

**A Multiple Case Study Exploration of
Undergraduate Subject Searching**

by

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Abstract

Subject searching—seeking information with a subject or topic in mind—is often involved in carrying out undergraduate assignments such as term papers and research reports. It is also an important component of information literacy—the abilities and experiences of effectively finding and evaluating, and appropriately using, needed information—which universities hope to cultivate in undergraduates by the time they complete their degree programs. By exploring the subject searching of a small group of upper-level, academically successful undergraduates over a school year I sought to acquire a deeper understanding of the contexts and characteristics of their subject searching, and of the extent to which it was similar in quality to that of search and domain experts.

Primary data sources for this study comprised subject searching diaries maintained by participants, and three online subject searches they demonstrated at the beginning, middle, and end of the study during which they talked aloud while I observed, followed by focused interviews. To explore the quality of study participants' subject searching I looked for indications of advanced thinking in thoughts they spoke aloud during demonstration sessions relating to using strategy, evaluating, and creating personal understanding, which represent three of the most challenging and complex aspects of information literacy.

Applying a layered interpretive process, I identified themes within several hundred instances of participants' advanced thinking relating to these three information literacy elements, with evaluative themes occurring most often. I also noted three factors influencing the extent of similarity

between the quality of participants' advanced thinking and that of search and domain experts which reflected matters that tended to be i) pragmatic or principled, , ii) technical or conceptual, and iii) externally or internally focused. Filtered through these factors, participants' instances of advanced thinking brought to mind three levels of subject searching abilities: the competent student, the search expert, and the domain expert. Although relatively few in number, I identified at least some advanced thinking evincing domain expert qualities in voiced thoughts of all but one participant, suggesting the gap between higher order thinking abilities of upper-level undergraduates and information literate individuals is not always dauntingly large.

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Chapter 1

Introduction

1.1 Undergraduate Learning and Subject Searching

While North American undergraduate education once focused primarily on student mastery of prescribed content in discrete disciplines (specific “know-what”), over the past several decades we have seen a shift in emphasis toward framing undergraduate education as a process of acquiring interdisciplinary foundational competencies (broad “know-how”) to ground the development of disciplinary expertise in a student’s chosen major and minor areas of specialization (DeZure, 2003). Among the commonly recognized foundational competencies are critical and creative thinking; problem solving; oral and written communication; information literacy and numeracy; appreciation of the main investigative traditions associated with the arts, humanities, and sciences; ethical and intelligent participation in social processes that is respectful of the diversity of human needs, values and beliefs; and stewardship of the environment (e.g., Paulson, 2001; White, 1991). Despite the increased emphasis on broad competencies, undergraduate degree programs today remain largely composed of a selection of general or liberal education courses, and a concentration of required and elective courses in one or two student-selected areas of specialization (DeZure, 2003).

This study explores subject searching, a process in which many undergraduates are expected to engage as they complete academic research tasks within and outside of their degree majors. A simple definition of subject searching is the process of looking for information with only a subject or topic in mind. Subject searching is sometimes contrasted with specific- or known-item searching wherein a searcher knows that a particular desired item exists and is aware of some identifying details such as its author or title (Poo & Khoo, 2003, p. 2219). For undergraduates, especially those just beginning their university studies, subject searching can be a demanding and at times daunting activity because they may have adequate knowledge of neither their search topic, nor the conventions and tools of the field of inquiry associated with their topic, nor the scholarly research process.

Largely unacknowledged during the initial developmental phases of end-user online information retrieval systems, the main source of difficulties facing inexperienced, non-expert subject searchers was identified by Belkin, Oddy and Brooks (1982) to be the inherent illogic of the “best-match principle.” In systems governed by this principle which remains prevalent today, information is retrieved on the basis of best matches between indexed document texts or their surrogates, and the searcher’s query terms. According to Belkin and his colleagues (1982, p. 63), this approach is rendered ineffective by two flawed assumptions: “that it is possible for the user to specify precisely the information that she/he requires; and that information needs (or at least expressions of them) are functionally equivalent to document texts.” These researchers further suggested a searcher’s information need emerging from incomplete or disorganized thinking about a topic represents an “anomalous state of knowledge,” whereas items being sought—relevant document texts—generally contain organized, informed statements. Subject searching problems therefore arise when representations of incoherent states of knowledge (perhaps one or two searcher-supplied broad terms) are used to try to retrieve documents on a search topic containing coherent statements of knowledge.

The pedagogical goals underlying tasks requiring undergraduate students to grapple with and make sense of a variety of ideas in unfamiliar subject areas include fostering engagement in independent or group problem solving and research in different domains. When these learning processes involve subject searching using information retrieval tools that remain governed primarily by the “best-match principle,” however, achievement of pedagogical goals may be weakened or subverted in at least two ways. Not knowing how a subject searching tool works or what subject terms to use to locate needed information may cause frustration leading to abandonment of the search. Equally problematic are frustration-free subject searches producing immediate, plentiful, but mediocre “best matches” that are nevertheless accepted and used by students who may be unaware of or minimally concerned about the low quality or relevance of their search results.

New undergraduate students are thus at a clear disadvantage in their initial research efforts involving subject searching on unfamiliar topics in little-known domains. As they progress through their degree requirements and gain more subject knowledge and research experience, it seems reasonable to presume that students who are highly successful in their academic endeavours perhaps experience fewer subject searching difficulties or somehow find ways to overcome initial subject searching challenges and deficiencies. Knowing more about either situation could illuminate effective ways to guide less successful undergraduates toward more effective subject searching.

My interest in acquiring a deeper understanding of undergraduate subject searching arose from extensive first-hand observations of subject searching difficulties evidenced in the online catalogue transaction logs of a primarily undergraduate university (Graham, 2004) and through awareness of other research efforts describing weaknesses in undergraduates' subject searching processes (e.g., Debowski, 2001; Kennedy, Cole, & Carter, 1999; Valentine, 1993). Contributing to this interest has been a growing conviction that subject searching is a key academic ability and a potential facilitator of undergraduate learning. How so? In my view, subject searching is important because it is an aspect of the foundational competency of information literacy.

1.2 Subject Searching and Information Literacy

Identifying and obtaining relevant, appropriate information about a given subject or problem represent components of a set of abilities known as information literacy, one of the foundational competencies embedded in many undergraduate degree programs. My perspective on the subject searching challenges faced by undergraduate students is largely informed by the concept of information literacy, which in essence is commonly understood to be “the ability to locate, evaluate, and use effectively the needed information” (American Library Association, 1989, para. 3) upon recognizing an information need. Although its label, meaning, validity, scope, and worthiness as a stand-alone discipline have been debated vigorously, information literacy has nevertheless become a

widely recognized concept within the fields of education, and library and information science. It encompasses, among other things, the idea of a core set of habitually exercised and experienced abilities and processes enabling individuals to find, evaluate, select and use appropriate information in any subject area to accomplish tasks, and guiding wise use of information to create new knowledge, make decisions and solve problems that are personally and societally beneficial.

A signal quality of the most demanding and advanced information literacy abilities is the disciplined employment of higher order thinking (Association of College and Research Libraries, 2000; Bundy, 2004) while applying search strategies, evaluating, creating, and using information. We expect domain experts working within their chosen fields of expertise to apply higher order thinking regularly when they perform the most complex and intellectually demanding aspects of their scholarly endeavours, and we hope that undergraduate students develop at least some of those higher order thinking abilities as they progress through their degree programs (Society of College National and University Libraries, 1999). I view subject searching to be a central aspect of information literacy, ideally involving the processes and experiences of finding, evaluating, and selecting appropriate information on a topic in order to accomplish a task or goal.

At one end of the subject domain/subject searching expertise continuum we find experienced, knowledgeable individuals such as faculty and professional researchers situated at universities, research institutes and other inquiry-intensive work environments who are acknowledged by peers to be expert, higher order thinkers in their chosen disciplinary fields. We assume these individuals are fully information literate in their chosen subject domains, and that their expertise in finding, evaluating, selecting, using and creating information in defined areas within those domains has been achieved incrementally over the course of their academic or research careers¹. Also operating in the realm of expertise are information search professionals who apply their skills, experience and

¹ While acknowledged domain experts are assumed to be necessarily information literate within their chosen subject domains, addressing the issue of whether their information literacy abilities are transferable to other unfamiliar domains is beyond the scope of this study.

knowledge about information seeking processes and tools to find required information sources and to evaluate their potential relevance to clients' information needs. We understand search experts also to be fully information literate on the basis of their proficiency in identifying, evaluating and using appropriate search strategies and search tools to conduct effective searches for information, although they are not necessarily experts in the subject matter of their searches, and are usually not the ultimate selectors or users of the results of their information searches.

At the opposite end of the continuum we have novice undergraduates in the early stages of their degree programs who become acquainted with scholarly research processes and conventions as they undertake a process of honing their higher order thinking. These students are perhaps testing several different disciplinary waters to find one that best suits their interests and abilities. We know that domain experts and domain novices tend to use different approaches to obtain needed scholarly information (Drabenstott, 2003; Ellis, 2005; Stoan, 1984), and that search novices struggle to use academic search tools effectively (Debowski, 2001), but what is known about what happens in the long stretch between those two well-delineated positions along the subject domain/subject searching expertise continuum? Partial answers to this question can be gleaned by considering the findings of studies that have investigated issues pertaining to undergraduate information literacy.

Some studies have suggested that the information literacy level of first-year undergraduate students is low (Coupe, 1993; A. L. Foster, 2006; Mittermeyer, 2005), that significant proportions of undergraduates have not achieved information literacy by the time they graduate (Maughan, 2001), and that undergraduate and graduate students lack critical library research skills such as evaluating information (Neely, 2002). Two qualitative studies involving small groups of undergraduates found that the identification of a focus for research projects (Fister, 1992) and evaluation of retrieved information (Morrison, 1997) were the most challenging aspects of researching and information literacy, respectively. An investigation of undergraduate research behaviour by Valentine (1993) found that most study participants chose the path of least resistance to complete research tasks and

used haphazard search tactics. In contrast, O'Brien and Symons (2005) reported the majority of their undergraduate study participants said they evaluated information obtained from the Internet, although faculty were less confident that adequate evaluation occurred in practice. O'Brien and Symons also found that students with more years of academic study said they obtained satisfactory subject searching results more frequently than did students with less academic experience.

In one large university system, more years of university education were associated with greater student knowledge of types of resources suitable for meeting information needs, and of the content and context of those resources (Dunn, 2002). Other studies have reported that students who received information literacy instruction were able to articulate ways in which it benefited them, including increased confidence in library use and conducting research, increased comfort in asking library staff for help, and more effective library use (Holliday & Fagerheim, 2006; Julien & Boon, 2004). Holliday and Fagerheim (2006) also reported that English literature instructors observed students who completed courses with information literacy content to use better and more relevant sources in their assignments. Burkhardt (2007) conducted preliminary analyses of five years' worth of pre- and post-test results from a credit-bearing undergraduate information literacy course. She found greater student comfort with research tools and technology was associated with higher post-test scores, and that students' library skills were on the whole improved by completing the course.

Thus there is evidence suggesting that while undergraduates may enter university with low levels of information literacy, their research abilities tend to become stronger with more years of study and academic experience, and that information literacy instruction can benefit their information retrieval tool use, subject searching, and research abilities, at least in the short term². At the same time we appear to have little knowledge about how undergraduates' research processes develop and

² It appears that few studies have looked at the durability of information literacy after students have graduated and moved into the next phases of their lives although the report by Candy, Crebert and O'Leary (1994) is notable. Their report which described for Australian higher education "the characteristics of undergraduate education which enable and encourage graduates to participate in formal and informal learning throughout their lives" (1994, p. iii) concluded that fostering lifelong learning requires universities to, among other things, "demonstrate specific support for learning-to-learn and information literacy programs" (1994, p. xiii).

change over different stages of their degree programs, and how their subject searching behaviours and thinking at those stages relate to the information literacy abilities and experiences we hope they have acquired by the time they graduate.

1.3 The Research Problem

Several studies have reported on the information literacy, research and subject searching behaviours and abilities of new undergraduates or high school seniors preparing to enter university (e.g., Debowksi, 2001; A. L. Foster, 2006; Mittermeyer, 2005; Valentine, 1993), of undergraduate students largely undifferentiated in data analyses by year of study (e.g., Head & Eisenberg, 2009; Morrison, 1997; O'Brien & Symons, 2005) and the research habits and preferences of domain experts and scholars in a variety of disciplines (e.g., Bates, 1996; Ellis, Cox, & Hall, 1993; Ellis & Haugan, 1997; Marchionini, Dwiggins, Katz, & Lin, 1993; Meho & Tibbo, 2003; Stoa, 1991). In comparison, it appears few studies have focused on the information literacy, subject searching or research behaviour of upper-level undergraduates who are in the second half of their degree programs; exceptions include the studies by Coupe (1993), Maughan (2001), and Head (2008). Moreover I am unaware of studies that have specifically focused on subject searching or information literacy abilities of academically outstanding³ upper-level⁴ undergraduates.

The research problem I set out to explore in this study is our incomplete understanding of how (or perhaps whether) undergraduate students become information literate individuals who habitually use higher order thinking abilities to find, evaluate, use and create new information wisely in their academic studies and other endeavours throughout their lives. New undergraduates tend to be double novices in both subject searching and domain knowledge who have yet to acquire adequate information literacy skills and experiences to support their future learning needs. Many studies have

³ Respondents to Coupe's (1993) library skills surveys were all high academic achievers to the extent that all had above-average SAT scores when they applied for admittance to the university comprising the study site.

⁴ In the present study, upper-level undergraduates are understood to have completed the equivalent of at least two full years of studies toward an undergraduate degree.

investigated or described various aspects of undergraduate research behaviours and information literacy, but only a few have reported findings relating specifically to upper-level undergraduates that go beyond identifying the proportions of study participants by year of undergraduate study.

Uncovering information about subject searching processes and experiences of upper-level undergraduates may contribute to our knowledge of what happens during the second half of the undergraduate segment of the subject domain/subject searching expertise continuum anchored at opposite ends by the novice undergraduate, and the practicing domain or search expert. Further narrowing the focus to subject searching by academically outstanding upper-level undergraduates provides the additional possibility of exploring the extent to which these undergraduates appear to exemplify information literate behaviours and higher order thinking suggestive of those demonstrated by domain and search experts. Enriching our understanding of how successful, experienced undergraduates approach subject searching may facilitate future efforts to discover or devise novel, meaningful ways to help less successful or less experienced students become more effective and confident subject searchers. It may also inform discussions of the idea that today's ubiquitous, easy to use, powerful, full-text, end-user search tools obviate the need for concern about subject searching expertise.

1.4 Research Purpose and Questions

This study was motivated by curiosity about what happens along on the pathway presumed to be traversed by at least some undergraduate students as they progress from being inexperienced to being more experienced and knowledgeable subject searchers. There appear to be few studies that have investigated how academically outstanding upper-level undergraduates perform subject searching, or the extent to which their subject searching behaviour and thinking reflect information

literacy competencies⁵. Most of the existing research on undergraduate research behaviours and information literacy has used interviews, focus groups or surveys to compile snapshots of individual students' abilities, behaviours, or thoughts at discrete points in time.

The purpose of the present study was therefore to cover new ground by assembling a well-rounded, detailed and context-sensitive picture of undergraduate subject searching through a longitudinal exploration of the subject searching processes of academically outstanding, upper-level students in order to understand how they think about and conduct subject searching. My reasons for employing information literacy as a conceptual framework for this study were two-fold: I view subject searching as one of two key aspects of information literacy (thoughtful and wise selection, and use of information), and I accept the proposition that information literacy is a desired core competency of all undergraduate degree holders because it holds promise of facilitating self-initiated learning throughout their lives (Candy, Crebert, & O'Leary, 1994; Head & Eisenberg, 2009).

The following two research questions guided this study's exploration of undergraduate subject searching:

- What are the characteristics and contexts of subject searching by academically outstanding, upper-level undergraduates that occurred over two successive academic semesters in response to genuine academic needs?
- To what extent did study participants' observed subject searching thoughts and actions suggest they had acquired some of the skills and experiences recognizable as being aspects of information literate behaviour and thinking, normally considered to be fully attainable only by search and domain experts?

To explore these questions I used a variety of methods to capture information over an eight-month period (two consecutive academic semesters) about all subject searching pursued by a small

⁵ The studies by Head (2008), Head and Eisenberg (2009) and Whitmire (2002) on undergraduate research behaviours or library use gathered data on students' year of study and grade point average, but did not differentiate between variant academic achievement levels in discussions of their research findings.

group of academically successful undergraduates in the second half of their degree programs that occurred in response to genuine academic needs or tasks. My hope was that an in-depth examination of how these students conducted subject searching would contribute new insights into the breadth and quality of their thinking and behaviour pertaining to research. New insights such as these may facilitate other research explorations of ways in which librarians and educators may effectively assist undergraduates to hone their information literacy abilities. Well-developed information literacy abilities and experiences may in turn enhance undergraduates' prospects of remaining successful independent learners, researchers, and information seekers in familiar and unfamiliar subject domains throughout their lives, which is increasingly viewed as being essential for prospering in today's information-rich world (Eisenberg, Lowe, & Spitzer, 2004; Head & Eisenberg, 2009).

Several aspects of this study's purpose and research approach set it apart from previous research on subject searching, information retrieval and information seeking, including:

- its focus on a little-studied subgroup of the undergraduate student population: academically outstanding upper-level undergraduates;
- its detailed exploration of the actual search actions and thoughts of undergraduate subject searchers;
- its attempt to gather detailed information about participants' genuine academic subject searching needs over one school year (September-April/May);
- attention to contextual elements of the study and of participants' subject searching; and
- consideration of the extent to which study participants' subject searching appeared to involve the kind of information literate thinking and actions normally ascribed to subject or search experts.

