi-database often commented that they liked it because it 'contained' the information. Ella noted "I think it narrows the field down, so you can actually go back to the library one with the right name of the journal article or the right author."

Initial searching was often backed up with use of the library's online catalogue, and several participants indicated the circular nature of their searching, often finding something in an electronic database and then being lead onto something else which they traced in the library catalogue by using a known title or author. The library catalogue was not used as an initial source, or cited as being the easiest source to use.

Fiona used Google for study and for resources for her teaching. She used multi-database for her literature review, but also used a single journal that she knew about and scanned through the table of contents. She liked multi-database because she could read a précis of an article. That allowed her to decide what to do with the information on the spot – save it for later reading, and/or continue searching. Multi-database didn't "slow you down." She also read as many of the required and recommended readings as she could, and also any authors mentioned in lectures. Carol was adamant about not using Google for study because she didn't trust it and didn't want to waste time reading material that was not scholarly. She had also used one of the specific education databases, ERIC, and had searched ProQuest Central, a large multi-disciplinary database. Three of the participants expressed a range of negative opinion regarding the use of Google – issues around time wastage, worries about the trustworthiness of information found on the internet and difficulties being able to access to the full-text.

Table 15

First Sources and Easiest Sources Used by Students

Student	First source used	Easiest source used
Anne	Google	Google
Betty	Google Scholar	Google Scholar
Carol	Library multi-database	Google Scholar
Dee	Library multi-database	Library multi-database
Ella	Lecturer supplied readings	Lecturer supplied readings
Fiona	Library multi-database	Library multi-database

Note. At the time of data collection the aggregated library multi-database consisted of 5 of the major databases suitable for education – A Plus Education, Education Research Complete, ERIC (Ovid version), ProQuest Education, Sage Journals Online and Index New Zealand

While electronic sources featured heavily as the preferred starting place for information seeking, they weren't the only sources used. It is clear that people, usually supervisors or lecturers, played a key role in the students' information seeking. Supervisors suggested authors to read and pointed student's towards other literature (Anne's supervisors guided her to readings around her methodology), while at the same time maintaining some distance from the analysis which they expected the student to complete themselves. One participant mentioned the research masters cohort – her peers in this group often suggested authors or articles to read. The student still working on a taught paper found that she relied on the required and recommended readings for her course, and also followed on up on any references made in the lecture itself. One of the students, who was also working at the faculty, described herself as "blessed...by being placed within the faculty with people who live and breathe this every day and who are very, very open to supporting me."

In addition to electronic and people sources, there was one other really important source of information. This was following up on the reference list from known books or articles. The technique of citation chaining was common and widely used by all participants.

Citation chaining was often helpful in being able to narrow down the sometimes vast array of possibilities within a topic, or equally useful in introducing a new concept. Sometimes it was the foundation of a whole area of information seeking if a seminal piece of literature had been found, at other times participants used it like stepping stones, moving from one citation to another. Anne noted, after being given a doctoral thesis in her area, that she "...started right at the beginning with the reference list. And so what I did was I looked for big names, and I looked at titles, and then I went alphabetically, just went through it."

Online searching behaviours of students. While no specific online behaviours were observed in my study, participants were asked how they went about searching. As their initial approaches to their information seeking were geared towards the electronic environment, it was clear many of the participants were browsing the databases using keywords or authors' names to guide them. Their choice of keywords was often informed by other reading or searching. Anne, who used Google for much of her searching, explained her technique:

> I use the internet for study ...I would go to Google first, then I'd go to Google Scholar, and then if I knew what it was – and I only have fallen across Google Scholar this year. And then I would go to the university library search when I felt confident of what sort of keywords I was using. But if I wanna play round with keywords and try and actually find a place for where I'm looking, I use Google to do that.

Dee found it more useful to use authors' names in searching, because using keywords was not delivering the information she needed. Betty noted with frustration that while some of her searches worked in Google Scholar, she often ended up with no results in library multi-database. This reinforced her belief in Google Scholar which produced both valid results and gave her access to the material. "I just get so sick and tired of getting no responses, no answers to this...so I go straight to Google Scholar."

Much of the searching involved complex negotiations between different electronic systems. Participants might start in one place but jump to another database or the library catalogue to gain further information. Betty located items in Google Scholar and then followed up a reference in the library catalogue - "I actually had gone through to Google Scholar and put that in there, and then they gave me some – I just scanned through and saw, oh, that looks interesting – the title – so I just took a copy of the title and then I went back to the catalogue..." Dee used multi-database search to start her searching, and would then go the library catalogue to see what books there were.

At the very least, all participants had developed ways of finding keywords and made decisions about what to do if the search terms were not producing the results they wanted. When asked about how many pages of search results they would be prepared to look at, and when they would decide to stop looking for information, there were various answers. Most were only prepared to look at two to three pages of Google/Google Scholar and had mechanisms for identifying when the search had gone "off." Carol explained how she kept information overload at bay: "I'm trying to constantly keep my question in my [mind]... keep focussed on what I'm looking for so that I don't go off onto a tangent, because it's so easy to do."

Fiona noted that if a search didn't deliver what she wanted in the first ten pages of results, she changed her search terms. Anne was prepared to look at 30 or 40 pages of Google and described how the results were often relevant at the start, but could "go off. But then it can come back again..." If she was feeling "really committed to it" she just kept on looking.

Deciding when to stop looking for information was not so easy. The nature of the research process meant new areas of interest came up and needed to be supported by the

literature, so the process was pretty much on-going. Dee noted that she didn't really stop looking for information until she got to the stage of writing the discussion chapter, and Fiona stopped looking when she reached "overload." Anne really only stopped when "it was a dead end."

Research capabilities of students. For the purposes of this research capability was deemed as knowledge, awareness and skill in the following areas: online searching skills, managing information, use of library services and aspects of the research process.

Online searching skills of students. When it came to a systematic approach to searching, only one participant said she used a plan to help her identify search terms. No students were aware of the method of concept mapping as a way of helping to identify possible search terms. The concept map alerts students to the possible range of keywords for searching, allows for an objective view of keywords across a topic and develops a set of terms for effective and relevant information retrieval. More importantly, a successful concept map can mitigate against information overload.

Both Carol and Fiona said they understood the mechanics of Boolean searching and were relaxed about making changes to search strategies when required. If Fiona had problems getting relevant results she changed her search terms, often using synonyms to replace unsuccessful terms. Carol also used journal articles to provide keywords for searching because she found difficulty locating information in one specific area. She couldn't decide whether this was because the search terms were incorrect, or because there was nothing that had been written about that particular topic. Betty refined her results by date in Google Scholar and in multi-database search. She also used the "related articles" and "cited" features of Google Scholar.

Anne started in Google "with as few focussed words as I possibly can." She subsequently used those, or other leads she found in Google, in the library catalogue or databases. She also hunted through tables of contents of electronic journals. Fiona didn't use a search plan either but was guided by the words used in the question (she was studying a taught paper at the time of the interview). Betty confessed her search terms grew a "bit more like Topsy." Ella used a broad-brush approach to keyword searching by using words in the course title or description, however she was aware of the need to use synonyms to get coverage in her search. Searching for authors or titles (known items) was deemed to be straight forward by all participants.

It is clear that all the participants had mechanisms that worked for them in the way they conducted topic searching in online databases and websites. It would be fair to say, however, that none of them was proficient – it was more of a question of them getting there in the end, often by quite circuitous routes. Betty, Carol and Dee expressed a desire for training to hone their searching skills. Anne noted her biggest worry was "that feeling of what I have missed."

> Keywords – but then I find keywords can just be too big, and then sometimes if you put in too many keywords, like if I was looking up self-concept of Maori students, you get nothing. So it's just a matter of trial and error for me. (Dee)

While five out of the six participants were primarily using library databases or Google Scholar for their information seeking, there were gaps in their knowledge about how the databases worked. Two participants never realised how essential it was to access Google Scholar through the library system – that by doing this they were much more likely to retrieve the full-text of an article because the library already had a subscription to that journal. Or that Google Scholar was able to provide them with 'related' articles. Dee knew about "cited"

articles in Google Scholar, but wasn't sure what that meant in terms of how an article could be evaluated.

At least two students realised that their use of the part of the library system for accessing online articles was deficient – there was an element of 'hit and miss.' Another student searched the catalogue to track down authors but didn't feel she had enough knowledge to use the databases:

> I think that online journals are really the trickiest part for me...when you select the online databases and you get the alphabet list come up or the choice of education or something, sometimes I seem to click on the right thing and sometimes I don't. And I guess that knowing more confidently how to use it would actually make it easier for me. (Ella)

Only two students said they made use of any of the individual education databases. Most were using aggregated sets, such as the education library multi-database set, or Google Scholar.

Managing information (including referencing and writing). Managing information electronically was a problem noted by all participants. Five participants used EndNote as a bibliographic management too. All apart from Betty were using it in its most basic form. Only Betty and Fiona used the Cite While You Write (CWYW) feature of EndNote, one of the programme's most powerful and attractive features. Betty also directly exported articles out of Google Scholar and into EndNote. Incidentally, she also had the most references stored – 318.

Others who were using EndNote used it mainly to hold their references and PDFs. Dee only recorded the references she actually used in her thesis. Anne related that she often looked for a PDF and a Word version of a document. She would then strip passages out of the Word version, would save what was left and copy it into the abstract field of EndNote.

Despite this, she also kept paper copies in a filing cabinet. Fiona used EndNote, but printed out most of her sources so she could mark them up. Apart from this, no participants used the abstract field or applied a controlled vocabulary to their references to assist them with later retrieval.

Ella, who wasn't using EndNote, often typed her notes as she read them. The material was then suitable to be copied straight into her assignment if she needed it. She kept electronic articles on her laptop as PDF files. She also rated her articles for usefulness.

Five participants expressed a desire to use EndNote more efficiently. They accepted that there was a degree of up-front time needed before the product could be used to its full capacity, and most had experienced 'hiccoughs' in the initial stages. Simple things such as not changing the referencing style to the correct format tripped up new users.

Not one of the participants was using an alerting service or RSS feed to stay up-to-date in their area of research, despite the fact that they were studying over at least a year's time span.

Use of library services. Knowledge of library systems and people which could be used to support their research was inconsistent. Two participants had actually made an appointment with a subject librarian for help with using EndNote. Others knew about subject librarians but were unclear what their role was, or how they could be accessed or didn't think to access them at all. The two participants who had consulted a subject librarian had also used either the recall system (for retrieving books on loan), or the intercampus delivery system (for delivering items from other University campuses). One had also learned how to renew her books online, something of a relief as she was only on campus once a month. Generally, however, the subject librarian service was under utilised by these students.

The distance student noted that she had also used the study and research help pages on the library's website. She had also emailed library staff "for help about things" but it was not clear if this was for information seeking help, or some other form of help.