1.5 Overview of the Study

In chapters 2 to 4 I provide background information for this study. I discuss in chapter 2 selected relevant research literature addressing different approaches taken in previous studies that sought to ameliorate subject searching problems, as well as research perspectives on the concepts of experience, expertise and context as they relate to subject searching. I describe the study's conceptual framework in chapter 3 which addresses four issues: i) the relationship of subject searching to information literacy, ii) the development and disputes associated with the concept of information literacy, iii) a definition of information literacy for the present study, and iv) a theoretical lens with which to seek answers to this study's research questions. In chapter 4 I outline the study's research framework, including its research approach, design, rationale and methods.

The study's contexts, findings, and conclusions are presented in chapters 5 to 7. I introduce in chapter 5 the study's institutional setting, study investigator, participants, and the courses in which participants were enrolled. I then address the first research question by describing contexts and characteristics participants' subject searching over the eight months of the study in terms of their subject searching abilities, tasks, resources, and topics, the information they sought, and aspects of their subject searching processes. In chapter 6 I present findings relating to my second research question on the extent to which study participants' subject searching processes evinced the kind of higher order thinking, abilities and experiences we understand to be part of the repertoire of information literate individuals. In chapter 7 I discuss answers suggested by the study's findings to the two research questions, consider the relationship of the study's findings to the existing knowledge base on undergraduate subject searching and information literacy, propose worthy areas for future research, and summarize my conclusions.

Chapter 2 Literature Review

2.1 Chapter Overview

In this chapter I review selected research related to the present study addressing the origins of online subject searching by nonspecialist users, problems of subject searching, and approaches to understanding and alleviating subject searching problems and challenges, especially those encountered by undergraduate students. Sections 2.2 and 2.3 consider subject searching problems faced by inexpert searchers in three online environments: library catalogues, other bibliographic databases, and Web-based resources. Section 2.4 surveys three approaches to solving subject searching problems: teaching the user concepts and skills for more effective use of tools, tailoring the tools to better serve users' needs, and examining the user's actual search processes to understand them better. Section 2.5 looks at studies that have examined differing levels of search experience and subject domain knowledge on subject searching behaviour and abilities, while Section 2.6 provides a brief overview of variant ways to view the role of the context in subject searching research.

2.2 Subject Searching in Online Catalogues

A review of online subject searching problems of untrained individuals necessarily begins with subject searching in online catalogues, as the online catalogue was the first online information retrieval tool to be developed specifically for users who were not information or research professionals. Until the introduction of graphical interfaces and Web-based Internet searching in the early 1990s, online catalogues remained the online tool used most frequently by users in academic libraries, and therefore received the most attention from researchers concerned about the problems of subject searching.

Making their first appearance in the 1970s, the earliest online catalogues were often based on, or extensions of, pre-existing automated circulation systems (Lancaster, 1977; Millsap, 1996; Peters,

1991). Two aspects distinguished online catalogues from other information searching systems: their intended users, and their scope. Not only were online catalogues designed for use by nonspecialists rather than subject experts or professional search intermediaries, they were also automated versions of the library card catalogue, which, in typical public and academic libraries, provided access to knowledge spanning a multitude of disciplines (Hancock-Beaulieu, Robertson, & Neilson, 1991; Hildreth, 1987) rather than narrow or well-defined, specialized subject areas.

In the early 1980s the Council on Library Resources (CLR) sponsored a series of milestone studies conducted at 31 large American research and academic libraries investigating users and nonusers of online catalogues through questionnaires, online catalogue transaction logs, and focus group interviews (Kaske, 1984). The published reports of the various CLR studies provided a wealth of new information on many aspects of online catalogues and their users and nonusers (Larson, 1983; Markey, 1984; Matthews & Lawrence, 1984; Matthews, Lawrence, & Ferguson, 1983; Tolle, 1983). Perhaps the most startling discovery was that study participants were most frequently interested in searching by subject, a finding contradicting the long-held basic tenet of librarianship that (card) catalogue searching was predominantly for known-items.

Initial incredulity notwithstanding, two of the most important CLR study findings on subject searching were incontrovertible: subject searching was the most frequently performed type of searching in online catalogues, and users experienced the most difficulty performing subject searches (Markey, 1986). Specific subject searching difficulties identified in the CLR studies included: finding the right subject heading to use, increasing the result when there were no or few retrievals, and reducing the result when there were too many retrievals (Markey, 1986, p. 35). In addition, three of the top six additional online catalogue features desired by CLR study respondents pertained to the improvement of subject searching: presentation of a list of words related to users' search words; searching a book's table of contents, summary or index; and searching by any word or words in a subject heading (Markey, 1986, p. 54).

Shortly after publication of the results of the CLR studies began, Hildreth (1984) characterized online catalogues as having evolved through two generations, with the need to progress to a third generation to address well-discussed, serious shortcomings of then-current systems (e.g., Bates, 1986; Borgman, 1986; Markey, 1986; Matthews & Lawrence, 1984). Hildreth (1984) described first-generation systems as primarily known-item finding tools whose basic performance and search results display capabilities limited them to being little more than crude replications of card catalogues. Second-generation systems offered more sophisticated features such as browsing, search refinement, a variety of display types, and subject searching via controlled and uncontrolled vocabularies, but despite their clear superiority over first-generation systems, users still experienced frustrations with subject searching.

Hildreth (1987, 1989) later expanded on the notion of generations of online catalogues by describing design improvements needed in the third generation, most of which pertained to subject searching. His main concern was that only knowledgeable library staff and trained library users were able to use the complex, idiosyncratic aspects of second generation online catalogues successfully, leaving the majority of online catalogue users who were untrained and inexperienced (Hildreth, 1987, p. 652) to struggle with significant subject searching difficulties. In his view, second-generation online catalogues offered inadequate support for effective subject searching because they failed to provide adequate support for the following: exploratory searching, guidance in alternative query formulation, linking free-text search term matches to appropriate controlled terms or class numbers, judging the relevance of retrieved items based on sufficient descriptive information, and relevance ranking of retrieved items (Hildreth, 1987, p. 654).

Over the 1980s and early 1990s, efforts to define and develop third-generation subject searching capabilities in online catalogues progressed at a brisk pace but began to lose steam by the mid-1990s, a point in time which also marked the advent of Web-based library catalogues. Although reasons for this loss of momentum are uncertain, contributing factors may have included the

extremely complex nature of remaining subject searching problems, diversion of efforts toward developing new Web interfaces for online catalogues and bibliographic databases, or a shift in research emphasis toward developing and refining new resources such as Internet search engines and digital libraries. Ortiz-Repiso and Moscoso (1999, p. 76) characterized the situation as one in which “efforts directed at applying network technology on top of traditional search engines has [sic] not given the results that could have been expected. In fact, it has effectively halted a process that was set in motion at the end of the past decade: the development of a third generation of OPACS, revolutionary in the way it conceives information access and retrieval.”

The pace of development of third-generation online catalogues abated over the 1990s, but compared to catalogues from the mid- to late-1990s, many early twenty-first century Web-based catalogues undeniably offer added value or content (Harmsen, 2000), examples of which include table of contents listings for newer publications, book jacket images, book reviews, and links to full-text (Breeding, 2002). More recently library catalogue developers have focused on making the discovery, search and display interface more appealing to library users who were born and raised in an online, Web-embedded world. Touted as “next-generation” or “next-gen” catalogues, these interfaces are a response to some of the shortcomings already noted by Hildreth and others in second-generation systems, as well as some newer concerns that traditional catalogues:

- are often not in compliance with well-established user interface conventions;
- are too narrowly focused on describing print monographic materials and provide insufficient coverage of other formats of information carriers and content;
- are unable to provide adequate online access to content; and
- lack social networking capabilities that “Millennial” users (Connaway, Radford, Dickey, Williams, & Confer, 2008) expect in Web-based information tools (Breeding, 2007d).

Among the kinds of features understood to distinguish today’s next-generation catalogues from those developed before the twenty-first century are the following:

- support for exploratory searching when little is known about what is being sought;
- content enhancements such as book cover images, tables of contents and reviews;
- relevance-ranked results;
- a broader scope that may include a variety of types of resources such as full-text articles, locally held print, audio-visual, and digital collections, as well as indexes and catalogues;
- federated searching or indexing across many different databases and indexes/catalogues;
- integrated links to licensed or free full-text;
- faceted search refinement that may involve data elements such as controlled vocabulary, call numbers, names, publication dates, material types, and language;
- the ability for users to contribute content such as reviews and personally assigned tags to catalogue records;
- “did you mean?” functionality guiding users from too few results to refined results that are more relevant (Breeding, 2007a, 2007b, 2007c, 2007e, 2007f, 2007g).

It is too early to know the extent to which these recent enhancements will improve catalogue users' subject searching experiences. In the meantime research investigations continue to indicate that subject searching difficulties remain in many of today's Web-based catalogues (e.g., Eden, 2008; Graham, 2004; Novotny, 2004; Ortiz-Repiso, Bazan, Ponsati, & Cottureau, 2006; Sridhar, 2004; Villén-Rueda, Senso, & de Moya-Anegón, 2007; Wolverton & Burke, 2009; Yu & Young, 2004).

2.3 Subject Searching in Bibliographic Databases and on the Web

Studies of end-user searching in online bibliographic databases were conducted less frequently than in online catalogues until the early 1990s, when improved search interfaces and competitive CD-ROM database subscription costs rendered end-user searching of online databases such as ERIC, Medline, and PsycINFO attractive and affordable for academic and research libraries. In this same period of time the first Windows and Macintosh graphical Web browsers became

available in 1993, followed a year later by the first Web search engines (Schwartz, 1998), thus setting the stage for the tremendous growth of the Web as well as the popularity of Web-based subject searching tools for nonspecialist users that persists today.

A key issue, of course, is whether the degree and type of subject searching problems encountered by inexperienced users in online catalogues are similar to those encountered in online bibliographic databases and Web search engines. In this regard, Debowski's (2001) examination of first-year undergraduate searching of the SilverPlatter ERIC database clearly indicated that users of this bibliographic database who lacked search experience and subject knowledge were no less susceptible to the problems and frustrations experienced by subject searchers in online catalogues. Among the subject searching problems identified in Debowski's (2001) study were the use of few search terms, repeated use of unsuccessful searches, poorly constructed search strategies, poor search results, little evidence that searchers understood the search process or system, and few indications that searchers tried to evaluate the quality of their searches. All of these problems have also been reported in studies of online catalogue users' failed subject searches (e.g., H. Chen & Dhar, 1990; Ferl & Millsap, 1996; Markey, 1986; Wallace, 1993).

Similar problems have also been encountered by inexperienced Web search engine users. The study by Jenkins, Corritore and Wiedenbeck (2003) of the effects of domain and search expertise on patterns of nurses' Web searching involved subject searching by domain and Web search novices who experienced problems with basic search mechanics and navigation; conducted searches that returned no results; used very few, basic search terms; and performed minimal evaluation of their search results. Several of these problems also applied to inexperienced Web searchers and users who lacked subject knowledge in Holscher and Strube's (2000) investigation of Web search behaviour of domain and search experts and novices.

Othman and Halim (2004) conducted an experiment to investigate retrieval features of 25 online databases as well as the way in which the features were used by undergraduate and graduate

students after extensive database search training was provided. This study also employed a control group who received no training before performing the same retrieval tasks. Retrieval difficulties were experienced by all study participants although the nature of the problems was qualitatively different. Participants who received training experienced retrieval difficulties while looking for search examples and synonyms in thesauri, as well as with other technical or network problems. Participants who received no training experienced difficulties commonly reported in studies of subject searching by inexperienced users. These difficulties involved problems in formulating searches, choosing search terms, and using Boolean operators.

Chen (2003) reviewed studies of information seeking by children and youth in online catalogues and on the Web, and concluded that many common difficulties were experienced by both groups of users using both types of search tools. The common difficulties involved spelling and typing search terms, generating search terms, identifying key concepts, planning effective search strategies, and evaluating search results. A smaller number of difficulties encountered only during Web searching included excessive browsing, and rapid link-following with no evaluation of results beyond the first retrieved screen.

Other researchers have suggested that Web searching is qualitatively different from online catalogue and bibliographic database searching. Jansen and Pooch (2001) selected three frequently-cited examples of online searching studies conducted in each of three categories of information systems—online catalogues, online bibliographic databases, and the Web—in order to assess whether users' searching characteristics appear to differ by type of search system. Jansen and Pooch found differences in failure rates, session length, query length, and use of Boolean operators, leading them to conclude that Web searching is qualitatively different from searches conducted in traditional information retrieval systems and online catalogues. Studies by Jansen, Spink and Saracevic (2000) and Wolfram (2008) reached similar conclusions.

The views of Jansen and his colleagues (Jansen & Pooch, 2001; Jansen, et al., 2000) are based on research that did not take into consideration the effects of search experience or domain knowledge on user searching or other situation- and context-specific factors. Compelling evidence from a number of other research efforts, some of which are noted above, offer an alternative view suggesting that similarly disruptive subject searching difficulties are encountered during online catalogue, bibliographic database, and Web search engine use by searchers lacking subject search experience and/or knowledge of the subject area they are searching.

2.4. Solving Subject Searching Problems

This section considers studies exemplifying three approaches researchers have used to try to help searchers overcome subject searching difficulties. These three approaches involve: teaching the user skills and concepts that can lead to more effective use of tools, tailoring the tools to better serve the user's searching needs, and examining the user's actual search processes to understand them more fully. Many of these studies naturally pertain to subject searching in online catalogues, as they have been the focus of many efforts of the past 20 years to improve subject searching, and were, after all, the first online searching tools to be developed specifically for nonspecialist users.

2.4.1 Teaching the User

After early findings of the CLR studies revealed that most online catalogue users struggled with subject searching, one approach taken to alleviating this problem focused on educating students about the importance and effective use of the library catalogue. At college and university campuses, academic librarians began to cover the online catalogue and its effective use in formal and informal library instructional sessions and to look for opportunities to incorporate online catalogue searching instruction into the provision of reference service at a user's point of need—strategies that are still commonly used today (McDermott, 2004; Prorak, 2003).

One attempt to evaluate the efficacy of online catalogue instruction was the CLR-sponsored Educating the Online Catalog User project (B. Nielsen, 1986), which used transaction logs to assess the effects of online catalogue instruction on the results of tests completed by university students that included questions on online catalogue searching. Test results of three experimental groups were compared: a control group received no instruction, while two groups received different combinations of in-class instruction and a printed instructional brochure. Among the study's findings were discoveries that students who were first given the in-class presentation made fewer errors on the written test than students who received the printed brochure first, and that students became bored with the in-class instruction and written test.

Two conclusions of this investigation into the efficacy of online catalogue use instruction are notable: "it is important that in our teaching we *not* fixate on the online catalog at all as the object of instruction . . . [and] we may want in the next few years to transfer some of the energies away from teaching to get more directly involved in systems design ourselves" (B. Nielsen, 1986 p. 33; emphasis in original). The first comment suggests that online catalogue use instruction may be more effectively incorporated into a broader learning context such as understanding the research process, and the second implies that online catalogue user education is perhaps less critical to the improvement of users' subject searching performances than the design of online catalogues themselves.

Several studies have attempted to address Nielsen's first concern—fixating too strongly on the tool itself—by devising online catalogue instruction around search concepts rather than specifics of using the tool (e.g., Borgman, 1999; Cherry & Clinton, 1991; Cherry, Yuan, & Clinton, 1994; Novotny & Cahoy, 2006), with slight or inconsistent indications that concept-based instruction results in improved search performance. The proliferation of subject searching tools for end users in the 1990s provided librarians with an even stronger reason to shift the emphasis of user instruction away from the mechanics of how to use specific information finding tools, and toward helping users

acquire an understanding of finding, evaluating and effectively using information as part of the broader processes of academic research and critical thinking (McCartin & Feid, 2001).

Evaluations of other types of online catalogue user instruction programs have employed a variety of approaches. For instance, Foust, Tannery and Detlefsen (1999) found post-instruction test results to be comparable between students who were presented with online catalogue tutorials covering similar content via the Web, and through in-class instruction. Using transaction logs, Pasanen-Tuomainen (1994) evaluated users' subject searching performance after exposure to hands-on training programs and concluded that this instruction approach is not effective. As well, the survey by Thompson, Pask, Peterson and Haynes (1994) of academic and other types of libraries investigated training initiatives directed at improving online catalogue use. Survey results revealed that the two most common approaches were to modify the online catalogue software, and to provide instruction, primarily through handouts.

In the early 1990s some librarians began to wonder whether library users' growing facility in using increasingly sophisticated online information systems and devices might eventually eliminate the need for user instruction (Tenopir, 1999). Today, however, the continuing need for information literacy instruction seems clear, due to the constant learning challenges presented by the complex, intertwined, and ever-changing and expanding universe of information resources and tools, and also because of the impossibility of mastering information literacy competencies and research skills in just one or two instruction sessions or encounters.

Significant effort continues to be devoted to developing, refining and evaluating new approaches to teaching users about effective subject searching using finding tools such as bibliographic databases and Web search engines, in addition to online catalogues. For example, Persson and Washington-Hoagland (2004) conducted an experiment using undergraduate participants to assess the efficacy of an online tutorial on searching the PsycINFO bibliographic database. Comparing pre- and post-test results of a quiz designed to uncover whether learning took place

revealed that post-test results were significantly higher, which led the investigators to conclude that the online tutorial was an effective alternative to in-class instruction.

To address the concern that undergraduate students have difficulty using Web search engines, Colaric (2003) used a pretest/treatment/posttest study design to compare three methods of teaching undergraduates how to search the Web effectively: instruction by example, instruction by conceptual models without illustrations, and instruction by conceptual models with illustrations. Results suggested that instruction by example most effectively increased participants' ability to retrieve needed information using a Web search engine.

Academic librarians sometimes despair of convincing student researchers that Google may not be the answer to their entire academic subject searching needs. Their concern may be well-founded, as a recent multiple case study of largely post-graduate and post-doctoral students' information behaviour revealed a surprising dependence on Google "as a starting point for searching *scientific* information" (Haglund & Olsson, 2008, p. 57; emphasis in original). To disabuse students of the notion that Google alone is an adequate subject searching tool, one university library took the novel approach of developing a 10-session, credit-bearing information literacy course consisting of a case study of Google (Ghaptery, 2004). Themes covered in this course included defining information literacy, Google search techniques, and Google system architecture. No formal evaluation of student learning outcomes was reported, but the class instructor noted that students acquired and demonstrated information literacy skills in completed assignments and class discussions.

As a final example in this section, Topi and Lucas (2005) investigated whether training in Boolean logic or use of an assisted search interface improved users' Web searching performance. The researchers found that receiving Boolean logic training or using the assisted search interface alone increased users' Web searching performance significantly, but the performance of users who received Boolean logic training and used the assisted search interface was no better than that of users in the other experimental groups.

Information literacy and user training remain popular topics in the library and information science literature today (Rader, 2002). The time-consuming nature of user instruction and the challenges in adequately assessing its outcomes, however, are reasons why some view the “teach the user” approach to alleviating subject searching difficulties as merely a stop-gap measure while more permanent solutions are sorted out by, for example, tailoring the tool, as was suggested by Nielsen (1986) and Borgman (1996). After all, we know that on many campuses information literacy has yet to be embedded in the curriculum in a way that reaches all students (D'Angelo & Maid, 2004), that students tend not to avail themselves voluntarily of library instructional sessions, programs, or reference service assistance in finding needed information (Leckie, 1996; O'Brien & Symons, 2005), and that we often lack clear evidence of the effectiveness of user instruction (Julien & Boon, 2004). Larson (1991a, p. 190) went so far as to suggest that “bibliographic instruction for online catalogs may be viewed as a method of adapting users to the idiosyncrasies of the system . . . [but] we take the opposite view, that the system should be adapted to meet the needs of the users.”

2.4.2 Tailoring the Tools

Addressing the problems of subject searching by tailoring the tools to better serve subject searchers is an approach largely indebted to the legacy of the Cranfield studies of the 1950s and 1960s. These studies evaluated different subject indexing languages through laboratory experiments involving test beds of indexed documents, researcher-devised experimental queries, indexing and retrieval systems, and panels of judges to determine the relevance of retrieved documents (Cleverdon, Mills, & Keen, 1966; Nuyl, 1968). Experimental and theoretical research efforts that followed have attempted to devise information retrieval systems capable of supporting more effective subject searching using a variety of techniques.

Table 1 presents a sampling of research efforts from the past three decades aimed at refining the effectiveness of subject searching tools that have targeted different system components. Some

efforts have attempted to enrich the subject content to increase the likelihood of matching searchers' query terms to a system's database content. Other attempts have focused on making the user interface easier to use, or on making the search engine smarter in an attempt to offload some of the burden of juggling many conceptual and technical tasks from the user to the search system. While much of the earliest work on tailoring online search tools involved nongraphical interfaces, later efforts have taken advantage of advances in information technology, tools, and protocols many of which are Web-based.

Table 1

Experimental and Theoretical Approaches to Tailoring the Tool

<u>Targeted Component</u>	<u>Attempted Enhancement</u>	<u>Research Efforts</u>
Online database content	Increasing the number of subject access points in catalogue bibliographic records	Atherton (1978), Beatty (1992), Byrne and Micco (1988), Cousins (1992), Knutson (1991), Lam (2000), Lester (1989), Mandel (1985), Markey (1984), Markey and Demeyer (1985), van Orden (1990), Wormell (1992)
	Adding keyword meta-tags to Web resource metadata	Alimohammadi (2003)
	Including controlled vocabulary reference structures	Cochrane (1983), Franklin (2003), Micco (1991)
Subject search interface	Developing interfaces specifically designed to facilitate browsing and other types of searching by non-subject experts	Bates (1986), Borgman, Hirsh, Walter and Gallagher (1995), S. Y. Chen, Dimakopoulos and Magoulas (2005), Fang and Salvendy (2000), Hildreth (1995), Pejtersen (1989, 1994), Waterworth and Chignell (1991)
	Proposing more effective display and browsing of search results	Luther, Kelly and Beagle (2005), Dimitroff and Zhang (2005), Drabenstott and Weller (1996), Kinnucan (1992), Massicotte (1988), McGarry and Svenonius (1991), Roussinov and Chen (2001)
Online catalogue search engine	Transferring a substantial amount of the cognitive load of subject searching from the user to the system via automatic spelling error correction, subject clustering or classification, truncation and term stemming, natural language queries, probabilistic best-match instead of exact-match, linking users' search terms to controlled vocabulary cross-references, probabilistic relevance ranking of search results, search trees to expand searches.	Experimental or operational online catalogues: <i>CITE/CATLINE</i> (Doszkocs, 1983); <i>Okapi</i> (Hancock-Beaulieu & Walker, 1992; Mitev, Venner, & Walker, 1985; Walker, 1987, 1988; Walker, Vere, & De Vere, 1990); <i>Muscat</i> (Merrington, 1999; Porter & Boulton, 2000; Porter & Galpin, 1988); <i>Cheshire</i> (Larson, 1991b, 1992, 2001, 2003; Larson & Carson, 1999; Larson, Moon, McDonough, Kuntz, & O'Leary, 1995; Larson & Watry, 1999); <i>ILSA</i> (Micco & Popp, 1994); <i>ASTUTE</i> (Drabenstott & Weller, 1994, 1995)

Table 1

Experimental and Theoretical Approaches to Tailoring the Tool

Web search tool performance	Fine-tuning performance using a variety of techniques, many of which are similar to those applied to online catalogue search engines.	Bates (2002), Radev, Fan, Qi, Wu, and Grewal (2005), Godby, Miller and Reighart (2001), Toth (2002), Wheatley (2000)
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Efforts to develop significantly improved subject searching tools at the outset seemed to hold much promise, and yet many subject searching short-comings of current tools remain much the same as those identified in second-generation systems of the early 1980s (Sridhar, 2004; Yu & Young, 2004). Furthermore, referring to TREC (Text Retrieval Conference) 7 and 8 interactive track performances, Larson noted that the hypothesis guiding the development of Cheshire II as a third-generation online catalogue capable of effectively addressing the problems of subject search failure and information overload “has not been upheld by the data collected so far [and] it has also become evident that the individual differences in users and their behavior require much larger samples for any significant analysis of activities as complex as information retrieval” (2001, p. 503). It is therefore reasonable to conclude that to date, neither teaching the user, nor tailoring the tool, alone, has adequately addressed the subject searching difficulties of nonspecialist users.

2.4.3 Examining Users’ Search Processes

A third approach to alleviating subject searching difficulties arose out of a shift in research perspective commencing in the 1980s toward acceptance of the idea that it is essential to understand users’ search processes fully through observing, analyzing and creating models of their thoughts, behaviours, feelings, search processes and information needs in naturalistic contexts (Dervin & Nilan, 1986). In this view, rich, detailed understandings can more productively support efforts to tailor search tools and prepare users to be able to address effectively and knowledgeably their subject searching needs throughout their lives.

Examining users' search processes has typically involved plumbing the depths of users' search behaviours, tasks, and processes, and some studies have sought to capture the breadth of those processes as they unfold over time. In-depth investigations of different kinds of subject searching behaviours and tasks have been conducted in various ways, a selection of which is summarized in Table 2.

Table 2

Studies of Users' Search Processes

<u>User Search Processes</u>	<u>Study Goals or Findings</u>	<u>Researchers</u>
Users' actual subject searching in a university library before and after the installation of an online catalogue	Subject searching data was collected by capturing users' talk-aloud protocols, observation, and screen logging. Conclusions were that searching i) does not necessarily begin with or involve the library catalogue, and is performed extensively at the shelves to evaluate the content of documents; and ii) was inadequate in then-current systems because they did not support exploration of contextual and matching catalogue searching, thus constraining the user's subject searching task.	Hancock (1987), Hancock-Beaulieu (1990)
Goals, tasks, and subject searching behaviours of catalogue users and nonusers at different types of libraries	Using screen transaction logging, observation and interviews, the study sought to discover what user needs should be supported by online catalogues, rather than study how users interact with existing catalogues that impose constraints on their needs.	Belkin, Chang, Downs, Saracevic and Zhao (1990)
System-dependent information seeking behaviour of academic social scientists, physicists and chemists	Using grounded theory, semi-structured interviews were used to explore researchers' information seeking activities. Eight basic, non-hierarchical characteristics underlying their information seeking activities were identified: starting, chaining, browsing, differentiating, monitoring, extracting, verifying, and ending.	Ellis (1989), Ellis, Cox and Hall (1993)
Searching by "Web-savvy" novice and experienced university catalogue users to complete researcher-imposed tasks that included subject searching.	Users talked aloud while completing information search tasks. Neither experienced nor inexperienced users were found to be proficient searchers. Novices expected the catalogue to perform like an Internet search engine, and preferred to click on hyperlinks without much thought in the hope of recognizing potentially useful information.	Novotny (2004)
Undergraduate students' practices during the process of writing research papers, including research strategies and resources they used.	A wide variety of methods were used to collect data on students' research processes and study habits (e.g., surveys, interviews, map diaries of places visited in a school day). Students were confident of their abilities to find and evaluate information, and described approaches suggesting they felt in control of those processes.	Foster and Gibbons (2007)

Most of the users who participated in the studies in Table 2 were students and faculty in higher education, and the search processes investigated in these studies included online and offline modes of subject searching that represented genuine, or simulations of genuine, information needs. The contributions of these kinds of in-depth studies of specific subject searching situations or practices have greatly increased our knowledge of users' information seeking behaviours and thoughts. Their "snapshot" views or verbal descriptions of user characteristics, needs, and behaviours gathered at discrete points in time, however, fail to provide a holistic, dynamic picture of interactions among user needs, thoughts, tasks, behaviours, and other potentially relevant characteristics across time or at different points in time when a variety of information needs and other factors are at play.

Other researchers have addressed the inherent limitations of studies focusing on searching activities taking place at discrete time points by examining longitudinally the information seeking processes of users as they pursued completion of particular academic projects over periods of several months or longer, in naturally occurring settings. Table 3 highlights a selection of such studies, each of which found changes in users' behaviours or thinking from the beginning to the end of the study.

Table 3
Longitudinal Studies of Information Seeking and Searching

<u>Users and Tasks</u>	<u>Study Approach, Goals and Findings</u>	<u>Researchers</u>
Academically capable high school seniors, who completed one research paper per semester over two semesters comprising their school year.	Thoughts, feelings and actions of 25 students engaged in research projects were studied via journals, search logs, written statements, teachers' assessments, and, for six students, interviews and conceptual maps. The goal was to understand successful students' search processes. From findings emerged the basis of a six-stage information search process model comprising: initiation, selection, exploration, focus formulation, collection, and search closure. Findings were confirmed and expanded by tracking four students after four years of college.	Kuhlthau (1988, 2004)
MSc students taking a course on information systems judged the relevance of online search results performed by search intermediaries.	Relevance judgments were made by 22 students on search results on their dissertation topic at the beginning and end of their three-month dissertation project. Students were not subject or search experts and judged most searches to be unsuccessful. Initial relevance judgments were much higher than final judgments; 81% of retrieved items in the end were not retrieved or judged.	Smithson (1994)

Table 3
Longitudinal Studies of Information Seeking and Searching

<u>Users and Tasks</u>	<u>Study Approach, Goals and Findings</u>	<u>Researchers</u>
Faculty, doctoral and masters student actual use of documents judged to be relevant 2.5 years previously by faculty, doctoral and masters students whose focus of study was in agricultural economics.	An initial study tracked 25 faculty and student document selection decisions via think aloud reports as they evaluated results of an intermediary's online search on a genuine research project topic. A follow-up study interviewed 15 of the original participants to learn how participants actually used documents earlier judged to be relevant. Compared to those who knew little about their search topic, participants who knew more about their topic tended to select fewer documents for use, but read and cited more of them in their final written product.	Wang and Soergel (1998), Wang and White (1999)
High school seniors who worked for 4 months in small groups on a 20-page group term paper on possible Swedish membership in the EU.	A phenomenographic approach was used to examine 25 students' experiences of the research process, and interactions between their conceptions of information seeking and of their research topics. Three broad categories of students' conceptions of information seeking were identified: fact-finding; balancing information in order to choose right; and scrutinizing and analyzing, with differences among experiences appearing to be influenced by conceptions of the subject matter being searched.	Limberg (1999)
Types of information sources used over a 1-year period by engineering and education doctoral students.	The goal of the study was to examine how 12 mostly first-year doctoral students "moved from being novices in information search to becoming expert searchers." Students ranked the importance of information source types at three time points using a questionnaire containing 26 source types and explained their rankings in an interview toward the end of the study. Source type importance varied according to students' stage of their degree program, and differences and similarities were found between education and engineering students.	Chu and Law (2007)

User studies have provided new insights on subject searching, including variant ways to conceptualize users' search processes and how users think about their search processes. For instance, theoretical constructs associated with information retrieval and subject searching such as relevance (Cuadra & Katter, 1967; Harter, 1992; 2004; Saracevic, 1975, 2007a, 2007b; Wilson, 1973) have been explored through user studies that have increased our understanding of the criteria employed by users to determine the relevance of retrieved information (Barry, 1994; Barry & Schamber, 1998). Other studies revealed relevance judgements to be fluid, situation- and context-dependent interpretations by users at particular points in time (Park, 1993), and confirmed the idea that a

relevance judgment of a retrieved information item is distinct from an evaluation of its quality although both higher order thought processes are interrelated and may occur at the same time (Fitzgerald & Galloway, 2001).

Despite the richer details of subject searching dynamics provided by longitudinal studies and definition and refinement of concepts such as relevance in information searching, we have few concrete details about what needs to change, and how, in order to support more effectively the processes of subject searching by inexperienced users. As of yet, neither teaching the user, nor tailoring search tools, nor examining users' subject searching processes appears to have led to adequate alleviation of nonspecialist users' subject searching challenges, although the latter may hold greater promise of uncovering further clues on how novice or less successful subject searchers learn to become more successful searchers, and factors that may facilitate this learning. The fourth part of this overview of related research considers selected studies on how subject searchers' levels of experience and expertise influence the degree to which they are affected by subject searching difficulties with an emphasis on studies that have investigated undergraduate researchers.

2.5 Subject Searching Experience and Expertise

It seems reasonably clear that subject searching difficulties can represent significant roadblocks to searchers who know very little about the topic or subject area they seek to understand better, as well as to those who are inexperienced in performing subject searches. New undergraduates generally have little in-depth knowledge of the subject matter of their enrolled courses (Budd, 2008) and may have minimal experience conducting subject searches on scholarly topics, whereas experienced academic researchers rely predominantly on means other than information search tools such as catalogues and indexes to address their information seeking needs in areas of academic interest and expertise (Ellis, 2005; Ellis, et al., 1993; Stoan, 1991).

The terms “experience” and “expertise,” however, often lack unambiguous, consistent definitions when used to refer to users’ subject searching skill level or their degree of knowledge in a particular subject domain. In section 2.5 I review selected research that has investigated the effects of experience and expertise in information seeking. I also summarize findings or viewpoints offered in research contributions that address the question of whether or not undergraduate students perform, or appear capable of performing research and information seeking in the competent (experienced and skilled) manner understood to be part of the repertoire of information literate individuals.

2.5.1 Experience and Expertise

Researchers addressing various aspects of the problems of searching for information often distinguish between the efforts and abilities of “novice” and “expert” users. In such cases “novice” may refer to users with little search experience or skill or little knowledge of the subject matter of the search, and “expert” may refer to users with varying amounts of accumulated experience, skill or subject knowledge. Widespread employment of the terms “experience” and “expertise” as though they are interchangeable may lull us into thinking they are more or less synonymous. Given “the fact that experience does not necessarily make one an expert” (Aula & Nordhausen, 2006, p. 1681), however, renders equating experience with expertise unwise.

Lack of clarity arises from the prevalent use of two distinct meanings of the term “experience.” The *Concise Oxford English Dictionary* defines experience as 1) “practical contact with and observation of facts or events” and 2) “knowledge or skill acquired over time” (Soanes & Stevenson, 2006). Fisher (1991) observed that reports of studies involving varying levels of computer use experience could be compared more reliably if they all shared a common definition of experience. To avoid ambiguity Fisher suggested that we use “experience” to denote accumulated practical contact with events (meaning 1, above), and “expertise” to denote accumulated skill or

knowledge (meaning 2, above), and recommended that we think of users as possessing variable levels of both.

In Fisher's (1991) view, experience is a user's accumulated amount of exposure to a particular task or event. A user who has never before attempted to perform a task is a beginner or novice, but repeated attempts to engage in the task generally results in an accumulation of experience, as over time the user amasses practical contact with the task. Expertise is the degree to which a user possesses specialized skills, knowledge or abilities in a particular performance or subject area. Unlike experience, expertise does not necessarily increase with repeated exposure or practical contact. A naïve⁶ user lacks specialized knowledge or skills, but with training, education, or other similar developmental effort, it is possible that the naïve user may acquire specialized knowledge and/or skills in a particular task or area, thereby amassing expertise.

If we apply Fisher's distinction to subject searching, "experience" denotes a user's accrued practical contact with, involvement in, or exposure to subject searching activities, whereas "expertise" denotes the amount of specialized subject knowledge or searching skill acquired by the user. The essential point is that a user's experience encompasses the total accumulation of all attempts to engage in subject searching which always expands incrementally with each new attempt, whereas a user's expertise in performing subject searches may or may not increase or develop substantially over time, depending on whether sufficient effort, ability, or learning is present. A user could conduct many subject searches over time and end up with substantial subject searching experience but little subject searching expertise⁷. In short, someone with substantial subject searching experience does not necessarily have subject searching expertise, although someone acknowledged by peers to have subject expertise is likely to have significant accumulated experience as well as strong domain

⁶ Fisher (1991) suggested we use "naïve" when referring to a user lacking expertise because "novice" is generally used to refer to a person lacking experience. "Novice" is often used in research reports to refer to users who lack experience or expertise or both, and is thus another potential source of unclear meaning.