Difficulties with the research process and research support. Nearly all the participants had undertaken some sort of training useful for their studies. Some had attended sessions on finding articles offered through a library session organised by their lecturer, others had availed themselves of sessions offered by student learning services around thesis writing. A number of the group had been part of sessions organised through the faculty's masters cohort group – sessions on SPSS, and handling long documents in Word. Others had attended library EndNote sessions or been in touch with a subject librarian regarding help with EndNote. Betty expressed annoyance and frustration about conflicting advice she had received about how to obtain copies of the software (SPSS) she needed for her research. There was inconsistent and misleading information coming from supervisors.

When asked what further training they would like which would assist them with their studies there was a range of viewpoints. Table 16 lists the training needs of the students – some of these were expressly stated, others deduced by me from comments made by the participants around problems they were experiencing.

Participants were unanimous in the way they wanted to receive training – firstly, they wanted to receive it face to face. Secondly, they wanted it either one to one or in small workshops where they could work with their own data. Ideally, it should be "just in time" and hands-on. This was especially the case for software such as SPSS and nVivo. Those who were studying part-time made it clear they needed classes outside of teaching time – either later in the day, on the weekends, or in the school holidays. Dee, who was working at a distance, wanted "block" sessions which made the travelling worthwhile. If a course was

Table 16

Training Requirements of Participants

Type of training – expressed and deduced	Number of students
Bibliographic management – EndNote	5
Using electronic journals/databases	5
Google Books	2
Library systems e.g. International interloan, recalling books, intercampus delivery	2
Basic essay writing skills	1
Consult a subject librarian	1
Finding full-text of articles	1
Finding theses & dissertations	1
Library Catalogue	1
Managing print copies of information	1
Note-taking	1
Referencing	1
RSS feeds and alerting services	1
SPSS	1
Using e-books	1
Using long documents	1

only an hour long, she considered it was not worth the four hour return drive to attend it. Dee advocated the use of one day workshops which would cover bibliographic management (EndNote), database searching and provide a forum to meet with other postgraduate students. Betty also stipulated that courses needed to be run on the faculty campus – there was a marked reluctance to go the city campus because of the difficulties of parking.

Betty also expressed her frustration with advice she had received from the faculty. She received inaccurate advice about previous courses which meant she ended up doing at least one course which was unnecessary.

Two students, Ella and Fiona, commented on their dislike of flexible courses. Ella felt online learning was "not conducive to good learning for me," and although Fiona was very IT capable, she missed the social and collaborative aspects of face to face learning. Ella found knowing what content to put into her literature review to be a problem. This was compounded by the fact that different lecturers had different expectations about how to do a literature review.

Fiona's biggest challenge was the literature review, despite the scaffolding provided by her lecturer. The conceptual shift from just using the literature to back up her own argument, to "setting the arguments against each other" was a big leap. She felt the "level of thinking and depth required" for masters work, compared to that of a postgraduate diploma, was challenging. Anne expressed similar views, but this time it was the change of thinking needed between qualitative and quantitative methodologies. "I was really struggling with trying to make what I believed was a very qualitative topic into quantitative." Once she had that thinking clear, she felt able to move on and craft her literature review. Carol was relaxed about the literature review process having done a number of them before, but found structuring the findings chapter the most difficult. Anne also noted she had re-written her findings a number of times.

Effectiveness of students' information seeking and information management. When asked to assess how effective they thought they were in terms of their searching, participants provided a range of answers based on their own perception of effectiveness. Most participants considered themselves effective in their searching while acknowledging

that there was more they could learn. They knew they were effective for the following reasons: awareness of the seminal authors in the area, talking with knowledgeable others, usually supervisors, passing of essay assessments and the use of a wide range of sources in the reference list.

Anne felt effectiveness should be judged by how much time it took to find the information - a kind of efficiency factor:

> Because it's about time, cos effective means successful that you nailed the right thing, but then is how fast it took you to get there, cos I guess when we've just been talking before about the fact that I know what I know, but I also know that there's some other stuff and so if I had that I would be more effective. I would be a more effective searcher if I had some of these other things that I know are there functioning better for me. So I think I do alright to meet my purposes. I know that I've got other things to learn.

While acknowledging that they got by, there was also a sense that they could be more efficient. Betty expressed it this way:

> I'm no whizz-bang person. I'd still say three to four out of 10 is my expertise. I have the very minimal stuff that gets me through. I don't have a lot of knowledge about things, but I get my answers met, and in that limited way, it serves my purpose, so I know there are always areas I could improve on.

Ella found accessing the full-text of an electronic article difficult – "cos I don't know how to get in them, and so I find the ones I find and hope that the ones I don't find aren't worthwhile." She described her efforts to get the full-text as "trial and error." Anne did not use Google Scholar because she could not often get to the full-text of an article. She felt that Google would provide access to scholarly articles anyway, without realising that the reason she couldn't access Google Scholar articles was because she wasn't working from within the library system.

Evaluation of information sources. When participants were asked how they evaluated online sources, all of them were aware of the need to evaluate the information they found. There was a range of perceptions around specific databases. Betty felt comfortable with the "reliability" of Google Scholar. She felt because it was offered through the University library that it would be "reputable." Ella felt the opposite about Google Scholar – "I don't know quite enough about Google Scholar to be too trustworthy of it, because it is internet after all. And I've got no idea who puts Google Scholar's stuff on, and how, and why and where." She tried to cross-check information from Google Scholar with another source, a journal or a book. Dee tried to verify the source of an online site by checking whether it was a university site, a published journal, or how often the article had been cited. She was unsure, however, what the number of citings of an article might mean. Fiona, who used Google with her students, preferred Google Scholar for her university work. Google Scholar "has purpose for me...I'm not just surfing."

Perceptions around the library catalogue and databases were generally much more positive in terms of the value of the material that was in them. The library multi-database was regarded as a reliable, authoritative source by those who used it.

When asked by what criteria they would evaluate a specific piece of information, there was a range of answers from "I just read it" through to cross-checking what was found in other databases, checking what other authors might have said about a particular piece of research, looking at the source of a website, how often it might have been cited, and looking at the rigorousness of the methodology. Dee was very conscious about the "validity" and "credibility" of information, especially when she found it so easy to access what she wanted. Anne made sure she checked what other researchers might have said about a particular piece of research, and tried to verify whether the author was considered credible in the field. Carol

looked to see whether opposing arguments had been presented, how rigorous the methodology was and generally how well the article was written.

Fiona, who was working with year five and six children, indicated she taught her students to look for bias in an article and to recognise whether it contained facts or opinions. If her students used a Google source, they also had to get a print source as well, because she did not allow them to "just write down a Google reference."

Conclusion

This research sought to answer the following questions: What influences the research behaviour of education masters students? How do education masters students approach information seeking? How capable and effective are education masters students in the way in they find, manage and evaluate information? What difficulties do education masters students experience in the research process?

The questionnaire revealed that demographic variables such as age, gender, time since last tertiary study, full-time or part-time status, year of masters study, and whether students were mainly on or off campus had little impact on students' information seeking and research behaviour. This is despite the fact that most of the participants were women and 69% were over 40 years of age. The interviews, however, indicated that there were negative influences regarding distance and flexible study, the pressure of combining work and study, and information overload. On the positive side, students were strongly motivated and wanted their research to "make a difference" in terms of their own practice and that of their colleagues.

Most participants were users of everyday technologies such as email, mobile phones and the internet, and this facility with technology spilled over into their perceptions about how successful they considered themselves to be in their information seeking. Over 84% of

students said they frequently/always found the information they were looking for, despite the fact that they reported unsophisticated strategies in both online searching and evaluating online information, and that a significant proportion of them (45% taught of students and 22% of research students) identified that they had problems finding the full-text of items they needed. The major finding of the interviews was the sense from the participants that they could have been doing things more effectively and efficiently in relation to their information seeking and their managing of information. They knew that they "got by" but they were aware that there were holes in their mental models of how the library databases and Google Scholar worked. Generally their information seeking was not informed by a coherent framework – it was "hit and miss."

Students' approach to the sources they used was determined mainly by electronic sources; course readings (most of which would be available through the University's learning management systems) and the library's electronic resources, Google and Google Scholar.

Adequately managing information proved problematical for participants in both the questionnaire and the interviews - most students who were using EndNote were under-utilising the capability of the software . Other aspects of the research process such as knowing which databases to use, referencing, selection of keywords, and framing research questions were also considered difficult by many students.

A recurring theme was that overall students considered themselves successful and skilful in their searching, use of information sources and other study tools. This positive impression was often belied by the difficulties they expressed. In other words they were probably over-estimating their success and skill.

Chapter Five: Discussion

Six major aspects from the findings of this research have formed the basis of the discussion in this chapter. Firstly and most significantly, the mismatch between students' perceptions of their success and the evidence of their capability has been discussed. Secondly, the role of demographic influences and how they affect research behaviour have been commented on. The results in this area were unexpected. The use of the internet has been a constant theme in this research and the answer to the title of this thesis "Is it all just Google?" has been addressed. Effective information management becomes even more critical when access to information is easy, so students' capability in managing information in the internet age formed a section of the discussion. The penultimate section addressed the interaction of students with experts, and the role those people might play in advancing student capability. Finally, the discussion turned back to the introduction of the thesis and discussed how students evaluated information and the link between evaluation and information literacy.

The Mismatch between Perception and Capability

One of the major findings of my research has been the discrepancy between how skilful students believe they are, in comparison to what they say they do. This has been evident in the way they search online, and in how they use information technology generally. Mostly students see themselves as successful users of technology, and as successful online searchers (84% frequently/always found what they were looking for), yet my findings suggest that their optimism is largely misplaced.

IT literacy. Students were asked both in the questionnaire and the interviews about their skill levels in using information technology. Students were frequent users of email, mobile phones, text messaging and using internet search engines. Ninety-six percent used

email daily and 67% used an internet search engine daily; 88% of respondents considered themselves skilled/very skilled at effectively and efficiently searching the internet. All of the interview participants were positive about their experiences of using information technology in their daily lives. In addition, they all felt confident in being able to pick up new technologies they needed for their work or study.

Self-reported skill levels in using IT systems such as the university email system, learning management systems, and printing and copying services were high, as would be expected for postgraduate students, 69% of whom had been studying at a tertiary institution within the last three years. Their confidence was equally high when it came to generic computer programmes such as Word and Excel. Nearly 83% considered themselves skilled/ very skilled. Self assessment, however, is likely to produce a far rosier picture than the reality (Grant, et al., 2009; Perrett, 2004). Word processing is obviously important to thesis students who need to be able format long documents, for example. It was impossible to tell from my study whether students were overly optimistic about their skills, but based on the research, it seems likely. At least one of the interview participants explicitly avoided the long documents format because "I've changed my tables and my headings and my positioning around so many times, I thought it would just annoy me to have to keep renumbering everything to do it" (Anne), not realising that the very action she was trying to achieve would have been made **easier** by use of such a format.