⁷ Borgman (1996, p. 494) referred to such users as "perpetual novices at information retrieval."

knowledge and competency in locating, evaluating and using appropriate information within that subject domain.

Leaving aside the issue of inconsistent usage of the terms experience and expertise for the moment, it is useful to consider what we know about the effects of subject or domain knowledge, and search experience and expertise on users' subject searching processes. Summarized here are some notable findings of selected studies that have investigated different aspects of this question⁸.

In their report on a series of four studies on domain and search expertise of domain and search experts involving researcher-imposed search topics, Marchionini, Dwiggins, Katz and Lin (1993) concluded that domain knowledge and search expertise are not independent factors in full-text database searching. They also noted that factors other than expertise are important, such as the strength of a user's motivation to persevere and to apply intellectual effort to solve a search problem.

A study by Hsieh-Yee (1993) required participants to search ERIC for answers to researcher-imposed questions in familiar and unfamiliar subject areas. Differences in study participants' search tactics were found to be correlated with differences in their levels of search experience although no attempt was made to assess the effectiveness of searches. The study results also suggested that subject knowledge may have been advantageous to the subject searching process only when a basic amount of search experience was present.

Meadow, Wang and Yuan (1995) found that domain specialists who were not online search specialists tended to read retrieved records resulting from subject searches to determine relevance and showed little inclination to explore the retrieval system itself. In contrast, search experts who were not subject experts spent comparatively little time examining search results and concentrated more of their time on browsing and exploring different ways of using the retrieval system. This finding is similar to that of Marchionini et al. (1993) who observed domain experts to be problem solvers,

⁸ To avoid misrepresenting authors' meanings, descriptions of research on "novice" and "expert" subject searching summarized here employ the terms used by the authors.

whereas search experts tended to be information search strategists who focused on problem statements and query formulation.

Drabenstott (2003) analyzed subject searches by “nondomain experts”—individuals lacking subject expertise about the topics they were searching—who used a university information gateway comprising an online catalogue and various Web-based online bibliographic databases. Searches were performed by undergraduates on the topics of recently assigned course-related tasks. Study participants infrequently used search strategies commonly associated with domain expert searching such as author searching, citation searching, footnote chasing, searching journal runs, and known-item searching (Drabenstott, 2003, p. 837) and in the rare instances when they did, a great amount of effort was required to obtain useful results.

Holscher and Strube (2000) used a 2 x 2 experimental design to investigate the extent to which Web searching experience and domain knowledge influenced search outcomes. As one might expect, the researchers found that participants having the greatest amounts of search and domain experience performed best. Their experiment also revealed that participants with lower levels of search experience and/or domain knowledge performed less well and used less flexible strategies, and that both search and domain experts appeared to have difficulty with Web searching.

Kim (2001) investigated how undergraduates’ cognitive style, online database search experience, and task type (known-item search vs. subject search) affected researcher-imposed Web searching exercises. Task type did not seem to have a notable effect on Web search performance, and cognitive style seemed to come into play only for searchers with little or no online searching experience. Experience in online database searching, however, was strongly associated with efficient Web searching.

Jenkins, Corritore and Wiedenbeck (2003) used a 2 x 2 experimental design to examine search behaviour patterns in researcher-assigned subject searches by nurses possessing different levels of Web and domain expertise, none of whom had any formal training in Web searching. Study

results revealed that domain and Web novices were timid, and preferred breadth-first searching that strayed only one click from a home base or hub, perhaps in order to reduce the cognitive load imposed by their lack of domain knowledge or an appropriate mental model of the Web. Domain and Web experts preferred depth-first searching, remained focused on their search task, and performed both searching and evaluation of retrieved resources with much less cognitive load.

2.5.2 Undergraduate Subject Searching Expertise

The studies described in the preceding subsection indicate that variant amounts of exposure to and knowledge of subject searching and particular intellectual domains can result in differing information search behaviours, preferences and outcomes. Whereas we generally expect lower-level (first- and second-year) undergraduates to possess low amounts of experience and expertise in information searching and scholarship within particular academic domains, we assume professors and seasoned information professionals have accumulated significantly greater quantities of domain and/or subject searching experience and have established themselves as experts in their chosen professional fields. Where, then, do upper-level (third- and fourth-year) undergraduates fall on the subject searching expertise continuum, given that they have, by definition, amassed more academic experience than lower-level students, and have possibly but not necessarily accumulated a greater store of subject searching experience?

Although to my knowledge no studies have addressed this precise question, many have investigated undergraduate students' research processes, research skills or library skills which are often understood to be aspects of information literacy. According to the Association of College and Research Libraries (ACRL) information literacy standards for higher education, the concept of information literacy embraces two basic categories of thinking skills—lower order and higher order—needed to realize the various desired learning outcomes associated with attainment of the competency

standards (Association of College and Research Libraries, 2000). Referring to outcomes of the ACRL standards and the task force that created them, Maughan (2001, p. 83) noted the following:

The outcomes include skills such as determining the availability of needed information; defining an overall plan to acquire information; assessing the quantity, quality, and relevance of search results; evaluating the reliability, validity, accuracy, authority, timeliness, and bias of the information retrieved; recognizing the cultural and other contexts in which information is created; and understanding the impact of these contexts when interpreting the information.

The task force distinguishes between higher-order thinking skills and lower-order thinking skills. The outcomes just described can be said to fall within the higher-order skills.

The following studies provide insights into undergraduate subject searching abilities and capabilities that are relevant to the question of the extent of upper-level undergraduates' achievement of information literacy.

Several researchers have surveyed upper-level undergraduates' research practices or information literacy skills. Coupe (1993) administered a survey of basic (lower order) library skills to two groups of students at Johns Hopkins University, the first comprising students in all four years of undergraduate studies, and the second comprising a larger group of only third and fourth year students. Conducted because the first survey showed little difference between the scores of first-year and fourth-year students, the second survey showed that while upper-level students performed better than lower-level students in tasks such as using keyword searching and identifying different formats of a key search tool, "fewer than half of them seem to have a working knowledge of these concepts" (Coupe, 1993, p. 193). Coupe's second survey yielded a mean average test score of 73% for the fourth year students which she observed was "hardly evidence that students are picking up library skills on their own" (1993, p. 194) as the university did not offer any instruction in basic library skills, although the results suggested respondents did assess their own skills accurately.

Maughan (2001) reported on analyses of three years of information literacy survey results gathered from selected groups of graduating fourth-year students at the University of California-Berkeley. Like the survey used by Coupe (1993), this survey included self-assessment and skills questions designed to measure respondents' lower-level information literacy competencies. Survey results revealed that students believed themselves to have far greater basic research competencies than their actual test scores demonstrated, as "in five of the eight groups studied between 1994 and 1999, the median score for graduating seniors was a failing score" (Maughan, 2001, p. 83) defined to be 65% or lower.

Head (2008) investigated how upper-level humanities and social science undergraduates at Saint Mary's College of California conceptualized and conducted course-related research through a survey of 178 students, small group discussions involving 13 students, and content analysis of professors' handouts outlining research assignments. Survey responses indicated that respondents' most common research tasks were short argument, literature review, and theory papers. They also indicated that respondents' first steps in conducting research involved easily accessible, primarily scholarly sources such as their course textbook and the library website, and that their greatest research challenges were procrastination, the overwhelming amount of information encountered during research, and identifying a sufficiently narrow topic. Both survey responses and small group discussions revealed understanding professors' expectations for assignments to be another significant challenge. Head (2008, p. 435) concluded that "most students are challenged by tasks requiring specific information literacy competencies, such as retrieving, evaluating, selecting, and using information" and that their greatest challenge lay in discerning the requirements of individual research tasks.

Lee (2008) interviewed 15 undergraduates from diverse ethnic backgrounds at the University of Wisconsin-Milwaukee, of whom 14 were third- and fourth-year students, to explore influences of the structure of information collections on their academic research processes. Most of the study

participants reported using easy and convenient information sources and search strategies. Students preferred Google and keyword searching over tools and sources on their library's website which they found confusing and difficult to use, they had knowledge of only a few search tools, used basic evaluative strategies such as name recognition, and often browsed the book stacks to find materials on their research topics. Lee (2008, p. 217) viewed the three types of subject searching difficulties experienced by study participants—"their unfamiliarity with a variety of resources that were available and useful, their underdeveloped skills for effective searching, and their deficient knowledge about evaluation of resources"—as indications that "undoubtedly teaching information literacy skills to students is critical to their education." Her conclusions included ways to enhance information structures in academic libraries to better support different user groups' information seeking processes.

Whitmire (2003) interviewed 20 fourth-year Yale University undergraduates majoring in a variety of humanities, social sciences and sciences to explore whether their research processes were influenced by their epistemological beliefs which, according to major theorists, can range from absolute beliefs in right and wrong knowledge largely held by less experienced students, to knowledge beliefs held most often by advanced scholars that are more relative, principles-based and context-dependent. Whitmire used interview data to categorize participants by epistemological development category (medium-low—3 students, medium-high—12 students, and high—5 students) and found those levels to influence the following processes occurring during stages two to five of Kuhlthau's information search process: topic selection, use of human mediators, search techniques, evaluation of retrieved information, and recognition of authority (Whitmire, 2003, p. 139). The most commonly used search activities were following chains of cited sources, and browsing library shelves and journals. Many students mentioned frustration in using online indexes to find journal articles. Whitmire found tendencies among medium-high and high epistemological believers to use a greater variety of search techniques, to consult with others (e.g., professors and reference librarians) to find needed information, to use their own knowledge to evaluate the quality of information, to accept

conflicting information, to recognize authoritative sources in their fields of study, and to recognize authors' biases and particular agendas.

Other researchers have included upper-level undergraduates in investigations of academic research skills and processes. Fitzgerald and Galloway (2001) explored relevance judging, evaluation and decision making during online subject searching for genuine academic tasks by 10 undergraduates majoring in economics or psychology at a large university in Georgia, 8 of whom happened to be fourth-year students. This study yielded a large pool of evaluation strategies that were notable for their variety and specificity and confirmed the view that evaluation requires higher order thinking and is complex.

Valentine (2001) interviewed 31 humanities and social science undergraduates from five college and university classes, 23 of whom were third- and fourth-year students (Valentine, 1999, p. 3) about their process of writing research papers. Fourth-year students appreciated assignments they believed prepared them for graduate studies or finding jobs, had learned how to calculate use of their research time and effort to achieve the desired grade, and by the end of their undergraduate studies were often "literally 'sick' of school, hence the appropriateness of the term used by many in this study: 'senioritis' " (2001, p. 113). In general participants in this study weighed carefully what Valentine termed "legitimate effort"—the amount of effort worth expending to complete a particular research task adequately that addressed what the professor wanted.

Neely (2002) developed and administered a survey of attitudes about information literacy skills to undergraduate, graduate and doctoral students in the School of Education at a major research university. Survey results revealed a significant discrepancy to exist between respondents' self-assessed information literacy abilities and their actual skill levels, particularly in the area of evaluation, which indicated that "students at all levels are not familiar with basic library research skills or search strategies, nor leading education resources," (2002, p. 149). These findings led Neely

to conclude that survey respondents' information literacy levels were quite low, and that they were unfortunately also unaware of the limited nature of their skills.

Novotny (2004) compared the performance on researcher-devised online catalogue academic search tasks of nine first-year Pennsylvania State University undergraduates as well as nine more experienced searchers, seven of whom were upper-level undergraduate and graduate students. He found experienced searchers conducted slightly more focused searches, changed search defaults, showed more search perseverance, and spent less time pursuing unproductive options. He concluded, however, that "although experienced users, on average, performed better than novices . . . they were not expert searchers . . . [and] it no longer seems safe to assume that an experienced user is also an advanced user" (Novotny, 2004, p. 534).

Twait (2005) interviewed 13 Gustavus Adolphus College undergraduates in their first- to fourth-years to explore their source selection criteria during the research process. She found that fourth-year students mentioned content as a criterion more often than students in other years of study, and that first and fourth-year students more often preferred print rather than electronic sources.

The last investigation I will mention here is unique because it represents the only longitudinal study of undergraduate information behaviours I have found that looked at genuine academic research tasks and was not linked to pre-determined tasks, search resources, or courses (Warwick, Rimmer, Blandford, Gow, & Buchanan, 2009). In order to explore how students developed expertise in information seeking, evaluation, and use, these researchers observed and interviewed 13 undergraduate students, 7 of whom participated to the end of the study, as they talked aloud while carrying out research tasks for their academic studies at four different time points over the first two years of a three-year degree in information management. During the study participants were observed to acquire research expertise, but not in the manner expected by the researchers. Most participants became skilled in strategic "satisficing" which involved using their existing skills in strategic ways to find the minimum information needed. While searching for course-related tasks, participants often

“used knowledge about information sources to justify not using those sources they disliked . . . [avoided] evaluating the information that they had found . . . [and] used their knowledge to justify a limited strategy and worked out the minimum acceptable material needed” when faced with complex, challenging tasks (Warwick, et al., 2009, p. 2411).

Collectively these studies suggest that many upper-level undergraduates are challenged by aspects of research and subject searching requiring both lower and higher order thinking, are often guided by matters having to do with pragmatic issues of ease, convenience and familiarity rather than information quality, research assignment quality or personal learning, and are very concerned about identifying and producing what professors want in assigned research tasks. In addition they indicate that upper-level students’ research processes can sometimes be differentiated from those of lower-level students although the type, extent and quality of those differences may not always be aligned with information literacy ideals. The study by Whitmire (2003) also suggests that upper-level students who have highly developed epistemological beliefs may be better positioned to engage in the type of higher order thinking represented by the most challenging aspects of information literacy, including confident and independent evaluation of information sources, use of a wide variety of search techniques, and effective use of human mediators to assist with information searching.

Undoubtedly experience and expertise in information seeking and scholarly domains exert influences on the processes, quality and outcomes of undergraduate subject searching, but they are only two of a great number of contextual factors that may be at play. It is therefore worth considering what is meant by “context” and its significance to research that seeks to explore and understand subject searching. In the following section I review different approaches to the meaning and uses of context in research related to subject searching.

2.6 Context and Subject Searching

It seems reasonable to assume that achieving a deep understanding of what users actually think about and do during subject searching necessarily involves understanding the circumstances under which users undertake their subject searching activities in the first place. I refer to these circumstances as the “context” of subject searching, but some clarification is required, as this term is often used by different researchers in richly variant ways.

In her discussion of the question “What is context?”, Dervin (1997) observed that although the importance of this concept is not in dispute, in-depth treatments of its theoretical and philosophical underpinnings are scarce. Dervin described a continuum of meanings of context in humanities and social sciences research, with one end represented by context as a variable to be studied (such as user experience or expertise) that could be any “attribute of person, culture, situation, behaviour, organization, or structure” identified and treated by researchers as a “container in which the phenomenon resides” (1997, p. 14). At the opposite end of the continuum is context as an all-encompassing environment indivisible from the entity being studied within it, context here being “the carrier of meaning” with every instance representing a unique “intersection of a host of nameless factors” (1997, p. 14-15). In research situated all along this continuum Dervin noted the tendency of researchers to compile long lists comprising widely varying types of contextual variables.

Dervin’s own perspective on context centred on interdependent “common themes of continuity and discontinuity within and between” the two ends of the continuum that include the following ideas: knowledge is impermanent and incomplete; reality is discontinuous and changes across time and space; knowing something involves personal interpretation; context is not an independent entity, but rather focuses on processes and relationships between things that appear stable and those that do not; and context is a necessary source of meaning (Dervin, 1997, p. 15, 17-19). Viewed in this way, context “is something you swim in like a fish” (Dervin, 1997, p. 32), something both containing and contained in the researcher and what is being researched.

Largely in accord with Dervin's understanding of context, Talja, Keso and Pietilainen (1999) distinguished between "objectified" and "interpretative" approaches to understanding context in research on information needs and seeking. They argued that most of the research in this area has addressed context by enumerating factors affecting the research focus, with the aim of identifying general patterns or proposing models of information seeking behaviour, thereby implying that research findings about those behaviours reflect objective reality. Talja et al. (1999, p. 755) suggested that a less frequently used but more fruitful approach views data such as "observations, interviews, diaries and text materials" as reflections of individuals' socially constructed representations of contexts of interaction and meaning which, in turn, interact with researchers' particular theories, with neither the researchers' theories nor data remaining stable over time.

Johnson (2003) explored the meaning of context by describing three different senses in which it is used in information seeking research: situations (lists of factors present during information seeking), contingencies (lists of key situational factors producing predictable information seeking behaviour), and frameworks (conceptual structures for establishing meanings or interpretations of information seeking). Johnson's three senses of context overlap with aspects of Dervin's characterizations of understandings of context as containers of data, lists of factors, and carriers of meaning relating to the focus of what is being studied. Johnson's main contention was that increased attention needs to be paid to multiple, varying contexts of information seeking to avoid arriving at research findings that conveniently fit expectations and explanations, or mask important differences, invariant aspects or core elements of information seeking across different contexts.

Acknowledging that "context" and "situation" are often used by researchers more or less interchangeably, Cool (2001, p. 8) suggested that "contexts are frameworks of meaning, and situations are the dynamic environments within which interpretive processes unfold, become ratified, change, and solidify," a view that positions context as being larger and more enduring, and situation as being an active, changeable component occurring within context. Noting the lack of agreement on

a definition of context and on what constitutes its key aspects for information seeking and behaviour research, Cool and Spink (2002, p. 606-607) described four overlapping, interrelated levels of context that influence human information behaviour: information environment (social and environmental factors), information seeking (behaviours directed at accomplishing tasks requiring information), IR interaction (user-system interactions within search sessions), and query (system interpretations of query terms based on their context). Cool and Spink observed that the largest proportion of research addressing context to date has done so at the level of information seeking.