While respondents and interview participants regarded themselves as skilled in using the internet, there was less confidence when it came to using library databases. Responses in relation to catalogue and database use varied between taught students, and research students. Forty-eight percent of the taught students found it easy or very easy to use the catalogue and databases, while 36% of the research group did so. The difference between the two groups can almost certainly be explained by the fact that there is less use of the databases by taught

students i.e. that they used the catalogue more and were locating known items. It is interesting that while only a third to a half of all students found searching the cataloguing and databases easy, a much greater percentage (65%) considered themselves skilled in this area; a somewhat inconsistent finding probably engendered by the wording of the variables. One variable was asking about student skill, while the findings around ease of use of the catalogue and databases were framed in terms of difficulty. The contradiction in the findings does imply that students' assessment of their own skill may be exaggerated.

The taught students were also far more confident in their ability to decide which research tools (such as databases and journals) they should use – 50% found it easy/very easy to select what they needed, while only 25% of research students did so. This is also no doubt a reflection of the fact that taught students would be likely to be using material that had been provided to them in the form of course readings possibly digitised in the learning management system. The greater degree of independent research needed for the masters thesis or dissertation, required the research students to use the databases more and demanded more decisions from them about which sources to use.

While many students were positive about their skill levels using information technology generally when it came to using the library-related technology for tasks such as electronically requesting and transferring, using library interloan, keeping up-to-date using alerting services or RSS feeds, and managing their references electronically many students reported difficulties. It was discouraging that over a third of masters students considered themselves somewhat unskilled/unskilled in managing their references electronically. This finding was completely corroborated by the comments of the interview participants, all of whom considered they needed further training in the use of EndNote.

Online searching – the problem of keywords. Although it was not possible to observe participants in my study, the information they provided in the questionnaire suggested they used the combination of a top-down strategy (typing words into a search engine) and a bottom-up strategy (using words from questions). The mixed strategy suggests a level of expertise in searching (Navarro-Prieto, 1999), but since it was clear from the interviews that there was little planning involved in searching it is likely that the strategies used by the participants were somewhat less complex than Navarro-Prieto's model suggests.

Participants in my study generally expressed confidence in the way they selected search terms; 69% of taught students and 45% of research students found this easy/very easy. When it came to searching three quarters of them began by "typing words into a search engine", a technique which may well produce hundreds, if not thousands, of hits which are marginally relevant. Students had few methods for dealing with information overload. Only 39% said they "formulated sub-questions," a method of refining searches, and one person was unclear about that meant. Two respondents did not know what an advanced search option was.

How students selected keywords was teased out by a question in the interviews which asked students if they had a plan of possible search terms. Only one person indicated that they used such a plan. The library frequently discusses how to develop plans for the use of keywords in both groups and individual sessions, but for many students the idea of a planned approach for interrogating online sources was a novelty.

Standard library advice for students beginning an online search is to create a concept map to assist with topic searching. The concept map alerts students to the possible range of keywords for searching, allows for an objective view of keywords across a topic and develops a set of terms for effective and relevant information retrieval. More importantly, a successful concept map can mitigate against information overload. The concept map is often built up over a period of time in the initial stages of information seeking.

Each main concept of the topic is considered and synonyms sought. Under concept 1, for example, all the words are considered synonyms of each other and each would be separated by OR. Each of the concept columns are linked by AND. While the AND/OR mechanism was designed to assist searchers with the use of Boolean operators in searches, much of this function has been lost due to changes in internet search boxes. Typical keyword searches today are represented by use of natural language, and have become less precise for this reason. The use of a plan not only helps clarify relevant terminology for searching but also marks the difference between novice and expert online searchers.

At the University of Auckland library concept maps are represented as textual models. Table 17 represents an example of a concept map used for this thesis.

Table 17

Textual Model of Concept Map

Concept 1		Concept 2		Concept 4		Concept 4
researchers		information retrieval		online		education
OR		**OR**		**OR**		**OR**
postgraduate		information seeking		electronic		social sciences
doctoral		information searching		computer		humanities
masters		information needs		databases		
graduate		researching		internet		
novice-expert	**AND**		**AND**	www	**AND**	
student scholar				world wide web		
distance students				virtual		
flexible students				digital		
blended students				web		
thesis						
dissertation						

Online searching – retrieving what is found. Being able to find the full-text of a document is a key measure of effectiveness. While difficulties accessing full-text can sometimes be due to issues of website usability, it can also suggest deficiencies in the skills of those searching. The research students had far less problem with accessing full-text articles than the taught students, no doubt because research students had more practice in finding the articles they needed for their research. However, it is a concern that 46% of the taught students found it difficult/somewhat difficult to locate full-text items. Whether the full-text of an item could be retrieved placed constraints on the choice of databases students used, and even what references they used. Difficulties in the retrieval of full-text articles must cast some doubt on students' notions of skill.

Online searching behaviours – knowing when to stop. Interview participants were also asked at what point they stopped looking for information. Ease of searching and access can produce a glut of information which can result in poor choice of information through excessive filtering (Case, 2008), or can induce information anxiety "a condition 'produced by the ever-widening gap between what we understand and what we think we should understand. Information anxiety is the black hole between data and knowledge.'" (Wurman, 1989, quoted in Case, 2008, p.105). At least one interviewee said she found it difficult to stop searching because she was "scared of what [she'd] missed." Others, however, were far more pragmatic. The two students studying papers were guided by the number of references their lecturer had indicated was suitable, while the dissertation and thesis writers had mechanisms to control how much information they were prepared to look at. These revolved around tracking back to their research question to make sure they were "keeping on track," or searching until they had found the answer they wanted. While the idea of searching until you find what you want seems daunting, many students were going beyond even that. Forty percent of students in the questionnaire said they continued to search even after they had found the information they

wanted. This unbelievable result suggested that either students had amazing resiliency in searching and were keen to find more, or that they were not really finding what they wanted in the first place and needed to continue to search to find something that really met their research needs. The latter scenario seems far more likely given the widespread use of simple keywords searches which would be unlikely to deliver precision in the results.

In many areas of the student research process, there is a gap between students' perceived success and what the findings of this study indicate. It seems implausible that students could be so far wrong in the assessment of their own skills and capabilities, and yet this is a phenomenon reported by a number of studies (Fast & Campbell, 2004; Gabridge, et al., 2008; Perrett, 2004; Sieber, 2009). The affective aspect of searching the internet cannot be over-estimated. Students perceive searching the web to be fast and easy and it delivers results which match their time frames. Keyword searching had been described as "dumpster diving for information; you dig through a lot of garbage but you might find a clean, wrapped sandwich" (Coyle, 2011, Para., 21). The success that students experience might in fact be gained at considerable effort, particularly if so many students continue to search even after they have found "relevant" information as indicated in my research. Human nature allows us to "ignore the false hits and zoom in on the successes." (Coyle, 2011, Para., 21).

The message which needs to be taken from my research is that most students would benefit from further training; not just in the use of online sources, but in how to formulate effective searches for keyword searching. Searching for concepts using keywords is difficult and the imprecise terminology of simple searches can lead to information overload and excessive post-search filtering by the user.

Influences on Research Behaviour

At the beginning of my research I believed demographic variables such as age, gender, distance, work and study, time since last study and whether students were predominantly on or off campus would have a major impact on student research behaviour. While there were some isolated examples where demographic variables were an influence on research behaviour, such as distance and work and study, the overall effect of demographic influences was minor. One of the reasons for this may have been due to the demographic characteristics of the sample, especially in relation to gender.

Time is of the essence. Since 66% of students answering the questionnaire studied part-time, it was expected that there would be impacts on the research behaviour of such students. While the link between work and study was not made in the questionnaire, two of the interviewees who were studying part-time made comments about time pressures. Clearly, studying part-time was always a balancing act between their teaching, their home lives and their study.

Similar time pressures were felt by full-time students. Many full-time students were released from their schools to undertake full-time study for a year to complete their masters qualification. From interview data it was apparent that these students felt the pressure of time as well. Often the year was less than a full 12 months, and the students were expected back at their school before the end of the year. This in combination with internalising the large amount of information they collected for their studies meant they were conscious of the clock ticking, and their inability to allow themselves sufficient time for reflection. Time pressure was intensified in the cases where students were completing their masters by undertaking taught papers and a dissertation. Aspects of the dissertation needed to be completed at the same time as taught papers were being undertaken. Ethics applications and the gathering of the literature were piggy-backed onto course work adding to the sense of dealing with

multiple aspects of their study at one time. Students made it quite clear that they needed to have training sessions outside of school hours, in the weekends or the school holidays. The faculty already recognises this by scheduling many face to face classes late in the afternoon, but the library needs to recognise that the times that students are able to come to the library for assistance are often times when those librarians with the skills to help them have gone home. More flexibility is needed from the library in the scheduling of both class and individual sessions.

Since time is an issue, for both full-time and part-time students, the question of how it impacts on student study is an interesting one. There is some literature which suggests that term-time work does negatively impact on student achievement (Callender, 2008; Humphrey, 2006; Metcalf, 2003) however it is an area which remains comparatively under studied, especially in New Zealand. An Australian study (Devlin, James, & Grigg, 2008) argued that "the incremental transfer of the cost burden of higher education to the individual student is having a significant impact on the student experience" (p. 121). The authors noted that despite the claims made for flexible and distance learning "these modes of delivery arguably have not met the high expectations of widening access and broadening participation" (p. 121). Data from my interviews indicated that students, even those who felt adept using technology, preferred a face-to-face learning environment, but had chosen to study flexibly because of work commitments.

Studies looking at student information seeking often cite speed, convenience, ease of use, reliability, accessibility and cost-effectiveness as key drivers in the places students go to find information (Connaway & Dickey, 2010; Connaway, et al., 2006; George, et al., 2006; Online Computer Library Center, 2006; University College of London, 2008b). Underlying the desire for many of these features are time constraints imposed by work.

Age and gender. The majority of participants in both the questionnaire and the interviews were over 40. The masters cohort was dominated by experienced teachers coming back into education for a variety of reasons, often a desire to contribute to their school communities by making a difference, or a thought that they might want to continue into doctoral study. The Education Counts website notes that "students aged 40 and over now make up 30 percent of all students enrolled in tertiary education providers in 2005, compared with 16 percent in 1995" and that "the number of older students in postgraduate level study has increased 150 percent over the last decade" (Scott, 2006). The ages of the students who participated in my study were considerably older - nearly twice as old - than those in the general tertiary population.

The literature on older students at the graduate level is deficient, which is surprising considering the number of older students now in postgraduate study. Age could have been considered a factor in successful information seeking or in the research process itself, given that older students might not have the facility or experience with modern information technology, in the same way younger students have. This proved not to the case, except in the use of Google where those under 40 were more likely to use it as a source of information than those over 40.

The effect of gender could not be tested in my research as there were so few male participants (14% in the questionnaire); the gender ratio was heavily biased towards women – 73% of the total masters cohort were women, and 86% of those who answered the questionnaire were women. While this seems to be extraordinarily unbalanced, the gender ratios relate strongly to the statistics available for the gender of students generally in tertiary education in New Zealand. Approximately 70% of all tertiary students in 2005 in the 40 to 64 age group studying a degree or higher, were women (Scott, 2006). The literature is also

equivocal about whether gender is a differentiating factor in student information seeking and research behaviour.