In a review of context in library and information research from the 1970s to the 1990s Thomas and Nyce (2001) noted a growing appreciation among researchers for the role of context in information seeking. They described research employing several different conceptions of context (treated mainly at what Cool and Spink (2002) called the information seeking level), and suggested that further qualitative research taking context into account from an ethnographic perspective (an information environment level) could advance the utility and influence of library and information science research.

In Solomon's (2002) review of everyday information seeking and use, information is viewed as being embedded in people's everyday lives, and therefore context is present in the everyday situations in which people discover and use information. Based on the premise that information is constructed by those who interact with it, Solomon's review focused on research involving context mainly at the information environment and information seeking levels that address ways in which people's personal situations affect their information behaviours and experiences, with an emphasis on studies of information seeking involving social processes and interactions with information systems and technology.

Kelly (2006, p. 1731) conceptualized information seeking context as comprising the "characteristics of the information need, the user and the available information tools [that] help define the problematic situation" which she viewed collectively as a matrix, "a composite of things,

comprised of unique, but not necessarily independent, elements or aspects.” Kelly described the background and methods used in a 14-week longitudinal case study exploration of the contexts of naturally occurring information seeking of seven doctoral students, with a focus on participant-identified tasks and topics as the contextual elements and key variables of endurance, frequency, stage, persistence and familiarity for each element.

Vakkari (2003, p. 416) also viewed user task as an important contextual element in information seeking research, describing it in a review of research on task based information searching as “an activity to be performed in order to accomplish a goal” that can often be broken down into subtasks. He noted that identification of tasks and their subtasks necessarily depends on the specific focus and goals of individual research investigations.

Referencing a comment by Choo (1998), Case (2007) observed that unlike the dominant view in past research, more recent research on information seeking does not always assume that information resides objectively in sources, but rather sees it as something that comes into existence only when it becomes meaningful to a user within some context. A similar observation was made by Taylor (1991) when he asserted that the value of a piece of information can be determined only by a user in a particular context who is able to derive criteria for judging value from that context. These conceptualizations of context are consistent with the social constructivist approach favoured by Talja et al. (1999).

Courtright (2007) undertook an in-depth review of information behaviour research addressing context. She analyzed and compared models and conceptualizations of context in research on information needs, seeking and use (“information practices”) and suggested that context is a frame of reference comprising “those elements that have a more lasting and predictable influence on information practices than situation; situation will be seen as a potential part of context” (2007, p. 276). She organized her review around four aspects of context: its boundaries and components, its ontological status, its stability, and its relationship to the information practices of users (“actors”).

Courtright concluded her review by noting a need for further research that treats context as relational and dynamic by acknowledging “that researchers contribute to actors’ versions of their information worlds rather than simply documenting these transparently,” and by tracking changes not only in actors, but in their contexts as well (2007, p. 291-293).

Although for now the concept of context remains much debated within library and information science research,⁹ it seems reasonably clear that an investigation of subject searching processes is enriched when the investigator acknowledges many and varied roles that contextual factors may play. From the preceding brief sampling of treatments of context in information behaviour research, I accept as sound foundational ideas for exploring what happens during subject searching Dervin’s (1997) premises that context is necessary for meaning, and requires a focus on process (actual thinking and action by subject searchers). It also seems prudent for investigators to strive to maintain a mindful stance regarding how their own knowledge, experience, values, expectations and assumptions influence the conduct, and is part of the context, of an investigation.

In the following chapter I further examine the concept of information literacy by describing its role in the conceptual framework I developed to structure and focus the present exploration of undergraduate subject searching.

⁹ An information retrieval symposium report indicated a panel discussion on “What is not context?” became “the apex of the Symposium,” producing much useful discussion (Ingwersen, Ruthven, & Belkin, 2007).

Chapter 3

Conceptual Framework

3.1 Chapter Overview

In chapter 3 I articulate the conceptual framework guiding the present exploration of undergraduate subject searching. This framework is founded on the concept of information literacy, which, despite being well-known to librarians and educators, is understood and applied in variant ways. I begin by describing in section 3.2 how subject searching relates to the concept of information literacy. Next I summarize the origins of the concept of information literacy and ways in which this concept remains disputed in section 3.3. Using the existing research literature as a foundation, I derive a definition of information literacy for use in the present study in section 3.4. Lastly, in section 3.5 I outline a proposal to use three advanced information literacy skills and experiences as a theoretical lens for exploring this study's research questions about the thoughts, behaviours and experiences associated with subject searching for genuine academic tasks by academically successful upper-level undergraduates.

3.2 Subject Searching as a Component of Information Literacy

I noted in chapter 1 that in the present study, subject searching is understood to be the process of looking for information with only a subject or topic in mind, and that an information literate individual is commonly understood to be someone who is “able to recognize when information is needed and ... locate, evaluate, and use effectively the needed information” (American Library Association, 1989, para. 3). The latter definition is similar to one derived by a Delphi panel of experts invited to participate in a U.S. National Commission on Information Literacy study: “Information literacy is the ability to access, evaluate and use information from a variety of sources” (Doyle, 1992, p. 2). Although variant definitions of information literacy abound, most make

reference to abilities similar to those presented in the American Library Association (ALA) definition involving finding and then using needed information effectively (Eisenberg, et al., 2004, p. 3-11).

The concept of information literacy is relevant to the present exploration of undergraduate subject searching because at a basic definitional level, information literacy entails successful subject searching. Subject searching involves seeking information (most often textual) *about* a particular subject or topic, which comprises one of the various types of information¹⁰ an individual may need. According to many definitions, information literacy involves, among other things, identifying an information need, then effectively finding, evaluating and appropriately using the needed information. Successful subject searching is therefore part of the repertoire of an information literate individual. Here I understand “effective” and “successful” to be essentially synonymous terms indicating the subject searcher has determined that the need motivating a search for information has been largely, if not completely, addressed.

It is worth noting that a single instance of successful subject searching is not necessarily an indicator of information literacy, as recognizing “when information is needed” is generally understood to mean *whenever* information is needed, regardless of the particular context or subject matter pertaining to the need. To be information literate means to be able to find and use needed information consistently, including needed information *about* various topics or subjects an individual wishes to understand better. Furthermore, finding just any piece of information on a subject will not do. An information literate individual undertakes an evaluative process in which the located information on a subject is evaluated for its relevance and appropriateness to the particular task motivating the search, and, if deemed to be suitable, uses the information ethically.

Although provisional adoption of the ALA (1989) definition of information literacy makes pragmatic sense due to its broad acceptance within librarianship and education, this definition

¹⁰ Examples of types of information one might need, where the defined need is not principally *about* a particular topic include works *by* a particular author or creator or composer, works *produced in* a particular *time period*, *geographic place*, *style*, *physical medium* or *language*, and works *representative of* a particular *genre* or *mode* of thinking or sensing.

nevertheless represents a rather abstract, mechanistic and somewhat circular conception. It is therefore worth considering how the concept of information literacy arose, what it is really about, and how best to define it for the purposes of the present study. I address these matters in the following two sections of this chapter.

3.3 Information Literacy Conceptual Development and Disputes

Credit for the first published reference to the concept of “information literacy” is often ascribed to Zurkowski (e.g., Behrens, 1994; Bruce, 1997b; Carbo, 1997; Eisenberg, et al., 2004; Kuhlthau, 1987). In a paper prepared for the U.S. National Commission on Libraries and Information Science (NCLIS), Zurkowski (1974, p. 9) described “information literates” as “people trained in the application of information resources to their work ... [who] have learned techniques and skills for utilizing the wide range of information tools as well as primary sources in molding information solutions to their problems,” and “information illiterates” as people who “do not have a measure for the value of information, do not have an ability to mold information to their needs”. Suggesting that only six percent of the American population was information literate, Zurkowski urged the NCLIS to adopt a goal of achieving national information literacy by 1984.

It appears the call to take up information literacy as an important educational cause—at times referred to as a “movement” (e.g., Bruce, 1997b, p. 4-8; Donnelly, 2003, p. 1545; Harris, 2008, p. 248; Huwe, 2006, p. 25)—was heard by many as a worthy goal. It is of course no coincidence that the conceptual development of information literacy took hold shortly after the accelerated evolution of new information technologies began to make accessible to a much broader, public base of non-specialist users a wealth of information that was formerly created, controlled and used predominantly by domain and information professionals and experts. The concept of information literacy remains relevant today as the size, reach and complexity of the information universe continues to be fuelled by

the proliferation of online information networks and digital information creators, vendors, sources, environments, products, and tools.

The information literacy movement is generally understood to have unfolded over the 1970s and 1980s, mainly in North America (Behrens, 1994). This movement flourished (Breivik, 1999) and became an international concern (Bruce, 2000; Bruce & Candy, 2000; International Federation of Library Associations, 2008; Moore, 2005; Rader, 1996; Virkus, 2003; Webber & Johnston, 2000) during the 1990s. Information literacy endures into the early twenty-first century as major focus of librarians and others committed to the advancement of lifelong learning¹¹ and an informed citizenry. In a thirty-year review of the information literacy literature, Rader (2002) noted a tenfold increase in the amount of literature produced per year from 1973 to 2002.

While use of the term “information literacy” has become commonplace within librarianship over the past thirty years, the idea of teaching, or facilitating learning, about various techniques and tools to assist students with their research needs was by no means a new one in the 1970s, as its history can be traced back to the nineteenth century and earlier (Hopkins, 1982; Lorenzen, 2001; Salony, 1995; Tucker, 1980; Weiss, 2003). Before “information literacy” became a widely recognized and used term, “bibliographic instruction” was frequently used to refer to the instruction activities performed by librarians, especially those affiliated with higher education institutions; other variant labels included “user education” and “library instruction.”

Information literacy and bibliographic instruction both involve the idea of instruction in how to use various resources and techniques effectively to find needed information, but are often seen as differing conceptually in at least two important ways: pedagogical focus and context of delivery. Proponents of these distinctions see information literacy as focusing on achieving a broad understanding of concepts for information seeking and use that are applicable across different needs and subject searching environments (interdisciplinary know-how), and bibliographic instruction as

¹¹ Lifelong learning is defined by Candy, Crebert and O’Leary (1994, p. xi) to be “all formal, non-formal, and informal learning—whether intentional or unanticipated—which occurs at any time across the lifespan.”

emphasizing primarily skills-based procedures for using specific tools and resources (subject- or context-specific know-what). In this view bibliographic instruction is often characterized as being delivered via stand-alone, single-session lessons in tool use, whereas information literacy instruction today is often considered to be most effective when delivered as a full-fledged course, or by integrating it into the academic curriculum with responsibility for course content and delivery shared collaboratively by information literacy instructors and discipline-embedded faculty (McCartin & Feid, 2001; Snavely & Cooper, 1997).

While the prevalence of the ALA (1989) definition of information literacy is undisputed, questions continue to arise regarding what this concept is really about. Specific bones of contention include the concept's utility, the soundness of its underlying assumptions, whether it is adequately named, its scope, its relationship to other literacies also touted to be essential skills for thriving in the digital information age, and whether it is best conceived and taught as a stand-alone discipline or as a learning component embedded in the subject matter of other disciplines.

In S. Foster's (1993) view the need for the concept is questionable because, as commonly defined, information literacy is not possible to measure usefully, and because it is so generally conceived that statements about learning demonstrated by information literate individuals are at best only trivially true. Foster suggested the concept was perhaps a public relations ploy to raise the status of librarians by claiming exclusive rights to address a fabricated social problem. He urged academic librarians to focus instead on serving the academy and its goals of "literacy, reading, and the pursuit of knowledge" (1993, p. 346). As these goals are likely considered by academic librarians to be generally compatible with the goals of information literacy, however, it is not clear that Foster's view of what academic librarians should focus is much different from what they actually do while promoting the development of students' abilities to find, evaluate, and use information effectively.

Twelve years later, Wilder (2005) expressed doubts similar in tone and sentiment to those of S. Foster (1993) about the assumptions underlying the concept of information literacy. His main

contention was that librarians who promote information literacy incorrectly assume students should learn to become expert searchers like themselves when students' real need is to learn how to read and write according to the norms of their chosen disciplines—that is, to become more like their professors. To rectify information literacy's incorrect assumptions, Wilder (2005, last para.) recommended that we view students as “apprentices in the reading and writing of their chosen disciplines,” and academic librarians as “experts who can help them master those tasks.” He suggested an alternative reading and writing model at the reference desk in which

a librarian helping an undergraduate on a term paper in art history might help him pick or narrow his topic, point him to standard reference works like the 34-volume *Dictionary of Art* for background reading, and offer suggestions on how to follow the citations in those works to other material. The librarian might show him relevant databases or print collections for supporting evidence, and provide help in preparing a bibliography. (Wilder, 2005, para. 12)

It is doubtful, however, that many academic librarians would find Wilder's alternative model to be much different in content or process from student-librarian interactions at the reference desk occurring within an information literacy model. Furthermore, Wilder's (2005, para. 14) claim that “the library must do a better job of reaching more students, more often” is likewise uncontroversial and is at times an explicit goal of information literacy initiatives (e.g., Owusu-Ansah, 2004).

Snaveley and Cooper (1997) reviewed criticisms suggesting the concept of information literacy lacks a clear definition and purpose, and that the concept is not appropriately represented by the term “information literacy.” In the end, however, the authors recommended using the term “information literacy” carefully and with a clear definition because they were unable to settle on a different, notably superior term.

Dissatisfied with other definitions and conceptions of information literacy too narrowly focused on lists of discrete skills and attributes, Johnston and Webber (2003, p. 336) offered an alternative definition: “Information literacy is the adoption of appropriate information behaviour to

obtain, through whatever channel or medium, information well fitted to information needs, together with critical awareness of the importance of wise and ethical use of information in society.” The intent behind this variant definition was to provide a more holistic view of what information literacy is about, by acknowledging explicitly the fact that information use takes place within a societal setting, and by avoiding the implication that it involves the rote performance of skills.

In a far-ranging review of information literacy, Marcum (2002) found it wanting in terms of its conceptual foundations, focus, and aspirations. He identified the underlying assumptions of information literacy to be those of the information processing paradigm¹² which holds that humans and computers process information in a comparable manner by transforming raw unorganized data into more organized forms referred to as information and (in humans) knowledge. Marcum noted there is not always a linear progression from information to knowledge, that information is not the same as knowledge although their exact relationship is disputed, and that the information processing model fails to acknowledge other factors such as human emotions, language, changing information technology and the social, cultural and organizational contexts of information creation and use.

Marcum viewed information literacy to be inappropriately focused on teaching to transfer uniform information rather than on facilitating the construction of unique knowledge by unique individuals situated within particular contexts, and too strongly slanted toward the traditional medium of print. In search of a more apt name, he reviewed different types of literacies—visual, technological, interactive, computational, and knowledge media (2002, p. 14-17)—proposed by others as requirements for exploiting fully the new media for communicating information, and considered competence, fluency and expertise as alternatives to the term literacy. Marcum concluded that “fluency” may connote a higher level of achievement than does “competency” (2002, p. 19).

¹² For example, Macpherson (2004) applied a two-stage information processing model of thinking involved in undergraduate information retrieval in electronic databases, and Budd (2008) described several instances in which the information processing model and the computational theory of mind appear to underpin information literacy programs and conceptualizations, including the ACRL standards framework.

Marcum's main concerns regarding information literacy were twofold: that the commonly used conception is too broad and aspires to achieve beyond what is feasible given that its full instantiation would seem to require every learner to develop the information seeking skills of a professional librarian, and at the same time its too narrow focus on print information environments means insufficient attention is paid to uses of non-print information media and technology and to other settings for learning and using information such as work environments. Marcum (2002, p. 21) recommended that we work toward replacing the concept of information literacy with a broader, more inclusive concept of "learning for sociotechnical fluency."

Carbo's (1997) reflections on the question of what is needed for an educated person to thrive in our information-rich, multimedia world led her to propose "mediacy" as a replacement for information literacy. Her dissatisfaction with the term "information literacy" stemmed from its association with the idea of a single set of generic skills encompassing all required abilities, one she believed to be untenable. Carbo conceptualized mediacy as the skills and knowledge required to find, evaluate, store, and use information ethically in a variety of media. Her conception of mediacy also included the ideas that different competencies may be needed for using information in different media, and that accessing, understanding and using information effectively in various media often involves technology in a mediation role enabling individuals to use information content.

Kapitzke disputed the soundness and usefulness of the common skills-based conception of information literacy on the basis of three concerns: "(i) its modernist preconceptions, (ii) its lack of a politicised criticality, and (iii) its neglect of the implications of new technologies on knowledge and literate work" (2003, p. 57-58). She contended that the dominant conception of information literacy as a logical, fact-finding exercise in critical thinking overlooks the historical, political, and social contexts of information as well as the transformation of the traditional print based conception of information by the "non-linearity" of the new online information world. As an alternative, Kapitzke proposed a "critical information literacy" that would avoid trying to "find the facts" about a topic

being investigated but instead would encourage learners first to consider the topic from multiple viewpoints, discourses and texts, and then to construct their own meaning (2003, p. 61).

Whereas Marcum (2002), Kapitzke (2003) and Carbo (1997) all shared the view that more explicit recognition is needed of how the new information technologies are transforming in important ways the processes of learning, and of finding and using information, Grafstein (2007, p. 51) took the opposite view, that “the basic concepts of information literacy predate and are largely independent of the new information environment.” Grafstein based her view on documents in the higher education and library literature published well before the advent of the Internet that champion the idea of assisting students to become independent learners capable of evaluating and thinking critically about a variety of viewpoints, although, of course somewhat different terms were used. While acknowledging the fact that the new online information environment does require additional skills in order to be information literate, Grafstein cautioned against allowing the primacy of the goals of independent learning and critical thinking to be diluted by a shift in emphasis toward technology because, she argued, the long-standing goals of higher education are not dependent on or conceptually related to information technology skills but rather are universally applicable to information produced in all formats and media.

Owusu-Ansah (2003) set out to resolve the debate on how best to define information literacy by tracing the definition and use of its two root terms, “information” and “literacy,” by proposing that we understand information to be related (and not opposed) to knowledge, and ultimately by suggesting that there is not much substantive difference between the view that information literacy is a *process* or *experience* of learning, and the view that it is a discrete set of *attributes* or *skills*. In a similar analytical manner, Pawley (2003) considered the sources of today’s connotations surrounding “information” and “literacy,” positing a natural tension to be inherent in the concept of information literacy because “information” is often associated with the ideal of freedom and empowerment (using information to free citizens to create and sustain a democratic society) whereas ‘literacy’ is

commonly linked to conformity and bounded freedom (imposing standardization in order to ensure uniform quality of content, learning and performance). By delving further into the historical roots of both terms, however, she determined that “information” is also associated with the opposing concept of control, and similarly that “literacy” has ties to the opposing concept of freedom. Pawley therefore urged us to embrace and use creatively the irresolvable tension between “information” and “literacy” to promote the democratic freedoms to learn and to access information, while using carefully controlled language to preserve the meaningful contexts of information.

In addition to differing views on information literacy’s label, definition, utility, underlying assumptions, and relationship to other literacies, variant positions have been offered on the issue of whether information literacy is and should be taught as its own distinct field of inquiry and practice, or whether it is best addressed as an accompaniment to learning and researching in other discipline-specific contexts. Shapiro and Hughes promoted the idea of information literacy as a stand-alone discipline by affirming the need to reconceptualize information literacy as “a new liberal art that extends from knowing how to use computers and access information to critical reflection on the nature of information itself, its technical infrastructure, and its social, cultural and even philosophical context and impact” (Shapiro & Hughes, 1996, para. 13). According to Shapiro and Hughes, information literacy reconceptualized in this way would require a fundamental redesign of the academic curriculum.

Basing their views in part on two years’ experience teaching an information literacy course for second- and third-year university students, Webber and Johnston (2000) argued that information literacy can be taught as a distinct discipline with its own theory and practice. Given the findings that students in their information literacy course found the content meaningful and useful, and were able to apply what they learned independently to other discipline-specific tasks, Webber and Johnston (2000, p. 395) suggested further research be conducted on appropriate approaches to teaching information literacy and on defining information literacy as a “coherent field of study,” using the non-

vocational discipline of information science as a starting point. Owusu-Ansah (2004) argued in favour of an independent credit-course in information literacy as a mandatory component of university degree programs, supplemented by subject-specific, advanced instruction provided by librarians on request from teaching faculty.

Although Grafstein conceived of information literacy as encompassing a fundamental, generic set of skills relating to finding, evaluating, and appropriately using information, she maintained, contrary to Webber and Johnston (2000), that it also “crucially involves being literate *about something*” (2002, p. 202; emphasis in original). In Grafstein’s view, information literacy can be taught and learned most fruitfully in the context of discipline-specific content and practices, because evaluating and using information effectively requires subject-specific knowledge. Grafstein envisioned a fully developed information literacy program to be an integrated, collaborative endeavour involving librarians covering the generic information literacy skills of finding, evaluating, and using information effectively, and subject-specialist faculty addressing the application of those generic skills to evaluating and using information in accordance with the conventions and standards of their particular disciplines.

D’Angelo and Maid (2004) described a successful team-taught collaboration at one university involving librarians and writing instructors to integrate undergraduate information literacy instruction with the university’s writing and technical communication program. Leckie (1996) endorsed a “stratified course-integrated approach” she had used successfully in her own university teaching that incorporated the skills of finding and evaluating information into the curriculum. This approach involved librarians teaching faculty what they needed to know in order for faculty, in turn, to be able to teach their students at least the basic information literacy concepts in a discipline-embedded manner. In Leckie’s view, this approach is worth consideration because of the continued lack of success in establishing enduring librarian-faculty partnerships for jointly embedding information literacy into the curriculum. Budd (2008) outlined a “phenomenological cognitive action” framework

for undergraduate information literacy focusing on effectively integrating “materialist” learning elements that are already meaningful and known to the learner with conceptual, new “constructivist” elements. Budd reported this framework was tested in a one-credit university course that was largely well received by students and seemed to result in at least some student-perceived cognitive growth.

The discipline-specific contexts within which information literacy may be appropriately integrated into higher education are sometimes referred to as communities of practice. For instance Huwe (2006) described ways in which academic librarians can immerse themselves in faculty and student communities of practice in order to build relationships that lay the groundwork for effective collaboration required across the academy to advance information literacy, and Bennett (2007) reported on aspects of campus culture that foster information literacy. Harris (2008) proposed that community is an often-unstated but important component of the concept of information literacy within higher education because it is learned and practiced within social contexts—learning communities, and communities of practice—that give rise to the need for, and specific meanings and appropriate uses of, information.

In summary, information literacy remains a much-contested concept. Some critics have dismissed the need for information literacy on the basis that the tried and true focus of higher education on reading, writing and knowledge suffices (S. Foster, 1993; Wilder, 2005). Others have faulted information literacy for its inappropriate conceptual foundations and assumptions, and impracticably lofty aspirations (Marcum, 2002; Wilder, 2005); its outdated conceptualization of learning as the transfer of specific informative content rather than a process of social construction of meaning (Kapitzke, 2003; Marcum, 2002) or of conceptions of relations between people and information (Bruce, 1997a, 1997b); and its failure to recalibrate its scope to accommodate adequately the proliferation of new information media and the concomitant expansion of skills needed to exploit them fully (Carbo, 1997; Kapitzke, 2003; Marcum, 2002), although not everyone agrees that recalibration is necessary (Grafstein, 2007).

Attempts have been made to alleviate the disputes surrounding the definition of information (e.g., Owusu-Ansah, 2003; Pawley, 2003; Snavely & Cooper, 1997) although the results have been, on the whole, inconclusive, and despite the wealth of proposed alternative definitions and terms to replace information literacy (e.g., Carbo, 1997; Johnston & Webber, 2003; Kapitzke, 2003; Marcum, 2002; Shapiro & Hughes, 1996), as of yet none appear to be in contention as true rivals to the still-dominant ALA (1989) skills-based conception of information literacy. Theorists and practitioners have promoted information literacy as being capable of standing alone as its own distinct field of inquiry or study (Budd, 2008; Owusu-Ansah, 2004; Shapiro & Hughes, 1996; Webber & Johnston, 2000) while others have claimed that it is most appropriately integrated into the learning and information seeking processes of the academic curriculum (D'Angelo & Maid, 2004; Grafstein, 2002; Leckie, 1996), with the context of learning and information use sometimes referred to as communities or cultures of learning and practice (Bennett, 2007; Harris, 2008; Huwe, 2006).

It is perhaps telling that the second edition of the *Encyclopedia of Library and Information Science* (Drake, 2003) does not contain entries for “information literacy,” “bibliographic instruction” or “library instruction,” although these topics are mentioned briefly in other articles and “online library instruction” is the title of one entry. Information literacy may remain a topic of debate for at least the next while because the issues are complex and interconnected, and because sufficient practical exploration of differing theoretical perspectives to determine their distinctive and shared aspects has not yet taken place.

3.4 Deriving a Definition of Information Literacy

While information literacy continues to be contested on several grounds, substantive areas of agreement also exist among its various conceptualizations and definitions, and it remains for now a useful conceptual tool in higher education and librarianship. To establish a clear understanding of the

scope of information literacy, in this section I compare four generally recognized conceptualizations¹³ of information literacy to identify their unique and shared elements. The four models are: the Society of College, National and University Libraries (SCONUL) information skills model, also known as the seven pillars model (Society of College National and University Libraries, 1999); the ACRL information literacy competency standards framework (Association of College and Research Libraries, 2000); the Australian and New Zealand Institute for Information Literacy (ANZIIL) framework (Bundy, 2004); and Bruce's (1997a, 1997b) relational model of information literacy. I chose these four models because they represent an international selection of well-articulated views belonging to prominent researchers or groups of practitioners and stakeholders within higher education of what information literacy is, and how it relates to the advancement of personal learning.

Developed in Great Britain, the SCONUL model conceives information literacy as encompassing both information skills and information technology skills. This model has two "strands" or levels of thinking about information skills, the first of which considers information skills to be study skills performed by the competent student, "one who is able to function effectively as part of the academic community" (Society of College National and University Libraries, 1999, p. 5). The model's second strand of information skills includes the above skills mastered by the competent student, as well as skills reflecting a deeper understanding of information, such as:

understanding of the way in which information is produced in the modern world, critical appraisal of the content and validity of the information . . . some practical ideas of how information in the real world is acquired, managed, disseminated and exploited, particularly with knowledge of how appropriate professional groups use information . . . For this level of information skills, the adoption of the term 'information literacy' is appropriate (Society of College National and University Libraries, 1999, p. 5).

¹³ In this discussion I use "conceptualizations," "models" and "frameworks" interchangeably to refer to distinct systematic approaches to, or considered ways of thinking about, information literacy.

The SCONUL model posits that the gap between base-level and high-level skills is narrowed incrementally if novice students acquire seven skills that help them convert basic information skill competencies into information literate expertise. Typically the following seven skills (Society of College National and University Libraries, 1999, p. 6-7) are mastered only by postsecondary graduates who participate fully in knowledge creation and use in their chosen domains:

- Recognise an information need
- Distinguish ways of addressing gap
- Construct strategies for locating
- Locate and access
- Compare and evaluate
- Organise, apply and communicate
- Synthesise and create.

SCONUL's promulgation of information literacy was spurred by the concern that former relatively tight quality control over information available to students (e.g., course textbooks selected by professors, library collections built by librarians) was being seriously eroded by easy access to Web resources of questionable quality. Recognizing that students often use the path of least resistance uncritically, the SCONUL model represented a call to address the challenge of preparing "informed and information literate" higher education graduates for enjoyment of successful and satisfying lives in the "information society" (Society of College National and University Libraries, 1999, p. 11).

ACRL, a division of the American Library Association, outlined an information literacy framework in its *Information Literacy Competency Standards for Higher Education* (Association of College and Research Libraries, 2000) representing a set of competencies applicable to all fields of inquiry imparting lifelong empowerment to students and their processes of learning. Each of the five standards (statements of specific competencies in an information literate individual's repertoire) is

associated with between three and seven performance indicators (behaviours and capabilities of information literate individuals indicative of the associated standard). In turn, under each performance indicator are listed between two and seven learning outcomes (examples of more specific actions and know-how associated with each information literacy performance indicator) for which measures can be devised to assess their attainment levels. In the ACRL framework (2000, p. 8-14), an information literate student:

- Determines what information is needed and how much
- Accesses needed information effectively and efficiently
- Critically evaluates information and its sources, and integrates selections into personal knowledge and values,
- Alone and as a group member, uses information effectively
- Uses information ethically and legally in a manner informed by an understanding of complex use issues.

In contrast to the general nature of the model presented by SCOUNL (Society of College National and University Libraries, 1999), the ACRL framework was designed as a practical guide for assessing the information literacy of higher education students. Its chief purpose was to provide tools to “pinpoint specific indicators that identify a student as information literate” (2000, p. 5).

The ANZIIL framework presented in the second edition of the *Australian and New Zealand Information Literacy Framework* (Bundy, 2004) in essence is an adaptation and extension of the ACRL competency standards (Association of College and Research Libraries, 2000). The ANZIIL model identifies principles and practice supporting the development of information literate individuals, as well as six core standards (Bundy, 2004, p. 11) which state an information literate person:

- Recognizes an information need, and determines what is needed and how much
- Finds needed information effectively and efficiently

- Critically evaluates information and the processes of finding it
- Manages information
- Applies information to construct new concepts or understandings
- Uses information wisely, with awareness of a variety of use issues.

There are notable differences distinguishing the ANZIIL framework from the SCONUL and ACRL models, one being the applicability of the former to all levels of education, whereas the latter two are focused more narrowly on postsecondary education. Another difference is the range of levels of conceptual development and complexity represented in these models, with the SCONUL model presenting a basic, largely information processing-influenced view, the ANZIIL framework providing the most complex picture encompassing the strongest incorporation of constructivist concepts, and the ACRL framework falling midway between the other two. An example of the ANZIIL framework's greater degree of complexity is the nested interrelationship among key concepts: information literacy is depicted as a subset of independent learning, which in turn is a subset of lifelong learning (Bundy, 2004, p. 5). Viewed in this way, information literacy is at the core of lifelong learning.

Another example of greater complexity is the ANZIIL framework's incorporation of two competing ideas: that information literacy is universally applicable across all fields of endeavour, and that differing discipline-specific practices exist for organizing, accessing and communicating information. Both ideas are accommodated in the ANZIIL framework's specification that information literacy comprises three partially overlapping components (Bundy, 2004, p. 7) influenced by the disciplinary context in which an individual interacts with information:

- Generic skills (problem solving, collaboration and teamwork, communication, critical thinking)
- Information skills (information seeking, information use, information technology fluency)
- Values and beliefs (using information wisely and ethically, social responsibility, community participation).

These differences notwithstanding, the SCONUL, ACRL and ANZIIL information literacy models share fundamental similarities. Except for the ability to recognize an information need which is implied but not specified in the ACRL framework, the three models incorporate all four core skills mentioned in the ALA (1989) information literacy definition—recognizing an information need, then finding, evaluating and effectively using needed information. Each of these three models emphasizes the key skill of evaluation. Only the SCONUL model does not refer explicitly to *critical* evaluation, but the idea of criticality—considering something in a discriminating manner using criteria such as authority, quality and relevance—is implied in the examples listed under the “compare and evaluate” skill: “awareness of bias and authority, awareness of the peer review process of scholarly publishing, appropriate extraction of information matching the information need” (Society of College National and University Libraries, 1999, p. 6).

In addition, the SCONUL, ACRL and ANZIIL models are representative of the two dominant ways of thinking about learning and information literacy characterized by Bruce (1997b) as the behaviourist and information processing approach, and the constructivist approach. The behaviorist and information processing leanings of these three models are evident in their incorporation of a list of fundamental (measurable) abilities, and in their overall linearity. By linearity I mean the enumerated elements of these models can be viewed as an abstract sequence of what ideally happens in an episode of trying to meet an information need, and of abilities we hope are honed over time as an individual accumulates experiences of trying to meet different information needs and gains proficiency.

The ANZIIL framework states its standards “are not intended to represent a linear approach to information literacy” (Bundy, 2004, p. 8) and includes the sample learning outcome “recognizes that the information search process is evolutionary and nonlinear” (Bundy, 2004, p. 17) under standard three which involves critically evaluating information and the information seeking process. But considered as a whole, the ANZIIL framework, like the ACRL and SCONUL models, outlines a

broadly unidirectional process ideally traversing the pathway from low to high level information literacy skills. In all three models, a significant amount of coherence would be lost if their constituent skills or standards were listed in random order, although on a personal, experiential level, learning in general is often non-linear and iterative, and can be disorganized or chaotic.

Also clearly evident in the ACRL and ANZIIL frameworks is the constructivist conception of learning by using information to create or modify personally meaningful understandings (standards three and five, respectively). In addition, the ACRL framework document describes a constructivist conception of “student-centered learning environments” requiring information literacy competencies in which “inquiry is the norm, problem solving becomes the focus, and thinking critically is part of the process” (2000, p. 5). Even more explicitly, the first of the ANZIIL framework’s four foundational principles acknowledges a constructivist view of information literate people who “engage in independent learning through constructing new meaning, understanding, and knowledge” (Bundy, 2004, p. 11).

It is possible to interpret the seventh SCONUL skill, “synthesise and build upon existing information, contributing to the creation of new knowledge” (Society of College National and University Libraries, 1999, p. 6) to mean the information literate individual synthesizes new understanding by combining new information with variant existing conceptions to create a new personally meaningful conception, which then adds to the total universal accretion of knowledge. The SCONUL briefing paper, however, explains this skill was intended to address “the notion of an individual who is able to contribute to the synthesis of existing information, to further develop ideas building on that synthesis, and ultimately, create new knowledge in a particular subject discipline” (Society of College National and University Libraries, 1999, p. 8). This notion seems to centre on synthesizing information located in the external accumulation of “existing information” and using those syntheses to expand the abstract external body of disciplinary knowledge, rather than on a

fundamental change in the individual's personal understanding. Constructivist conceptions of learning are thus less definite in the SCONUL model of information literacy.

Bruce (1997b, p. 2-3) pointed out that while the constructivist approach construes learning as involving problem solving and constructing new personal understandings when new or variant information clashes with a learner's existing knowledge, its advocates often resort to using theoretically incompatible skills-based constructs belonging to the behaviourist and information processing approach for lack of better alternatives. Bruce viewed her relational approach as holding promise of providing alternative constructs compatible with the constructivist approach. Where learning is viewed in the behaviourist and information processing approach as acquiring skills, attributes and knowledge, and in the constructivist approach as constructing a personally meaningful mental representation of what is being learned, the relational approach views learning as developing the variety of ways in which individuals experience the object of learning (Bruce, 1997b, p. 5).