Being off-campus. Only one participant in both the quantitative and qualitative studies was known to be a distance student. Her greatest difficulty was the sense of isolation she experienced and in trying to keep herself motivated. Her isolation from people and the University had an impact on what sources of information she used. She focused mainly on using the library's online databases because she knew she would be able to access the information. "I suppose the thing that influences me the most is the ease of access. Like how easy is it going to be for me to access a library book or a journal article say." Her information seeking preferences reflected those of distance students found in the international literature (Liu & Yang, 2004; Malki, 2005; Thórsteinsdóttir, 2005).

While there was only one known distance student in my sample, over three quarters of the students in the questionnaire indicated that they were off-campus, so it is very likely that the distance student's sense of isolation was felt by other students as well. What also seems clear is that access to digital resources means there are very few disadvantages, in terms of information seeking, to being off-campus.

However, students who work at a distance or off-campus, often have difficulty accessing the support services that the University provides for students. If students are to travel to make use of the services they want to have sessions chunked together so that the travelling becomes worthwhile – a one hour class is not practical for someone who has a four hour round trip.

Several students commented on their preferences for face to face learning. It is not known how widespread these kinds of views are, but in a faculty with a large number of

online (flexible) learning courses, it might be both interesting and beneficial to further investigate student views, expectations and success rates for this type of learning.

Is it All Just Google?

The answer to this question is both "yes" and "no." There is no doubt that Google played a large role in graduate student information seeking. Searches might start in Google and move onto library databases, or vice-versa. The student relationship with Google was complex but it was not exclusive. Textbooks or readings were the most frequently used sources of information, a finding similar to that of Head & Eisenberg (2009) in their large scale examination of how undergraduate college students seek information in the digital age. Over 84% of students in my study said they frequently/always used textbooks or readings. This was no doubt influenced by the 35% of students who were undertaking a masters degree by taught papers only. It is to be expected that those students would rely more heavily on required readings and textbooks. Another explanation for the high frequency of use might be that those students who were undertaking a dissertation were also required to complete two papers as part of their degree, so they would also be more reliant on course readings for that part of their degree. Since 62% of students in the survey were also in their first or second year of studying their degree, and most dissertation/portfolio students would complete the papers part of the degree first, the high frequency of use of textbooks and readings was not unexpected. Course readings are frequently digitised for students and are a convenient and time-saving way to access the required material. Since the source "textbook or other readings" was located in a single variable, it was not possible to tell what proportion was textbook use and what proportion was readings use.

The second most frequently used sources (79%) were the online resources of the library, including e-books, e-journals, databases and articles. Google (67%) and Google Scholar (66%) ranked third and fourth as the most frequently used sources of information. It

is possible that the closeness in these latter scores comes as a result of some uncertainties about the differences between Google and Google Scholar. While most students were wary about using Google for academic study, they weren't so sure about the veracity of Google Scholar, given the "Google" tag and the "beta" status still given to it after seven years. While Google wasn't used as primary source by the interview participants, this finding needs to be regarded with a degree of caution. It is contradicted by the questionnaire data which indicated that 67% of students said they used Google frequently/always for their study. A possible explanation for the discrepancy is that in a face to face interview with a librarian (as the researcher), interview participants under-reported their use of Google for study.

Interpersonal sources such as supervisors were also key in assisting students on where to look for information, as has already been discussed, but they were not the most frequently used sources. This is understandable given that accessing supervisors or lecturers is not always easy or convenient, and convenience is a key impetus in decisions about where to look for information.

In comparison to the high use of library electronic resources, it was noted that only 21% said they frequently/always visited the library for browsing. This is still 10% more than those who frequently/always consulted a subject librarian, so the lack of use of subject librarians is not accounted for by the fact that students are not coming into the library. Physical use of the library would also be determined by other factors such as full-time or part-time status and by the availability of materials in electronic form. Students who are only on campus once a week would be more inclined to rely on electronic resources.

Interview participants were asked what their first choice of source would be, and then what was the easiest source to use. In most cases the choice of first source and the easiest source to use were the same – ease of use was a key factor in choosing a primary source.

Access to the full-text of a document was also another reason. Students were looking for two things in their choice of electronic resources – something that would deliver the required information and something that was easy to use. This finding is reflected in a recent analysis of 12 major user behaviour studies in the United States and the United Kingdom called *The Digital Information Seeker* (Connaway & Dickey, 2010). It was noted that across all studies "regardless of age or experience, academic discipline, or context of the information need, speed and convenience are important to users." (p. 4).

Given that the use of digital sources for student research will become more prevalent, there are implications for libraries. Much of subject librarians' time is currently spent teaching students how to use those resources, and yet it is clear from the earlier discussion, that the way that students use them is far from optimal. More thought on the part of libraries needs to be given to not just teaching how to search specific databases, but to teaching students generic skills in relation to online information that can be used across many different types of database; instead of emphasising the differences, librarians need to be identifying similarities, and the best way to do that might be to use Google as a starting point and point out how effectively searching Google might also make them more effective searchers in academic databases.

In addition, students have hazy concepts of the relationships between different electronic sources. Their mental models in this area, as in the area of information management, prevent them from knowing which might be the best source to answer a particular question. Clarification of the relationships between electronic sources should be a key role for libraries; as should the clarification of concepts about Google itself. Few students have knowledge of the "deep web" for example, or realise that despite the hundreds of thousands of hits they retrieve, they are really only searching the tip of the iceberg.

Keeping Information Found

Managing information was the area where students showed themselves least capable. Approximately one fifth of both taught and research students found it somewhat difficult/difficult to manage the results of their searches, and 35% of students felt they were somewhat unskilled/unskilled in managing references and using bibliographic management tools such as EndNote. Given that 73% frequently/always printed out the results of the searches, it is probable that they had problems managing both electronic and print copies of their information (Williamson, et al., 2007). Many students do not have mechanisms for organising their printed material – no students were aware of simple tips such as numbering their printed documents by the EndNote record number and filing them accordingly.

Five of the six interview participants used EndNote to manage their information, but usage of the software was in its most basic form i.e. a place where students stored their references and PDFs. Only one student said she directly exported references from Google Scholar into EndNote, and only two students were using the Cite While You Write (CWYW) feature of EndNote.

How research students manage their information has been investigated by a number of studies. Geroni & Partridge (2000) discovered that "students frequently reported on their information management in a way which suggests that they are untutored in the skills of creating 'mental maps' of their research data, which are necessary for it to be structured and organised in an orderly fashion" (p. 227). Since 2000, little seems to have improved in the way students manage their information, particularly in relation to bibliographic management software. Randall et al. (2008) suggested that the time needed to become proficient with such software outweighed the benefits. "All the students we interviewed struggled to achieve proficiency in both traditional and digital technologies. We did not interview a single student who had settled into a satisfactory routine in either" (p. 2).

The University of Auckland Guidelines and Principles on Information Literacy (University of Auckland, 2011) are based on a framework developed by the Australian and New Zealand Institute for Information Literacy which states that an information literate student "manages information collected or generated." The masters students in my study struggled to manage their information. A key aspect of the struggle was not just the housekeeping aspect of information management, but the conceptions, or mental models, students had about information generally. Students need to be aware from early in their studies of the big picture of where their information fits and how to apply techniques which will allow them to both manage it in a physical sense and retrieve it at will. More importantly, they also need to appreciate broad concepts about information and making meaning from information.

Novice-Expert Interaction

One of the major influences on students' research behaviour was people who were able to provide expertise. Nearly always this was or supervisors or lecturers. There were negative influences such as not knowing what the lecturer required for an assignment, or not having enough information from the lecturer. Around half the taught students said this was somewhat difficult/difficult. Despite this, 41% of students indicated they frequently/always talked to their lecturer or supervisor, and another 41% indicated they sometimes did so.

Positive influences were much more likely to be noted by the research students who developed a closer relationship with their supervisors than taught students did with their lecturers. The interviews fleshed out the nature of this relationship which was often tinged with both gratitude and frustration. Support from supervisors was wide-ranging, but not all students received the same kind of help. Supervisors suggested readings, gave guidance in narrowing down research questions, provided feedback on draft chapters, gave advice and

tutorials on how to use new software, helped with coding, pushed students back into their own learning and generally acted as support for students.

While this was appreciated there were comments about the frustrations of working with supervisors as well. One student commented that there was sometimes conflicting, or at least confusing advice from each of her supervisors; two others wished supervisors had taken a more active role in guiding their research, in helping them to cut away the detritus of their information searches and honing in on the essentials. At the same time as they voiced the supervisors' lack of intervention as a criticism, they also noted that the struggle to make meaning from the literature on their own was an important step in refining their own learning.

The significant role that supervisors of graduate students play in the research process and in information seeking has been highlighted in the literature. (Barrett, 2005; George, et al., 2006; Heinstrom, 2004; Junni, 2007; Williamson, et al., 2007). However, my study found that the roles were not well defined or consistent across all supervisors. It was noted by students that supervisors either did not have some information and/or gave conflicting advice. There were varying levels of help and support given to students; some supervisors were quite hands-off, while others seemed to be fully engaged in the process, sometimes even helping in aspects of data analysis. While training exists within the University for new supervisors, it seems that as time goes by the knowledge from this training is diminished, and suggests there is a need to update supervisors with new skills and training. Some of the inadequacies noted by students in the supervision process are being partially addressed by the faculty in the form of a postgraduate website for students. Further enhancements to the website will make it equally useful for supervisors.

While supervisors played an important role for students in both information seeking and in the research process, it was clear that librarians did not. When asked how often they consulted a subject or reference librarian, only 10% of respondents to the questionnaire said

they did this frequently/always. A further 16% had *never* consulted a subject librarian and 41% *infrequently* used them. These figures reflect the Education for Change study (2010) where a high proportion of young doctoral students across all disciplines had never consulted a subject librarian. The subject librarian service is one of the key services provided by the library to assist students, in particular postgraduate students, with their studies. The nature of the services they provide, either as one to one consultations or in classes, is assistance in information seeking and searching, including instruction on creating concept maps; advice and instruction on bibliographic management (EndNote); instruction on how to use library databases; advice and tips around the use of information, and advice on using library systems such as interloan.

The low frequency of use of subject librarians indicated in the questionnaire was disappointing, and was also reflected in the interviews. Only three of the six interview participants had made time to see a subject librarian, and all three of them had received help using EndNote. Barrett (2005) commented that librarians were really only consulted to try and track down specific works, an important role, but a somewhat limited one. Barrett's findings were also borne out by later studies (Harrington, 2009; Randall, et al., 2008; Sadler & Given, 2007).

The role of subject librarians is not clear to postgraduate students, and there are issues around accessing them at suitable times. Few students have accessed personal help from a subject librarian, and they are not rated highly as a source of information for students' study. The expertise of subject librarians, and how it can be used to assist students in the research process, needs to be explicitly outlined not only to students, but also to supervisors. It is an irony that the very capabilities that students need, and that this research has shown to be lacking, are the capabilities that librarians are able to offer. The role of actively marketing its services to postgraduate students needs to be undertaken more seriously by the library. In

addition, subject librarians need to be around at times that suit the students who are full-time teachers. Reviewing the support services for students provided by the library might necessitate changes to work patterns for professional library staff.

Finally, the difficulties expressed by students in the research process itself signal that more help needs to given, and that the roles between the library, supervisors and other student support providers need to be locked together more seamlessly.

Evaluation of Information Sources, Information Literacy and Teaching

Student effectiveness in research can be signalled by how effectively students evaluate the information they use, especially information from the online environment. Data from the questionnaire in my study indicated students followed the trend found by OCLC (Online Computer Library Center, 2006). The most frequently used method of evaluating information was scanning through it, which suggested students were using "personal knowledge", as had been found by OCLC. In a deeper investigation of this question in the interviews, however, all six students were cognisant of the need to evaluate online information. In nearly all cases Google was regarded as being unsuitable for academic study The library databases and Google Scholar were seen as being more "reliable," and having more "authority."

The notion that information should or could be cross-checked was a well-embedded one and was supported by data from the questionnaire. However simple tips such as looking for the website update date or checking that the URL was from a reliable provider were largely underutilised. Twenty percent of taught students had some difficulties in evaluating what constituted a credible source. Students would benefit from more instruction about reliable sources. Google Scholar is recognised as a reliable source by the library (it sits under the umbrella of library databases), but some students seemed confused by the "Google" tag

and were hesitant to use it. One student exhibited sophisticated mechanisms for evaluating what she had found – checking how often it was cited, looking for opposing arguments and noting how rigorous the methodology was. If more students were aware of these kinds of methods for evaluating sources, they might have more confidence in using a wider range of sources, including Google. The question of evaluation becomes more imperative as more information becomes available on the internet. The fact that Google now provides some access to scholarly information only adds to the confusion.

The ability to evaluate information requires metcognitive skills related to individual epistemic beliefs which have been found to change depending on the context of the information need. Evidence suggests that students do not transfer what they know about evaluation to areas outside their field of academic study (Mason & Boldrin, 2008; Mason, et al., 2010). The lack of transference of evaluative skills has repercussions for students who are teachers.

In nearly all cases, the participants in this study were practising teachers. Since evaluating information is a skill teachers need to teach to their own students, it is important they have the skills themselves. A recent New Zealand study (Ladbrook & Probert, 2011; Probert, 2009) indicated that few secondary teachers explicitly taught their students how to evaluate a website. In the primary sector, the National Education Monitoring Project (NEMP) Report on Information Skills noted that "students are fairly good, particularly at year 8, at finding and using basic information, but not as good at judging the merits of that information, comparing multiple sources of information, or organising and employing information to buttress arguments" (J. Smith, et al., 2009, p. 3). Perhaps more tellingly, the overall information skills of year 8 students have not changed in the 12 years the reports have been gathered. The outcomes of the New Zealand research indicate that New Zealand

teachers are not passing on information skills to their students. The reason could well be that they do not have the skills themselves.

Conclusion

The results of my research point to some inadequacies in the research-related and information literacy capabilities of our early postgraduate students. In order for students to successfully migrate the passage to doctoral study and beyond, the closing of some of these gaps seems crucial to the quality of the student research output and the strategic goals of the University. But even more critically the gaps that need to be addressed are having an impact out in the education community. Unless pre-service and in-service teachers develop those information capabilities which will make them both good researchers and good teachers, the trends noted by NEMP will continue to show up in schools. In addition, the propensity of students to over-estimate their abilities in some of the key research areas needs to be recognised by all who are involved in teaching and learning in higher education.

Chapter Six: Conclusion

This study began as a desire to see if New Zealand masters students reflected the trends in information seeking that were evident in the literature. No studies of either graduate or undergraduate information seeking in New Zealand had been conducted so it was unknown whether New Zealand students followed the paths indicated by the international literature. My research came to involve not just how students sought information for their studies, but also what factors influenced their research behaviour, and how capable and effective they were in the way they found, managed and evaluated that information. Driving the impetus for this research has been a desire to have empirical evidence on which to base changes to library services for postgraduate students.

Inevitably, any research on information seeking within a tertiary library context will link to information literacy. Information literacy has been a key plank in academic library activity around the world for more than 30 years. Unfortunately, beyond library realms, there is little recognition, or even understanding of the concept. Despite this, the University of Auckland library has made impressive inroads into integrating information literacy into a number of disciplines such as business, law, medical and health sciences and engineering. Part of the impetus of my research was to build a foundation for the furtherance of information literacy for postgraduate education students.

The findings did not deliver any real surprises. On the whole, New Zealand graduate students reflected the behaviours noted in the literature. Demographic influences seemed to have a negligible impact of information seeking, even for the distance student. The role of people such as supervisors and librarians certainly reflected the international literature – supervisors had an enormous role in information seeking, and librarians did not. Factors such as time and information overload were linked to the use of electronic sources; limited time

driving students to sources where access to required information was guaranteed, and the concomitant use of such resources leading to the need to filter an enormous amount of information. How to limit the amount of information through effective searching is an area that still needs to be developed for most masters students.

Students relied heavily on electronic sources of information and they did use Google, but Google was by no means their first choice of source – textbooks and course readings were, followed by the online resources of the University of Auckland library, Google and Google Scholar. The inter-relationship between students' use of Google and of the library databases is one which would bear further investigation. While it was pleasing to see the use of trusted library resources, students also indicated some difficulties in using them

Managing information was a weak point for education masters students. They "got by" but failed to use the full capabilities of EndNote, or even some of the basic features. They still collected large amounts of information in paper and no doubt had primitive systems for managing this as well, although how they managed paper was not tested in this research.

Students were conscious of the need to evaluate information, and did cross-check information from one source against another in an attempt to verify its validity. Beyond that, however, there was little knowledge of how to evaluate whether information was credible or not.

There were clear problems, what I call sticking points, in the research process which came through strongly in the questionnaire. Areas such as narrowing down topics, framing research questions, and synthesising information for cohesive argument were all considered problematic or difficult.

A mixed methods methodology was used in this research project. It was chosen so that the interviews could elaborate on some of the information in the questionnaire. The method worked well with the period between the data collection and analysis of the questionnaire, and the data collection for the interviews, allowing for new insights to be added to the indicative questions that had been submitted for ethics approval. The additional questions related to: everyday technology use, the choice of taught papers or dissertation/thesis, the hard/easy parts of students' study, tracking further information, the use of search terms, the number of result pages of an online search students would be prepared to look at, stopping looking for information, the process of the literature review and the affective aspects of searching Google, Google Scholar and library databases

My research has given an insight into the information seeking and research processes of New Zealand tertiary students. It has also added to the small, but growing, body of research on masters students. Until recently, masters students have largely been an ignored group, either sandwiched into the general "graduate" label, or ignored altogether in preference for studies on undergraduate and doctoral students. I believe students at the masters level are of strategic importance. Successful masters study experiences will feed more students into the doctoral programme. It might also improve the retention and completion rates for masters students – 39% of New Zealand masters students between 2002 and 2009 did not complete or were not enrolled in an eight year period; similarly the 8 year qualification attrition rates stood at 41% for masters students across all universities (Ministry of Education, 2011).

Implications of this Study

The major implication from this study is that masters students need build their capabilities in aspects of the research process by accessing expertise not just from supervisors, but also from other learning support agencies from within the faculty and the University. Students need a cohesive instructional programme along the lines of the Doctoral

Skills Programme currently run by the University of Auckland. One of the significant differences, however, would be that the programme would need to be faculty-based and would focus on the masters student as researcher. Students also need a one-stop shop for information. The existing faculty postgraduate website fulfils this function already, but could be expanded to co-ordinate all masters student support available.

A masters support programme could cover the following topics which are arranged under possible faculty areas of responsibility, although many of these will overlap:

Library

- Raise awareness of the roles of subject librarians in terms of their ability to assist students with information seeking and managing
- Develop instructional programmes at times that suit postgraduate students including distance students
- Strengthen the use of concept mapping for keyword searching in electronic databases
- Teach students how to use Google successfully – they are using it anyway
- Highlight advanced searching options for use of databases
- Teach specific skills on how to evaluate (online) information
- Develop good mental models of various electronic information sources so that students can "see" how these fit together
- Develop student awareness of ways to keep up to date e.g. alerting services and RSS feeds
- Bridge the gap between using bibliographic managers and information management generally – rethink teaching programmes to include ideas around making meaning from information

- Investigate the ways in which social networking and mobile technologies could be used to assist postgraduate students

Faculty Postgraduate Centre (including supervisors)

- Clarify the roles of supervisors for masters students
- Develop student ideas about possibilities for publication since many of them are keen "to make a difference"
- Develop a set of exemplars of both dissertations and theses
- Develop broader understandings of the research process, in particular skills around the literature review
- Give specific advice about narrowing the topic and framing the research question

Student Learning

- Advise students about the best ways to manage their dissertation/thesis document (version control) and the best ways to back it up (including cloud storage)

Limitations

Inevitably, there are limitations to this study. The literature review was generally limited to "countries like ours." The jurisdictions mainly covered were United States, United Kingdom, Canada, Australia and some European countries. There has been an increasing amount of research coming out of Asian countries, particularly China, in the last few years. This was generally not used but does form fascinating reading. There were also those countries who do not have the same educational infrastructure as New Zealand or whose academic library systems were unfamiliar to me, such as Greece and Israel. In that sense, then, this thesis has a very "Western" bias. I am conscious that it is also "library-centric"

despite the attempt to examine some aspects of information seeking through the lens of educational literature. Librarians hold particular views of the research process which do not necessarily match views held by students or academic staff; the fact is, however, that much of the literature on student information seeking comes from within the field of library and information science.

Disciplinary differences in student information seeking were not examined, mainly because this cohort was from one disciplinary background, education. Therefore the literature review focused on the social sciences, humanities, education and psychology. Significant work on student information seeking has been done in other areas such as medical and health sciences, but this was not generally considered. For this reason it is unclear how transferable the results of this inquiry will be. It is expected that much of it might be reflected in other tertiary educational faculties, and possibly arts and humanities disciplines. Teacher education, however, is directed toward a professional qualification, and students in an arts faculty may well behave differently.

At the beginning of this research I had hoped to be able to comment on differences in information seeking which may have been based on ethnicity – hence the question in the questionnaire asking about students' first language. However, 73% of the total cohort indicated that English was their first language and 93% of those who answered the questionnaire indicated the same. This left little possibility for such as examination which was unfortunate considering nearly 8% of the total cohort was Asian, and 10% were Pacific Island students.