According to Bruce (1997b), the relational approach uses phenomenological and hermeneutic traditions of inquiry to understand information literacy in terms of the variant ways in which individuals relate to and experience the use of information. Bruce conducted a phenomenographic study involving a group of individuals presumed to possess a full range of experiences of using information—60 university personnel including academics and librarians, none of whom had researched or written about information literacy (Bruce, 1997b, p. 93)—in order to investigate the variety of ways in which they experienced and conceived of information use. Using an iterative qualitative approach to analyze interview and written data gathered from study participants, Bruce (1997b, p. 10-17) found seven categories¹⁴ of way in which participants were aware of and ascribed meaning to their experiences of information literacy:

- Information technology (using technology to retrieve or access desired information)

¹⁴ Bruce also referred to these categories as “conceptions” which she defined as ways of experiencing something involving a relationship between the individual who perceives the object and the object itself (1997b, p. 40).

- Information sources (finding information located in information sources)
- Information process (executing a process of encountering an information need, finding and using information)
- Information control (controlling and storing information)
- Knowledge construction (constructing a personal knowledge base on a topic by critically analyzing what is read)
- Knowledge extension (extending the disciplinary knowledge base on a topic by creating new knowledge using intuition or novel insights)
- Wisdom (using information wisely to benefit others by applying personal values and viewing information in a broader context).

Applying the relational model to teaching information literacy would involve developing ways to help students to experience and conceive of information use in these seven ways.

Given the shared focus of the SCONUL, ACRL and ANZIIL information literacy models on measurable skills, and the contrasting focus of the relational model on experiences and conceptions of information use, it is useful to consider whether markedly different answers are afforded by these models to the question “what is information literacy about?” I will do so by comparing the SCONUL, ACRL and ANZIIL models to the relational model in terms of their derivation, presentation mode, and constituent ideas. On first consideration, the derivation of the relational model is clearly differentiated from the other three models of information literacy by its basis on verbal reports of postsecondary academics’ personal conceptions and experiences of actual information use. Bruce emphasized the empirical foundations of the relational model as being qualitatively different from other models constructed “artificially” (1997a, p. 21) through theoretical discussions about behaviours and skills an information literate individual should be able to perform, although notably the second edition of the ANZIIL framework incorporated contributed experiences of academics and librarians who had used the first edition.

On further consideration, however, the thinking and experiences forming the basis of the four models all belonged to postsecondary professionals—librarians, university administrators and managers, and faculty—representing a relatively homogenous group when considered in the context of the entire populace for whom information literacy is thought to be beneficial (Association of College and Research Libraries, 2000, p. 16; Bruce, 1997a, p. 21; 1997b, p. 92-93; Bundy, 2004, p. 1; Society of College National and University Libraries, 1999, p. 13). As well, Bruce’s claim that her study participants were distinctive because “none . . . had written about information literacy or information literacy education, nor had they engaged in information literacy research. . . . [they] were not information literacy scholars or experts” (Bruce, 1997b, p. 93) is weakened by the fact that participants in the development of the SCONUL, ACRL and ANZIIL models were not all declared to be information literacy experts or researchers, although it is likely that most, if not all, viewed the concept favourably. Hence while the relational model differs from the other three in terms of its basis on personal experiences rather than theoretical ideals, the individuals who provided descriptions of those experiences are broadly comparable to the developers of the SCONUL, ACRL and ANZIIL models in that all were employed in higher education and shared similar educational backgrounds and an interest (if not research experience or expertise) in information literacy.

In contrast, an unqualified difference between the relational model and the other three models is their presentation modes. The relational model presents information literacy from a personal, ground-level viewpoint, which allows us to imagine an individual having multiple experiences of information at the same time (e.g., experiencing interaction with an online index to periodical literature as simultaneously using information technology, and finding information sources), and having those singular or multiple experiences of information in many different sequences (no particular order of the seven categories of experiencing information seems to be required or implied). The relational model’s presentation mode is one that identifies “concrete” building blocks of

information literacy (basic categories of conceptions and experiences of information use) without prescribing particular ways of arranging them.

At the opposite end of the concrete-abstract spectrum, the SCONUL, ACRL and ANZIIL models are all presented from an idealized, elevated perspective. Specific descriptions of information literacy skills pack into relatively few words what in reality can comprise many distinct, complex experiences or thought processes that likely take place over time, possibly in a disorganized, nonlinear fashion (e.g., ACRL standard three, “evaluates information and its sources critically and incorporates selected information into his or her knowledge base and value system” (Association of College and Research Libraries, 2000, p. 11)). We can think of the presentation mode of the SCONUL, ACRL and ANZIIL models as one of presenting an abstract flow chart for building information literacy, in which a logical order of construction is implied (lower order skills must be mastered before higher order skills can be aspired to), even though we know the actual experience of learning those skills can be non-linear, iterative, and initially confusing.

A third basis for comparing the four information literacy models is their constituent ideas, and the extent of similarity among those ideas. Table 4 presents the fundamental elements of the four models, with each element similarly phrased as a discrete experience or ability of an information literate individual. I used descriptions and examples of the elements in Table 4 (Association of College and Research Libraries, 2000; Bruce, 1997b; Bundy, 2004; Society of College National and University Libraries, 1999) to compare the four models by considering i) whether each skill in the SCONUL, ACRL and ANZIIL models related to at least one of the relational model’s seven experiences of information use (results of this skills models → relational model comparison are summarized in Table 5) and ii) whether the main ideas represented in the relational model’s seven experiences of information use are acknowledged in the other three models of information literacy (results of this relational model → skills models comparison are summarized in Table 6).

Table 4

Fundamental Elements of Information Literacy: Four Models

<u>7 Categories of Experiences</u> (Christine Bruce, 1997)	<u>SCONUL 7 Headline Skills</u> (Society of College, National and University Libraries, U.K., 1999)	<u>ACRL 5 Competency Standards</u> (Association of College and Research Libraries, U.S., 2000)	<u>ANZIIL 6 Core Standards</u> (Australian & New Zealand Institute for Information Literacy, 2004)
<ul style="list-style-type: none"> experiences information literacy as using information technology 	<ul style="list-style-type: none"> recognises] a need for information 	<ul style="list-style-type: none"> determines the nature and extent of the information needed 	<ul style="list-style-type: none"> recognises the need for information and determines the nature and extent of the information needed
<ul style="list-style-type: none"> experiences information literacy as finding information sources 	<ul style="list-style-type: none"> distinguishes ways in which the information 'gap' may be addressed 	<ul style="list-style-type: none"> accesses needed information effectively and efficiently 	<ul style="list-style-type: none"> finds information effectively and efficiently
<ul style="list-style-type: none"> experiences information literacy as an information process 	<ul style="list-style-type: none"> constructs strategies for locating information 	<ul style="list-style-type: none"> evaluates information and its sources critically and incorporates selected information into his or her knowledge base and value system 	<ul style="list-style-type: none"> critically evaluates information and the information seeking process
<ul style="list-style-type: none"> experiences information literacy as information control 	<ul style="list-style-type: none"> locates and accesses information 	<ul style="list-style-type: none"> individually or as a member of a group, uses information effectively to accomplish a specific purpose 	<ul style="list-style-type: none"> manages information collected or generated
<ul style="list-style-type: none"> experiences information literacy as knowledge construction 	<ul style="list-style-type: none"> compares and evaluates information obtained from different sources 	<ul style="list-style-type: none"> understands many of the ethical, legal and socio-economic issues surrounding information and information technology 	<ul style="list-style-type: none"> applies prior and new knowledge to construct new concepts or create new understandings
<ul style="list-style-type: none"> experiences information literacy as knowledge extension 	<ul style="list-style-type: none"> organises, applies and communicates information to others in ways appropriate to the situation 		<ul style="list-style-type: none"> uses information with understanding and acknowledges cultural, ethical, economic, legal, and social issues surrounding the use of information
<ul style="list-style-type: none"> experiences information literacy as wisdom 	<ul style="list-style-type: none"> synthesises and builds upon existing information, contributing to the creation of new knowledge 		

Table 5 indicates that all skills in the three skills-based models of information literacy can be mapped to at least one of the relational model's information use experiences. In addition I found the skill "Identify ways to meet information need" to relate to two information use experiences (Information Sources and Information Technology), and the skill "Use information effectively" to relate to three information use experiences (Knowledge Construction, Knowledge Extension, and Wisdom).

Table 5

Mapping of Information Skills to Information Use Experiences

<u>Information Skills (SCONUL, ACRL, ANZIIL Models)</u>	<u>Information Use Experiences (Relational Model)</u>
Recognize need for information (SCONUL, ANZIIL)	→ Information Sources
Identify ways to meet information need (SCONUL, ACRL, ANZIIL)	→ Information Sources Information Technology
Construct strategies to find information (SCONUL, ACRL, ANZIIL)	→ Information Process
Find information (SCONUL, ACRL, ANZIIL)	→ Information Process
Manage information (SCONUL, ACRL, ANZIIL)	→ Information Control
Evaluate information (SCONUL, ACRL, ANZIIL)	→ Knowledge Construction
Use information effectively (SCONUL, ACRL, ANZIIL)	→ Knowledge Construction Knowledge Extension Wisdom
Contribute to creation of new knowledge (SCONUL, ACRL, ANZIIL)	→ Knowledge Extension
Understand cultural, ethical, social, legal issues surrounding information use (SCONUL, ACRL, ANZIIL)	→ Wisdom

The reverse comparison to explore whether the main ideas in the relational model's seven categories of information use are incorporated in the SCONUL, ACRL and ANZIIL models of

information literacy revealed that in almost all cases, each of the seven information use experiences was reflected in at least one skill associated with each of the three skills-based models. Table 6 indicates the two exceptions were the Knowledge Construction, and Wisdom conceptions, which are not as fully represented in the SCONUL model as they are in the ACRL and ANZIIL models.

Table 6

Mapping of Information Use Experiences to Information Skills

<u>Information Use Experiences</u> (Relational Model)	<u>Information Skills</u> (SCONUL, ACRL, ANZIIL Models)
Information Technology	→ SCONUL skill 4 ACRL standard 5 ANZIIL “information skills” dimension
Information Sources	→ SCONUL skills 2, 5 ACRL standards 1, 2, 3 ANZIIL standards 1, 2
Information Process	→ SCONUL skill 3 ACRL standard 2 ANZIIL standard 2
Information Control	→ SCONUL skills 4, 5, 6 ACRL standard 4 ANZIIL standard 4
Knowledge Construction	→ *SCONUL skill 5 ACRL standard 3 ANZIIL standards 3, 5
Knowledge Extension	→ SCONUL skill 7 ACRL standard 3 ANZIIL standard 5
Wisdom	→ *SCONUL skill 6 ACRL standard 5 ANZIIL principle 3 and standard 6

* SCONUL skills 5 and 6 only partially address the relational model’s conceptions of Knowledge Construction, and Wisdom, respectively.

My intent in comparing the content of the skills-based and relational models was not to provide an exhaustive list of every possible relationship between information literacy skills and

experiences in the four models, but rather to obtain a general sense of whether or not the relational model's experiences of information use are compatible with and recognizable in the enumerated information literacy abilities of the skills-based models, and vice versa. These comparisons revealed that each information literacy skill is easily mapped to at least one information use experience. They also indicated that the reverse is also true with the exception of two information use conceptions whose representations in the SCONUL model are less full than those found in the ACRL and ANZIIL models. Based on the bi-directional comparisons summarized in Tables 5 and 6, it is reasonable to conclude that the content of the information literacy models presented by Bruce, SCONUL, ACRL and ANZIIL are all largely similar to each other.

Returning to the question of the extent to which the four models of information literacy provide similar or different pictures of "what information literacy is about," most certainly there are differences. The relational model's derivation from actual experiences of information use is unique, as is its nonlinear, concrete, ground-level presentation mode, contrasting sharply with the logically linear, abstract, high-level mode of presentation of the three skills-based models. In addition, the relational and skills-based models place different emphases on how desired learning outcomes are characterized, with the relational model centring on conceptions and experiences, and the skills models focusing on abilities, attributes and knowledge (Bruce, 1997b, p. 169). The main difference between relational/constructivist approaches, and behaviourist/information processing approaches is the former's interest in *how* individuals conceive of and experience information use, whereas the latter is primarily concerned with gauging *how much* information use skill or understanding they have.

Despite these differences, results of the mapping exercises suggest the content of the four models of information literacy are strongly aligned. Their comparability is perhaps partially explained by the professional careers in higher education shared by all individuals whose experiences and thinking formed the foundation of each model, and the likelihood that the framework creators

were aware of other models or conceptual approaches. Despite their differing emphases, Bruce (1997b, p. 169) conceded that the relational and skills-based approaches to information literacy both involve acquiring skills and knowledge, the difference being in the relational model's focus on having a variety of conceptions rather than measuring skills and knowledge. She also acknowledged that different levels of information use categories exist: "it is not unreasonable . . . to claim that the categories do become more complex as the outcome space is traversed from the information technology conception to the topmost pair [knowledge extension and wisdom conceptions]" (1997b, p. 156).

In different ways, all four models suggest that "molding information solutions" (Zurkowski, 1974) successfully to the tasks, problems and goals an individual may pursue depends on, among other things, between five and seven fundamental skills or experiences enabling the individual to find, evaluate, and use needed information wisely and ethically. The models acknowledge learning and acquiring personal experiences of *why* and *how* to choose and use information wisely to be effortful, and encompass the idea that being information literate equips individuals with practical skills and experiences enabling successful navigation through areas of today's information-intensive world that are unfamiliar as well as familiar. Taking into account that all four information literacy models considered here:

- represent articulations of thinking by four groups of higher education personnel on three different continents about what information literacy is and why it is important,
- are largely in accord with respect to their underlying ideas of what information literacy is about, although their derivation and presentation modes differ, and
- include the idea of information literacy as an information search process (finding, evaluating, using information) representing three of the four cornerstone skills named in the widely used ALA (1989) definition,

I propose the following definition of information literacy:

Information literacy is the abilities and experiences of

- *recognizing when information is needed*
- *determining appropriate sources of needed information,*
- *using strategy to find and select needed information*
- *using information technology and other resources and techniques to access, control, manipulate and store information*
- *evaluating information, finding aids, the search process, and one's own thinking about the needed information and underlying tasks*
- *creating personal understandings of the needed information and underlying tasks*
- *extending the universe of knowledge through novel ideas and syntheses*
- *using information wisely and ethically to advance personal, community and broader societal needs and values.*

I employ the above definition in this study, with the aim of reconsidering its adequacy in light of the study's findings.

3.5 A Theoretical Lens for Exploring Subject Searching

In this section I outline a rationale for using a subset of the elements comprising the study's definition of information literacy as a theoretical lens to guide the present exploration of undergraduate subject searching processes. Each of the four information literacy models considered in the previous section acknowledges varying levels of complexity among its constituent information literacy skill or experience categories. The SCONUL model refers to a "progression from novice to expert," with "first year undergraduates . . . perhaps only practising the first four skills, whilst postgraduate and research students will aim to be towards the expert end, and will be aspiring to the seventh" (Society of College National and University Libraries, 1999, p. 8). The first four SCONUL skills thought to be within the reach of novice students involve obtaining information (recognizing an

information need, distinguishing ways and then constructing strategies to address it, and accessing the information), whereas the last three skills said to be fully attainable only by experts emphasize interacting with information in more complex ways (comparing, evaluating, applying, communicating and synthesizing information, and creating knowledge).

The ACRL framework (Association of College and Research Libraries, 2000, p. 6) states the learning outcomes associated with its five information literacy standards involve “both ‘higher order’ and ‘lower order’ thinking skills, based on Bloom’s Taxonomy of Educational Objectives,” and provides examples of both:

‘Lower Order’ thinking skill:

Outcome 2.2.a. Identifies keywords, synonyms, and related terms for the information needed.

‘Higher Order’ thinking skill:

Outcome 3.3.b. Extends initial synthesis, when possible, to a higher level of abstraction to construct new hypotheses that may required additional information. (Association of College and Research Libraries, 2000, p. 7)

The ANZIIL framework similarly refers to information literacy outcomes associated with different thinking skill levels ranging from “lower level” to “higher level,” and includes the same examples of “lower order” and “higher order” thinking skills provided in the ACRL framework (Bundy, 2004, p. 26-27). Bruce (1997b, p. 156) also acknowledged that qualitatively different levels of experience are identifiable across the relational model’s seven conceptions of information literacy with “the categories . . . becom[ing] more sophisticated as we move from . . . the information technology conception, to the . . . knowledge extension and wisdom conceptions.”

Thus, although different terminology is used, all four models refer to two broad groupings of information literacy abilities or experiences, one in general being more complex or sophisticated than the other. Johnston and Webber (2003, p. 341) recognized this distinction by suggesting higher order

elements of the SCONUL, ACRL and relational models of information literacy to include evaluation, application (of information to solve problems), synthesis, knowledge extension and wisdom.

Research supports the idea that some information literacy skills and experiences are more challenging or effortful than others. Neely (2002, p. 149) surveyed undergraduate, masters and doctoral students about their library research skills and information literacy attitudes, concluding that “overall, college-level students are not equipped to make evaluative judgments about information in a variety of formats used in research projects for a variety of end products.” In a focus group exploration of undergraduate student perceptions of information literacy Morrison (1997, p. 7) found consensus among focus group participants “that evaluating information is the most advanced of the four skills” named in the ALA definition of information literacy, and that they “lacked confidence in their ability to evaluate information, particularly its credibility.” These participants also “unanimously perceived a skill in locating information,” and believed finding information to be effortful and “particularly challenging today because of the recent technologies and the abundance of sources” (Morrison, 1997, p. 7). Fitzgerald’s (1999) review of the challenges presented by the information literacy skill of evaluation identified two contextual factors (degree of problem or task structure, and depth of processing or effort), and four continua (affect, prior knowledge, epistemology, and developmental level) that strongly influence evaluation.

In the four information literacy models and in research findings of student perceptions and abilities relating to the more challenging aspects of information literacy, a key characteristic distinguishing less complex information literacy skills and experiences from those that are more complex appears to be the level of discernment and sophistication of thinking involved. Complex information literacy skills may be analytical, evaluative, or constructive, and may involve wisdom, ethical considerations, acute judgement and introspection. They are therefore not simple rote processes, although domain and research experts likely perform at least some of them with less effort and more confidence than non-experts and developing experts.