Possibilities for Further Research

A subject such as this one which covered a wide range of capabilities needed not just in information seeking, but in the research process itself, obviously lends itself to a number of areas of further research.

From my point of view it would be interesting to examine more closely the difficulties students have around the literature review. This part of the research process was flagged by a number of students as being complex and an area where they felt they needed more support.

Another area of research to develop would be to undertake research around what students actually do, rather than relying on self-reporting. Observation of how students undertake information seeking would expand the data that have been collected for this study, and may alter the perspectives that have been gained.

Reflection

This study began from an interest in how students gathered the information they needed for their study. The interest was fuelled by my job as library manager at the Faculty of Education and as a result of readings which indicated that the internet and Google dominated the way students found this information. The interest was both personal and work-related; personal in the sense that I was also a student who had undertaken postgraduate study after a long time away from formal education; work-related because during my postgraduate diploma studies I had become aware of the Sisyphean role that academic libraries have played in the last 30 years to promote the issues of information literacy. There was also a more prosaic, but not unimportant reason – was the library getting value for money in terms of what it spend on electronic databases if, as the literature suggested, students were simply using Google?

My background both as a teacher and a librarian has impacted on my thoughts around this study. Information literacy has two faces in an education institution – students need to be information literate in terms of their own study and for lifelong learning; as pre-service or in-service teachers their understanding of the importance of information literacy is even more critical. The two aspects are not mutually exclusive but they do impose on a teacher training institution more of a responsibility than in other areas of the University. How to promote this within the faculty has occupied my thoughts for a good few years now.

At the point of data collection, I was also a member of the cohort being studied. This raised some interesting issues around the closeness of the researcher to the subjects of the research. The ethical considerations were not difficult, but how that closeness influenced the collection of data brought its own challenges. Inevitably, I believe, there will have been some creep of my views into the data interpretation – a degree of bias engendered by my own professional observations and experiences. I have tried to be as conscious of this as possible and limit the effect of it. Some of this closeness I believe was reflected by my role in the interview process. In hindsight, I can see a little too much of the interviewer.

I was fortunate indeed to have had the support of my fellow students in this project. Despite their enormously busy schedules they were generous with their time. What impressed me most about the participants was their passion for their teaching and their real desire to "make a difference" for their students. If they truly represent the faculty's postgraduate population it would seem teaching is in good heart.

I have found the research process has been immensely rewarding and intellectually stimulating. I have learned how to use new software, and had the opportunity to reflect on how what I have learned may have some practical application. I would very much like to see a co-ordinated instructional framework for masters students, bringing together all those

responsible for supporting masters education in the faculty. Some steps along this route are already beginning and I hope that the outcomes of this research will further that process.

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Appendix A

Questionnaire

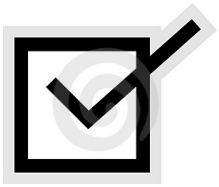
Project Title: Information seeking: The research behaviour of education masters students

Researcher: Chris Moselen

The focus of this research is the information seeking behaviour of masters students at the Faculty of Education, University of Auckland. I am conducting this research with a view to improving Library services to future cohorts of masters students.

As explained in the Participant Information Sheet which accompanies this questionnaire it is an anonymous questionnaire and the answers that you give will be analysed and reported statistically.

Your participation is entirely voluntary and by returning this questionnaire you agree to participate in this research.



Please tick the box alongside the appropriate response

When you have completed this questionnaire:

- please return it in the enclosed stamped, addressed envelope
- If you are willing to participate in an interview, please also include the yellow form which indicates this.

1. How old are you?

- 20-29 years ☐
- 30-39 years ☐
- 40-49 years ☐
- 50 years or older ☐

2. Please indicate your gender:

- Male ☐
- Female ☐

3. What is your first language? _____

4. When was the last time you studied at a tertiary institution (whether or not you completed a qualification)?

- 1-3 years ago ☐
- 4-6 years ago ☐
- Between 7 and 12 years ago ☐
- More than 12 years ago ☐

5. Are you studying:

- Full-time ☐
- Part-time ☐

6. Which year of your masters degree are you in:

- 1st or 2nd year ☐
- 3rd or 4th year ☐

7. As a masters student, how many times a week are you physically on campus?

- 5 or more times ☐
- 2-4 times ☐
- Once a week ☐
- Not on campus at all ☐

8. What is the name of the degree you are studying towards?

- Master of Educational Leadership ☐
- Master of Professional Studies ☐
- Master of Education ☐

9. What kind of information technology user are you in your **EVERYDAY LIFE**? How often do you use the following for work, study or recreation? *Tick the **one response** for each item that best describes this*.

	Never	**Once per year**	**Once per quarter**	**Monthly**	**Weekly**	**Several times per week**	**Daily**
Mobile phone							
MP3 player or iPod							
Email							
Text message							
Instant message							
Spreadsheets (such as Excel)							
Presentation software (such as PowerPoint)							
Internet search engines such as Google							
Social networking sites such as Facebook, Bebo, MySpace							
Social bookmarking/ tagging (such as del.icio.us, Diigo)							
Online games either through the internet or computer based							
Online virtual worlds (such as Second Life, World of Warcraft, poker etc)							
Voice over internet Protocol (VoIP) from your computer (such as Skype)							

10. Do you own a handheld device that is capable of accessing the internet (whether or not you use that capability)? Examples include iPhone, Blackberry, iPod touch, PDA.

    Yes – **Go to Question 11** ☐

    No, but I plan to purchase one in the next 12 months – **Go to Question 11** ☐

    No, and I don't plan to purchase one in the next 12 months – **Go to Question 12** ☐

11. Which of the following services would you use if they were available on your handheld internet device?
    Tick all those that you would use.

    Library catalogue ☐

    Library databases & Articles ☐

    My library patron information ☐

    Research study and help available through the library website ☐

    Course pages available through the library, Cecil or Moodle ☐

    Email system ☐

    None of these ☐

12. Where do you do most of the work on your assignments/research? *Tick **one** of the following.*

At the library on the Epsom Campus ☐

At another University of Auckland library ☐

At an office or study space on a University of Auckland campus ☐

At an office or study space at home ☐

Other. Please specify: ☐

13. What is your skill level using the following information technology systems, programmes or resources? *Tick the **one response** that best describes your skills for each item.*

	Unskilled	**Somewhat unskilled**	**Neither skilled or unskilled**	**Skilled**	**Very Skilled**	**Do not use**
Using the UoA IT systems (such as student email, Cecil, Moodle, nDeva, printing & copying)						
Using generic computer programmes (such as Word, Excel, Access)						
Using the internet to effectively and efficiently search for information						
Using UoA's library website for catalogue searching (including finding books, and requesting and transferring books between						
Using UoA's library website for article searching						
Keeping up-to date in your research (use of tools such as alerting services, RSS feeds)						
Using specific electronic education databases such as ERIC or ProQuest Education						
Finding resources beyond the UoA (e.g. inter-library loans)						
Finding/using data and datasets online						
Managing references and using tools (e.g.EndNote) to do this						

14. Below are a number of *sources* of information for your study. *Tick the **one response** which best indicates how often you would use **each** of the sources listed:*

How often would you:	**Never**	**Infrequently**	**Sometimes**	**Frequently**	**Always**
Use a textbook or other reading(s) from the class					
Talk to the lecturer responsible for the course or your supervisor					
Consult a peer or colleague					
Use a general search engine such as Google to find resources					
Use an academic search engine such as Google Scholar					
Use an online community encyclopaedia such as Wikipedia					
Use and online scholarly encyclopaedia such as Britannica					
Use the website of an organisation or person (including publishers)					
Use the online resources (e-books, e-journals, databases and articles) of the UoA library					
Consult a reference or subject librarian					
Visit the UoA library (Sylvia Ashton-Warner at Epsom or other campus libraries) to browse the shelves					
Buy a book that has information you could use					
Other please specify below:					

15. By the end of the search process have you usually found what you are looking for, or something of equal relevance? *Tick the **one box** which best describes your situation.*

Never ☐

Infrequently ☐

Sometimes ☐

Frequently ☐

Always ☐

16. Once you have found information relevant for your assignment or research, what do you usually do with it? *Indicate your behaviour by ticking the **one** most accurate response for each item in the list*.

When I find the information I want I:	**Never**	**Infrequently**	**Sometimes**	**Frequently**	**Always**
Read it/work with it online					
Borrow it from the Library					
Read it in the Library					
Make handwritten notes of or from it					
Make electronic notes of or from it					
Photocopy it (or excerpts from it)					
Download it (or excerpts from it) for later use					
Print it out (or excerpts from it)					
Book mark it					
Add it to a reference list such as EndNote					
Do something else with it. Please describe what you do:					

17. When you search for material **online (either library databases or on the www),** indicate the *strategies* you use for searching: *Tick the **one** best answer for each strategy listed below.*

Strategy used for searching online:	**Never**	**Infrequently**	**Sometimes**	**Frequently**	**Always**	**I am not sure what this means**
Search for general background information on a topic						
Formulate sub-questions						
Use words from my questions as search items						
Determine the best places to search for this information						
Start by typing words into a search engine						
Determine new search terms during the search process						
Use the option “advanced search”						
Other. Please specify						

18. When you search for material **online (either library databases or on the www),** indicate how you *evaluate* the sources you have found. *Tick the **one** best answer for each strategy listed below.*

Strategy used for evaluating online information:	**Never**	**Infrequently**	**Sometimes**	**Frequently**	**Always**	**I am not sure what this means**
I examine the number of results found						
When a search produces too many results I narrow my search						
I quit searching the moment I find relevant information						
I scan through the information found						
I use the top list results						
I manage the information found so I can find it easily again						
I examine the results on subsequent result pages						
I examine the URL to evaluate information						
On the www I examine the date of the last update						
On the www I examine the rest of the webpage to judge the reliability of the information						
On the www I examine whether the information consists of facts or opinions						
I carefully read the information found						
I use more than one source to answer my question						

19. What type of degree are you studying?:

- ☐ Taught masters (papers only) – **Go to question 20**
- ☐ Taught masters with dissertation or research portfolio – **Go to Question 21**
- ☐ Research masters – **Go to Question 21**

20. TAUGHT MASTERS (PAPERS ONLY) answer this question:

Indicate the degree of difficulty you have with each of the following examples.
*Tick the **one** best response for each item.*

It is difficult when:	**Difficult**	**Somewhat difficult**	**Neither difficult nor easy**	**Easy**	**Very easy**
I don't have enough information from the lecturer to begin the assignment					
I have to figure out what each lecturer wants in his or her assignment					
I have to narrow down a topic and make it manageable					
I have to select the keywords and vocabulary to use in my searching					
I have to decide which research tools (such as databases and journals) I should use					
I need to search the UoA library catalogue and databases					
I need to evaluate what constitutes a credible resource					
I have to find the fulltext of an item in print or online using the UoA library catalogue or databases					
I need to manage the results of my searches					
I have to write my assignments using correct referencing and avoiding plagiarism					
I have to write in an academic style					

21. TAUGHT MASTERS WITH DISSERTATION or RESEARCH PORTFOLIO or RESEARCH MASTERS answer this question:

Indicate the degree of difficulty you have with each of the following examples.
*Tick the **one** best response for each item.*

It is difficult when:	**Difficult**	**Somewhat difficult**	**Neither difficult nor easy**	**Easy**	**Very easy**
I have to choose a topic and create the conceptual framework for my research					
I have to frame the research question					
I need to select the keywords and vocabulary to use in my searching					
I have to decide which research tools (such as databases and journals) I should use					
I need to search the UoA library catalogue and databases					
I have to evaluate my search results and then review my keywords or my research question					
I have to find the fulltext of an item in print or online using the UoA library catalogue or databases					
I have to request an item from another library in NZ or overseas					
I need to manage the results of my searches					
I have to synthesize the information I have found into a cohesive argument					
I have to write my thesis using correct referencing and avoiding plagiarism					
I have write in an academic style					

APPROVED BY THE UNIVERSITY OF AUCKLAND HUMAN ETHICS COMMITTEE on 12 May 2010 for (3) years, Reference Number 2010/174

Appendix B

Interview Questions

1. Are you currently doing a thesis or dissertation? Please tell me about your research topic.
2. Tell me something about the last time you searched for information for your study.
3. How many times have you accessed information for your study this week?
4. Where did you mostly do this?
5. Where are the places you find most of your information?
6. What is the easiest kind of information for you to find?
7. Who influences you the most when it comes to places to look for information?
8. What other things influence the way you look for information?
9. Talk about some of your information seeking successes – think of a recent assignment or research project.
10. Now think about some of the difficulties you have finding information – explain what they are.
11. In terms of locating the information you need, do you think you have all the skills you need, or are there areas where you think you would benefit from some additional training. What might they be?
12. What sort of training would you like?
13. What would be the best way for you to receive that training, and what time would suit you?
14. How effective do you think you are at finding information for your research?
15. What would be the one thing that would make researching easier for you?
16. Are you aware of any services provided by the Library that might help you in your information seeking?
17. If you are working online through a search engine how do you evaluate the information you have found? Would you use information you found through Google? What about Google Scholar?
18. Just to finish off can you please give me some demographic information? – age, first language, last time you studied at a tertiary institution, programme enrolled for, full-time/part-time, on campus or flexi.

APPROVED BY THE UNIVERSITY OF AUCKLAND HUMAN PARTICPANTS ETHICS COMMITTEE 12 May 2010 for (3) years, Reference Number 2010/174

Appendix C

Dean's Consent

CONSENT TO SITE ACCESS
(Dean, Faculty of Education)
(This consent form will be held for a period of six years)

Project Title: Information seeking: The research behaviour of education masters students

Researcher: Chris Moselen

I understand the nature of this research. I have received a description of the research and have had an opportunity to obtain satisfactory answers to any questions. I understand that the participation of the students will be entirely voluntary.

I allow site access to the Faculty of Education, Epsom Campus at The University of Auckland, to conduct this research project, and in particular:

- For information and anonymous questionnaires to be sent to students currently enrolled in the Master of Educational Leadership, Master of Professional Studies and the Master of Education. I understand that their names and addresses would be produced on labels by the Education Student Centre, Faculty of Education, The University of Auckland, and that the information will be posted by a Faculty staff member, acting as research assistant, who has signed a confidentiality agreement to prevent the researcher having access to student data.
- For the researcher to conduct interviews in a meeting room in the Sylvia Ashton-Warner Library, Epsom Campus, The University of Auckland.
- I give my assurance that the participation or non-participation by students will not affect their grades.

Associate Professor Graeme Aitken
Dean
Faculty of Education
The University of Auckland

Signed:_____

Date: _____

APPROVED BY THE UNIVERSITY OF AUCKLAND HUMAN PARTICPANTS ETHICS COMMITTEE on 12 May 2010 for (3) years, Reference Number 2010/174

Appendix D

Education Student Centre Consent

PARTICIPANT INFORMATION SHEET

(Education Student Centre, Faculty of Education)

Project Title: Information seeking: The research behaviour of education masters students

Researcher: Chris Moselen

Education Student Centre Manager
Phone : (09) 623 8815 Extn.
Epsom Campus
Faculty of Education
University of Auckland

Dear Mrs Dougan

My name is Chris Moselen and I have just begun a Master of Education here at the Faculty of Education. I am working part-time on a research thesis under the supervision of Tony Hunt and Dr. Claire Sinnema. The focus of my research is the information seeking behaviour of masters students here at the Faculty of Education. I am conducting this research with a view to improving Library services to future cohorts of masters students. Outcomes form the research may also be useful for the Faculty of Education and other tertiary education institutions.

I have recently received ethical approval from The University of Auckland and consent to site access from the Dean, Associate Professor Graeme Aitken, for the proposed research to be undertaken as part of my Master of Education degree. In addition, I have received permission from him for the names and addresses of masters students currently enrolled in the Master of Educational Leadership, Master of Professional Studies and the Master of Education to be accessed.

The data gathering will consist of a questionnaire sent to all masters students enrolled in the above programmes in May/June 2010. This will be followed up by interviews of six students. The interview questions will be guided by the results of the questionnaire. Participants for the interviews will volunteer by filling out a separate sheet which will be sent back with the questionnaire. I will not have access to the names and addresses. Replies will be sent back to a research assistant, who will sign a confidentiality agreement. This person will separate questionnaires from the agreement to participate in interview forms. Entry and transcription of the data will be completed by third parties who have also signed confidentiality agreements.

To contact the participants of this study I need the names of addresses of all currently enrolled masters students in the Master of Educational Leadership, Master of Professional Studies and the Master of Education. I understand from Leigh Beever that the Education

Student Centre will be able to provide this information in the form of name and address labels and I would be grateful if you could supply these. A research assistant from the Sylvia Ashton-Warner Library will post out the questionnaires to the participants and receive the replies. I will not have access to the information you provide.

I have included a consent form for you to sign.

Many thanks for your help and support in enabling me to get this research underway.

Yours sincerely,

Chris Moselen

Researcher	Supervisor	Supervisor	Head of Department
Chris Moselen c.moselen@auckland.ac.nz Phone: (09) 373 7599 Extn. 48973 Epsom Campus Faculty of Education University of Auckland Private Bag 92601 Symonds St Auckland 1150	Tony Hunt t.hunt@auckland.ac.nz Phone:(09) 623 8899 Extn. 48656 Epsom Campus Faculty of Education University of Auckland Private Bag 92601 Symonds St Auckland 1150	Dr. Claire Sinnema c.sinnema@auckland.ac.nz Phone: (09) 623 8899 Extn. 46426 Epsom Campus Faculty of Education University of Auckland Private Bag 92601 Symonds St Auckland 1150	Dr. Frances Langdon f.langdon@auckland.ac.nz Phone: (09) 373 7599 Extn. 48769 Epsom Campus Faculty of Education University of Auckland Private Bag 92601 Symonds St Auckland 1150

For any queries regarding ethical concerns you may contact the Chair, The University of Auckland Human Participants Ethics Committee, The University of Auckland, Office of the Vice Chancellor, Private Bag 92019, Auckland 1142, Telephone (09) 373 7599 etxn. 83711.

APPROVED BY THE UNIVERSITY OF AUCKLAND HUMAN PARTICPANTS ETHICS COMMITTEE on 12 May 2010 for (3) years, Reference Number 2010/174

Appendix E

Participant Information Sheet

PARTICIPANT INFORMATION SHEET

(Masters Education Students)

Project Title: Information seeking: The research behaviour of education masters students

Researcher: Chris Moselen

My name is Chris Moselen and I am a Masters student at the Faculty of Education, University of Auckland. I am also employed full-time as the Library Manager at the Sylvia-Ashton Warner Library at the Faculty of Education.

I am undertaking research which is investigating how education masters students look for the information that they need when undertaking study at this level. Very little information in New Zealand has been gathered about the information seeking behaviour of masters students. Your participation in this project would allow the Library to structure programmes which will assist future students to more successfully locate and use information for their masters studies. The outcomes may also provide useful information for the Faculty of Education and other tertiary education institutions.

If you are studying the Master of Educational Leadership, Master of Professional Studies or the Master of Education you will have received a questionnaire to complete, and an invitation to participate in a follow-up interview. The Dean of the Faculty of Education has given consent for the Education Student Centre to provide a list of your names and addresses for the purposes of this research. A member of the Faculty of Education, acting as a research assistant, who has signed a confidentiality agreement, will post out the questionnaire to you and receive your replies. I will not have access to your personal details. A reminder to complete the questionnaire may be sent out to you by the research assistant at a later date. Please ignore this if you have already filled out and returned the questionnaire.

You do not have to complete the questionnaire, but by completing it, you are giving your consent to participate in the research. Follow-up interviews will be conducted with six students, who will be selected by a research assistant according to demographic criteria, from those of you who have indicated a willingness to take part.

The questionnaire:

- will take 10-15 minutes of your time to fill out
- will be anonymous
- includes an addressed and stamped return envelope so you can post your questionnaire back
- includes a form for you to indicate if you are prepared to be involved in an interview at a later date. This form should be posted back with the questionnaire. On receipt, this form will be separated from the questionnaire by a staff member of the Faculty of Education acting as a research assistant, so that the questionnaire remains anonymous
- findings will be available online through the University of Auckland's ResearchSpace thesis repository once the research has been completed and marked.

The interview:

- will take up to 45 minutes
- is to be conducted in a meeting room at the Sylvia Ashton-Warner Library at a time convenient to you, or by telephone
- will be recorded and then transcribed. During the interview you may request the recorder to be turned off at any time without giving a reason. The transcripts of the interviews will be sent to you to check for accuracy, and a summary of the findings will be sent to you once the study is complete
- cannot guarantee anonymity, but if the information you provide is reported/published, this will be done in a way that does not identify you as its source.

Your data:

- will remain in the possession of the researcher
- either in the form of paper or electronic files (CDs), will be kept in locked filing cabinets in the researcher's office at the University of Auckland for a period of six years and then destroyed by erasing the CDs and shredding of paper copy. Questionnaire data cannot be withdrawn as it is anonymous, but you may withdraw your interview data up until the 31 July 2010 when analysis will commence
- will be available to third parties for the purposes of processing the questionnaire, data entry, transcription. Those people will be asked to sign a confidentiality agreement to ensure your privacy and the confidentiality of your data
- will be analysed using two different software packages – PASW (formerly SPSS) for the statistical data, and NVivo for the transcripts from the interviews.

Consent forms signed by those participating in interviews, will be kept by my supervisors in a locked filing cabinet for six years, and then destroyed by shredding.

Your participation in the questionnaire and/or interview is entirely voluntary. Although I am an employee of the University of Auckland, I have no access to, or ability to influence,

grades. The Dean has given his assurance that your participation, or non-participation, in this research will have no influence on your university record.

Questions relating to this research can be sent to me, my supervisor/s or my Head of Department. Thank you for your participation in this research.

Researcher	Supervisor	Supervisor	Head of Department
Chris Moselen c.moselen@auckland.ac.nz Phone: (09) 373 7599 Extn. 48973 Epsom Campus Faculty of Education University of Auckland Private Bag 92601 Symonds St Auckland 1150	Tony Hunt t.hunt@auckland.ac.nz Phone: (09) 623 8899 Extn. 48656 Epsom Campus Faculty of Education University of Auckland Private Bag 92601 Symonds St Auckland 1150	Dr. Claire Sinnema c.sinnema@auckland.ac.nz Phone: (09) 623 8899 Extn. 46426 Epsom Campus Faculty of Education University of Auckland Private Bag 92601 Symonds St Auckland 1150	Dr. Frances Langdon f.langdon@auckland.ac.nz Phone: (09) 373 7599 Extn. 48769 Epsom Campus Faculty of Education University of Auckland Private Bag 92601 Symonds St Auckland 1150

For any queries regarding ethical concerns you may contact the Chair, The University of Auckland Human Participants Ethics Committee, The University of Auckland, Office of the Vice Chancellor, Private Bag 92019, Auckland 1142. Telephone 09 373-7599 extn 83711.

APPROVED BY THE UNIVERSITY OF AUCKLAND HUMAN ETHICS COMMITTEE 12 May 2010 FOR (3) years, Reference Number 2010/174

Appendix F

Willingness to Participate in Interview

WILLINGNESS TO PARTICIPATE IN A FOLLOW-UP INTERVIEW

Project Title: Information seeking: The research behaviour of education masters students

Researcher: Chris Moselen

IF YOU ARE WILLING TO TAKE PART IN AN INTERVIEW

PLEASE FILL IN THIS SHEET AND RETURN IT WITH YOUR QUESTIONNAIRE

I am willing to take part in a follow-up interview which will be based on the outcomes of the questionnaire and where I will also be able to talk in detail about the way I look for information for my academic study. Some of the areas discussed will be my use of electronic resources, ways I feel the Library/University could make my studying easier, and how effective I am in the use of the information I need for my study.

I understand the interview will be up to 45 minutes long and will take place at a time convenient to me in the Sylvia Ashton-Warner Library on the University of Auckland Epsom Campus, or by telephone.

I understand that six interviewees will be chosen from the people who are willing to participate and that I will be contacted by the researcher to confirm whether or not I have been selected.

I understand that this form will be separated from my questionnaire on receipt by a research assistant who has signed a confidentiality agreement. This prevents the researcher from connecting my name to the questionnaire.

My name is:_____

Contact email:_____

Contact phone number:_____

For further information please contact the researcher:
Chris Moselen
c.moselen@auckland.ac.nz
Telephone (09) 373 7599 Extn. 48973
Mobile: (021) 420540

APPROVED BY THE UNIVERSITY OF AUCKLAND HUMAN PARTICPANTS ETHICS COMMITTEE on 12 May 2010 for 3 years, Reference Number 2010/174

Appendix G

Interview Consent Form

CONSENT TO PARTICIPATE IN RESEARCH

(Masters Education Students Individual Interviews)
(This consent form will be held for a period of six years)

Project Title: Information seeking: The research behaviour of education masters students

Researcher: Chris Moselen

I have been given a Participant Information Sheet and have read it thoroughly. I understand the nature of this research. I have had an opportunity to obtain satisfactory answers to any questions I may have had.

- I agree to take part in this research.

- I understand that I have been selected from those who indicated a willingness to participate in an interview by a research assistant according to factors such as whether I am full-time or part-time, flexi or on-campus, and how long ago I last studied

- I understand that my participation is entirely voluntary and I can withdraw personally from the research at any time. I can also withdraw any interview data from the interview up until 31 July 2010.

- I agree to take part in an interview which may take up to 45 minutes.

- I understand that the interview will be digitally recorded and transcribed by third parties who have signed confidentiality agreements for both transcription and data entry. I may request that the recording be stopped at any time during the interview without giving a reason.

- I understand I will have an opportunity to read and correct the transcript before the data is analysed.

- I understand that a summary of the findings will be made available to me at the completion of the research.

- I understand my name will not be used in any written or oral presentation. If the information I have provided is reported or published, this will be done in a way that does not identify me as the source. A pseudonym of my own choice will be used to refer to me in any form of publication.

- I understand that this consent form will be stored in a locked cabinet in the supervisor's office for a period of six years and then it will be destroyed by shredding.

The researcher will store the transcript of the interview in a locked cabinet for six years. It will then be destroyed by shredding. Digital recordings will be stored on the researcher's laptop computer until such time as the transcriptions are complete, and then the files will be erased.

- I understand that the Dean has given his assurance that my participation or non-participation in the research will not affect my grades.

Name:_____

Signed:_____

Date: _____

Pseudonym I would like to be known by in the report (optional):

_____

APPROVED BY THE UNIVERSITY OF AUCKLAND HUMAN PARTICPANTS ETHICS COMMITTEE 12 May 2010 for (3) years, Reference Number 2010/174

Appendix H

Transcriber Confidentiality Form

TRANSCRIBER CONFIDENTIALTY AGREEMENT

Project Title: Information seeking: The research behaviour of education masters students

Researcher: Chris Moselen

Data Transcriber :

I agree to transcribe the audiotapes for the above research project. I agree that the information contained within them is confidential and must not be disclosed to, or discussed with, anyone other than the researcher and her supervisors. Once the researcher has acknowledged receipt of the transcriptions, I will erase all files relating to this research from my computer.

Name:_____

Signature:_____

Date:_____

APPROVED BY THE UNIVERSITY OF AUCKLAND HUMAN PARTICPANTS ETHICS COMMITTEE on 12 May 2010 for (3) years, Reference Number 2010/174

Appendix I

Interview Coding Template

1. Influences

1.1 Age
1.2 Distance
1.3 Ethnicity
1.4 Fulltime/part-time
1.5 Gender
1.6 Information overload
1.7 Motivation and attitude
1.8 Family & other people
1.9 Place of study
1.10 Work environment
1.11 Technology use in everyday life
1.12 Work & study (time constraints)
1.13 Type of degree
1.14 Other

2. Approach

2.1 Searching behaviours

2.1.1 Easiest place to search
2.1.2 First place to search
2.1.3 Keywords
2.1.4 Other places to search
2.1.5 Resilience in searching (satisficing)
2.1.6 Stopping searching
2.1.7 Tracking further information
2.1.8 Other

2.2 Information sources

2.2.1 Internet/Google
2.2.2 Library databases
2.2.3 Library catalogue
2.2.4 People as an information source
2.2.5 Physical resources
2.2.6 Other

3. Capability

3.1 Using the Library

3.1.1 Knowledge of Library databases
3.1.2 Knowledge of Library Catalogue
3.1.3 Knowledge of internet/Google
3.1.4 Subject Librarians
3.1.5 Other

3.2 Research process

3.2.1 Information seeking
3.2.2 Literature review

3.2.3 Methodology
3.2.4 Research difficulties
3.2.5 Writing process
3.2.6 Other

3.3 Handling and managing information

3.3.1 EndNote
3.3.2 Information handling
3.3.3 Physical organisation of references
3.3.4 Alerting services
3.3.5 Other

3.4 Problem solving

3.4.1 Other

3.5 Training

3.5.1 Training needs
3.5.2 Training undertaken
3.5.3 Delivery of training
3.5.4 Other

4. Effectiveness

4.1 Evaluating sources

4.1.1 Validity/reliability of sources
4.1.2 Other

4.2 Searching behaviours

4.2.1 Finding full-text
4.2.2 Narrowing a search
4.2.3 Selecting keywords
4.2.4 Other

4.3 Perception of success

4.3.1 Successful search example

5. Other

5.1 Future study

5.1.1 Needs for future study

5.2 Information literacy

5.3 Other

Appendix J

Ethics Approval

14 May 2010

UNIVERSITY OF AUCKLAND
HUMAN PARTICIPANTS ETHICS COMMITTEE

MEMORANDUM TO:
Mr Tony Hunt; Dr Claire Sinnema / Christine Moselen
Faculty of Education

Re: Application for Ethics Approval (Our Ref. 2010 / 174)

The Committee met on 12-May-2010 and considered the application for ethics approval for your project titled ''Information seeking: the research behaviour of education masters students''.

Ethics approval was given for a period of three years.

The expiry date for this approval is 12/05/2013.

If the project changes significantly you are required to resubmit a new application to the
Committee for further consideration.

In order that an up-to-date record can be maintained, it would be appreciated if you could notify the Committee once your project is completed.

Please contact the Chairperson if you have any specific queries relating to your application. The Chair and the members of the Committee would be most happy to discuss general matters relating to ethics provisions if you wish to do so.

ALL COMMUNICATIONS WITH THE UAHPEC REGARDING THIS APPLICATION SHOULD INDICATE OUR REFERENCE NUMBER.

c.c. Head of Department / School, Faculty of Education

Lana Lon
Executive Secretary
University of Auckland Human Participants Ethics Committee

Christine Moselen
44 WELLPARK Ave
Grey Lynn
Auckland 1021
1. Should you need to make any changes to the project, write to the Committee giving full details including revised documentation.
2. The approval is for three years. Should you require an extension write to the Committee before the expiry date giving full details along with revised

documentation. Extension can be granted for up to three years, after which time you must make a new application.
3. At the end of three years, or if the project is completed before the expiry, you are requested to advise the Committee of its completion.
4. Do not forget to fill in the 'approval wording' on the Participant Information Sheets and Consent Forms giving the dates of approval and the reference number before you send them out to your participants.
5. Please send a copy of this approval letter to the Manager - Funding Processes at Research Office if you have obtained any funding other than from UniServices. For UniServices contract, please send a copy of the approval letter to the Contract Manager at UniServices.
6. Please note that the Committee may from time to time conduct audits of approved projects to ensure that the research has been carried out according to the approval that was given

Appendix K

Receipt of Questionnaires Agreement

RECEIPT AND SEPARATION OF QUESTIONNAIRES CONFIDENTIALTY AGREEMENT

Project Title: Information seeking: The research behaviour of education masters students

Researcher: Chris Moselen

Receipt of questionnaires by :

I agree to separate the questionnaires, and the forms which indicate a willingness to participate in an interview, for the above research project. I will purposively select the interviewees based on factors supplied to me by the researcher – factors such as whether a student is full-time/part-time, flexi or on-campus, and the length of time since a student last studied. I agree that I must not disclose to the researcher or her supervisors any information that will identify the participants. I also agree that the information contained within the questionnaires is confidential and must not be disclosed to, or discussed with, anyone other than the researcher and her supervisors.

Name:_____

Signature:_____

Date:_____

APPROVED BY THE UNIVERSITY OF AUCKLAND HUMAN PARTICPANTS ETHICS COMMITTEE on 12 May 2010 for (3) years, Reference Number 2010/174