Of the eight abilities and experiences comprising this study's definition of information literacy, I suggest the following five require the most advanced thinking and are the least amenable to rote performance:

- using strategy to find and select needed information
- evaluating information, finding tools, the search process, and one's own thinking about the needed information and underlying task
- creating personal understandings of the needed information or underlying task
- contributing to the universe of new or synthesized knowledge
- using information wisely and ethically to advance personal, community and societal needs and values.

Of the above five advanced information literacy skills and experiences, the first three—using strategy, evaluating, and creating personal understanding—relate most strongly to subject searching. By strategy I mean a deliberately applied plan or approach directed at accomplishing an aspect of finding, evaluating, using or understanding needed information, or otherwise advancing the underlying task. I understand the hallmark of evaluating to be a critical posture toward searching for subject information that questions or weighs various aspects of the subject searching process such as the quality, adequacy and scope of search tools, searching techniques and approaches, personal understanding of the search topic or task, and search results. Securing a personal understanding of a subject searching topic and task is vital to the successful completion of a task, and is sometimes important to establish sufficiently well before successful subject searching can occur. I view awareness and experience of the value of assessing accurately one's own level of understanding about a subject searching topic and its underlying task or goal to be a major distinguishing characteristic of an information literate individual.

The advanced information literacy skills and experiences of contributing new knowledge and using information wisely and ethically in the main may lie beyond the scope of this study since they

usually come into play when subject searching has produced a sufficient amount of useful information sources to support commencement of the underlying task. In this study I therefore employed a theoretical lens principally comprising the following three advanced information literacy skills and experiences to guide and focus an exploration of the extent to which participants' subject searching processes appeared to involve the kinds of advanced thinking and skills thought to be used by information literate individuals:

- *using strategy* to find and select needed information
- *evaluating* information, finding tools, the search process, and one's own thinking about the needed information and underlying task
- *creating personal understandings* of the needed information or underlying task.

In the following chapter I outline the research framework and methods used to conduct this study.

Chapter 4 Research Framework

4.1 Chapter Overview

This study's exploration of undergraduate subject searching was guided by two research questions:

- What are the characteristics and contexts of subject searching by academically successful, upper-level undergraduates that occurred over two successive academic semesters in response to genuine academic needs?
- To what extent did study participants' observed subject searching thoughts and actions suggest they had acquired some of the skills and experiences recognizable as being aspects of information literate behaviour and thinking, normally considered to be fully attainable only by search and domain experts?

In chapter 4 I describe the research framework I used to explore these two questions. Section 4.2 provides an overview of the research approach used in this study, section 4.3 describes the study's research design, and section 4.4 details the study's research methods and data collected for the study.

4.2 Research Approach

Because I am interested in understanding what undergraduates actually do and think while engaged in naturally occurring subject searching situations, as I planned and conducted this study I strove to avoid constraining or influencing study participants' behaviour and thinking unnecessarily with my preconceptions of what is involved in subject searching. One way to reduce the likelihood of a researcher's tacit suppositions unduly colouring a study's observations, analyses and conclusions is for the researcher to be as explicit as possible about pre-existing suppositions and biases, and to be mindful of them throughout the study. Hence, the following are my philosophical and theoretical assumptions which underlay this study's research approach:

- All scientific research involves selection and interpretation of phenomena and data such as statistics, measurements, behaviours, descriptions, events, and ideas.
- Both quantitative and qualitative data must be interpreted systematically in order to become meaningful in a research endeavour.
- Seeking to understand users' subject searching processes necessarily involves taking account of the context in which subject searching occurs. Context is important because it "is a necessary source of meaning" that "requires attention to process [and] to change over time" (Dervin, 1997, p. 18-19).
- Because it is not feasible to anticipate and provide for all circumstances and outcomes that may occur in a naturalistic study, handling of unexpected situations or findings should take into account and be guided by participants' needs, interpretations, and viewpoints about the subject matter of the study whenever possible.
- A pragmatic research approach emphasizes using a combination of appropriate methods, and uses triangulation to compensate for the limitations of any one type of data collection or data analysis method (Creswell, 2003). Using a pragmatic approach for this study is appropriate because of its exploratory nature, its aim to contribute new information toward understanding undergraduates' subject searching processes and how difficult encounters with the subject searching paradox may be alleviated, and the need to use a variety of methods to gather as much in-depth information as possible on the complex and dynamic human activity of subject searching.

It is also important to disclose delimitations and limitations of a study in addition to the researcher's assumptions. Delimitations are boundaries of research efforts that are set and explained by the researcher (Bryant, 2004; Mauch & Park, 2003). One delimitation was this study's descriptive rather than prescriptive intent. Since my primary interest is in how undergraduates actually conduct and experience subject searching related to their academic studies, in this study I explored the subject

searching processes of academically successful, upper-level undergraduates to try to understand their subject searching processes and the contexts of successful and unsuccessful searches—what they actually thought and did, rather than what they ought to have been thinking or doing. This study did not presume any causal relationships to exist between undergraduate academic success and successful subject searching.

Another delimitation was my desire to gather data for this study using a naturalistic, non-intrusive approach whenever possible. Detailed transaction logs of actual subject searches were captured only for participants' online subject searches using easy-to-use screen recording software to try to avoid burdening students with a requirement to use time-consuming, complex tools to capture the data I needed. Information about other searches was gathered through electronic diary entries prepared by participants using a custom-programmed software application designed to assist them in diarizing their subject searching quickly and easily. Data on participants' independently conducted subject searching were therefore created only when participants were willing or able to do so.

A third delimitation is the small sample of undergraduate students who participated in this study. The practical challenges of tracking even one or two students' entire subject searching experiences over an extended period of time are considerable. In the interest of learning as much as possible within a workable period of time, in this study I set out to track subject searching behaviour of 12 academically successful, upper-level undergraduates over the course of two consecutive academic semesters (about eight months, representing a typical undergraduate school year).

Limitations are factors not under the researcher's control that are associated with the methods used in a study and may affect the study's outcomes (Bryant, 2004; Mauch & Park, 2003). I was aware of several limitations at the outset of this study. The risk of at least some participant attrition was unavoidable, as participant retention is a perennial challenge in longitudinal investigations. If too few participants completed the study, achievement of the study's goals and objectives would possibly be compromised because of insufficient subject searching data to explore the research questions fully.

A larger limitation was the practical impossibility of removing any traces of unintentional researcher-generated influences on study participants' behaviours. Although I attempted to gather data unobtrusively whenever practicable and to maximize the ease of participant compliance with study protocols, it is possible that study-imposed effort may have influenced participants' subject searching behaviours, thereby reducing the extent to which their searching experiences in this study represent naturally occurring processes.

The necessarily small number of study participants and the case study approach limited generalizability of findings across different individuals, types of information sources, and contexts of information seeking and searching. As it was impossible to control or measure all participant and researcher characteristics and other factors that possibly influenced the study's outcomes (e.g., degree of diligence in complying with study protocols), conclusions of this exploratory study are therefore necessarily tentative.

4.3 Research Design

Determining the types of data to gather for a study and how to gather them should be guided by the purposes motivating a research effort (Newman, Ridenour, Newman, & DeMarco, 2003). The overall purpose of the present study was to explore the subject searching processes and contexts of academically successful undergraduates who had completed the equivalent of two or more years of undergraduate studies. My research purpose was pursued through a longitudinal exploration of how a small group of upper-level academically successful undergraduates engaged in subject searching as their needs for information on particular subjects relating to their academic studies arose naturally over the course of two successive semesters.

Of the nine broad categories of research purposes proposed by Newman et al. (2003), two closely approximate the purposes of the present research proposal: "add to the knowledge base," and "understand complex phenomena." The former attempts to clarify, correct, and/or add to what is

known about the research phenomena, and the latter seeks to uncover the meaning of behaviours, processes, events, and other complex psychological or social phenomena. Newman et al. (2003) suggest that complex research purposes will likely require multiple research methods; a review of research on end-user online searching covering 1997 to 2000 revealed that mixed methods were the norm (Ondrusek, 2004).

I determined that this study's complex phenomena of interest (academically successful, upper-level undergraduates' subject searching processes) and purpose (to explore and understand in greater depth these processes and the extent to which they appear to evidence information literacy abilities and experiences) are well suited to case study research given that in both instances, attention to the context in which those processes occur is important. Case study research is defined by different researchers in variant ways (e.g., Gillham, 2000; Gomm, Hammersley, & Foster, 2000; Stake, 1995; Yin, 2003). For the present purposes I conceive of it as longitudinal research involving multiple sources of data gathered on a small number of selected instances of the phenomena of interest. The data for this study were gathered primarily in naturally occurring settings chosen by participants, and indistinct boundaries existed between some of the contextual aspects of their subject searching processes and experiences which constitute the phenomena of research interest.

What constitutes a case is usually defined by the researcher, and may be any naturally occurring unit of human activity in a particular setting or context such as individuals, families, groups, institutions, communities (Gillham, 2000; Gomm, et al., 2000; Stake, 1995; Yin, 2003). Since the research focus of this study is the subject searching processes of academically successful, upper-level undergraduates as these processes unfold over time, the most appropriate unit of analysis—the case—encompassed each study participant's total accumulation of subject searching experiences over the course of the study as well as the participant's discussions about those experiences with me.

Another important research design issue is the appropriate number of cases to study, the determination of which should be informed by the purpose of the study. To contribute new information to the existing knowledge base on subject searching I hoped to study the subject searching processes of academically successful upper-level undergraduates who were likely to engage in a significant amount of course-related subject searching over a postsecondary school year in a variety of naturally occurring contexts. I chose to seek 12 study participants because this seemed large enough to include a variety of subject searching processes even if several participants withdrew, and small enough to be manageable in terms of the number of laptops I needed to acquire for the study as well as the amount of data the study could potentially generate.

Studying multiple cases is an effective way of addressing possible concerns about reliability, or “the uniqueness or artifactual condition surrounding the [single] case” (Yin, 2003, p. 54) by choosing cases that are likely to replicate each other’s results, as well as other cases that may produce distinctly different results. This study therefore included subject searching processes of students engaged in upper-level undergraduate studies in different Arts and Science academic disciplines, because it seemed reasonable to suppose that some differences in subject searching processes might be based in disciplinary differences in how information resources are created, organized, and accessed. Recruiting participants at similar stages of their undergraduate degree program who were majoring in different disciplines (e.g., humanities, social sciences, sciences) was also an attempt to “cover the extremes of [one aspect of] expected relevant heterogeneity” (Gomm, et al., 2000, p. 107).

External validity—the degree to which a research finding can be generalized to other individuals and contexts—is also known as the issue of generalizability. Many varied and divergent views have been presented on the definition and appropriateness of generalizing findings of case study research to a larger population (e.g., Gomm, et al., 2000; Stake, 1995; Yin, 2003). After considering a sampling of different views, I adopted an approach to the issue of generalizability which I believe is in alignment with the aim and nature of the present case study. Since widespread

heterogeneity within a small number of cases can reduce the ability to generalize findings, I selected cases from a relatively homogeneous group: academically successful, upper-level undergraduate students attending one Canadian university who were enrolled in full-time studies anticipated to include at least one course involving research tasks in the fall 2005 and spring 2006 semesters.

4.4 Research Methods

The aim of the present study was to examine the subject searching processes and experiences of 12 academically successful upper-level undergraduates enrolled in full-time studies at a small, primarily undergraduate Canadian university over the Fall 2005 and Spring 2006 semesters spanning the period September 2005 to April/May 2006. In April 2005 I received approval to conduct this study by the University of Toronto Social Sciences and Humanities Research Ethics Board, and by the Human Subjects Research Committee of the university selected as the site for this study (the “home university”). This section describes the methods I used to recruit participants and to collect and analyze data pertaining to participants’ subject searching processes and experiences.

4.4.1 Participant Recruitment

I received invaluable assistance from the home university’s Associate Dean of Arts and Science while developing workable methods to identify potential participants who were upper-level, academically successful undergraduates enrolled at the university selected for this study. Two approaches were used to recruit participants. In the first approach, the Associate Dean of Arts and Science sent an email to Arts and Science faculty in March 2005 (see Appendix 1), asking for the names of upper-level, academically successful undergraduate students who were likely to enroll in Fall 2005 and Spring 2006 semester courses involving subject searching (e.g., literature reviews for independent studies, undergraduate thesis courses, or advanced seminar courses.) The Associate Dean forwarded to me the names of students submitted by faculty in response to this email. I, in turn,

sent those students a letter of invitation to participate in the study (see Appendix 2). Because this first approach generated far fewer than 12 qualified, potential participants, I also pursued a second recruitment approach.

In the second approach, the Associate Dean of Arts and Science sent an email in May 2005 (see Appendix 3) to students on the Dean's Honour List¹⁵ introducing my attached letter of invitation to participate in the study (see Appendix 2). All students but one who agreed to participate in this study were recruited via this second approach. In the period May to July 2005 I received responses from 41 interested students and interviewed 27 respondents by telephone or in-person. In those interviews I described the type of participant I was trying to recruit, the study's purpose and rationale, participant involvement and responsibilities, participation risks and benefits, and I responded to questions about the study. I explained that I was looking for upper-level students who planned to enroll in Fall 2005 and Spring 2006 semester courses that included at least one course in each semester that was likely to require significant amounts of subject searching.

I asked interviewees who remained interested in participating in the study to complete an initial questionnaire (see Appendix 4) asking for details of their enrolled degree program, courses they planned to take over the Fall 2005 and Spring 2006 semesters, and their experience in subject searching. I used the completed questionnaires to select participants enrolled in a variety of degree programs, and asked those selected participants to sign and return a letter of consent (see Appendix 5). I stopped interviewing interested respondents in July 2005 after 12 students had returned a completed initial questionnaire as well as a signed letter of consent to participate.

¹⁵ In this study, *academically successful* students are defined as students who were on the Dean's Honour List. Students on the Dean's Honour List had completed four or more graded courses in the Spring 2005 semester and had achieved a grade point average of 3.75 or higher on those courses; the highest average possible was 4.0.

4.4.2 Participant Retention

While identifying the parameters of this study I was aware that participant retention was a potential challenge, and indeed four participants withdrew over the course of the study. All 12 students who, by July 2005, had signed a letter of consent to participate did commence participation in the study at the beginning of September 2005. By the end of September, however, one student withdrew, citing concerns that a heavier than expected study and employment-related workloads would prevent her from participating fully in the study.

Because the case study was just underway, after the first student withdrew I opted to try to recruit another qualified participant, using my list of respondents to the email sent by the Associate Dean of Arts and Science to Dean's Honour List members. From those respondents I chose to contact the student who had most recently indicated an interest in participating in mid-September. After interviewing this student and receiving a signed letter of consent, he was admitted to the study on October 4. This student participated throughout the Fall 2005 semester but withdrew in mid-December 2005 because his original plans for the Spring 2006 semester had changed, and he no longer intended to enroll in courses likely to require significant amounts of subject searching.

After completing almost all participant requirements, a third student chose to withdraw from the study in mid-April 2006 because she was no longer comfortable with the idea of having her subject searching processes studied. Up to the point of her withdrawal, this student had completed all three information literacy quiz completions, all three online subject searching demonstrations, and had submitted several CDs containing diary entries and screen recordings pertaining to independently conducted course-related subject searching.

By the end of the study, I was forced to treat a fourth participant as having withdrawn from the study. Although this student had completed two participant requirements in October 2005 (he demonstrated an online subject search, and he completed the information literacy quiz once), I received no further case study data from him despite my attempts to follow-up by telephone and

email when he failed to make appointments for his second and third online subject searching demonstrations. This student returned the loaned laptop to me in May 2006. During data analyses I discovered unexplained anomalies in the screen recordings and diary entries of a fifth participant after he had completed all study requirements and returned the loaned laptop, which led me to exclude from the study all data pertaining to this student. In the end, a total of eight students completed all case study requirements over the period September 2005 to May 2006 and submitted usable diary entries and recordings of their privately pursued online subject searches.

4.4.3 Research Procedures

Outlined here are the steps I took to orient students to the case study participation requirements, to gather various data about participants' subject searching processes throughout the study, and to conclude students' participation in the study.

4.4.3.1 Orientation Session

In September and October 2005 I provided individual orientation sessions in my office at the commencement of each student's participation in the study (see Appendix 6 for an outline of the content of the orientation). At each session I provided participants with a written summary of the study's requirements and timelines (see Appendix 7) as well as hands-on introductions to using the Camtasia Studio and DiaryClient applications loaded on their loaned laptops. I demonstrated how to burn copies of their Camtasia Studio and DiaryClient data files to compact discs (CDs), I provided each participant with several blank CDs, and I requested that they send me copies of their data files on a regular basis (blank CDs were provided by me for this purpose throughout the study).

Each participant signed a memorandum of agreement acknowledging receipt of a new laptop loaned to them by the home university for the duration of the study (see Appendix 8). I was greatly assisted in my quest to secure funding to purchase 12 new laptops for use in this study by the home

university's Vice-President, Academic. Once all study data was copied and then erased from the laptops at the study's conclusion, the laptops were transferred to the home library where they were added to a collection of circulating equipment available to home university students and staff for short-term loans.

At the conclusion of each orientation session participants were given their new loaned laptops which were configured for access to the home university's wired and wireless networks, as well as a package of information sheets summarizing the use of the applications on their laptop they would need to record and submit case study data. I invited participants to contact me at any time during the study if any questions or concerns arose regarding any aspect of the study.

4.4.3.2 Information Literacy Quiz

The information literacy quiz used in this study was developed in 1998 by a librarian at the study's home library and has since been incorporated into a variety of information literacy instruction classes and courses at the home library. The quiz was designed to be a practical tool to help information literacy instruction librarians gain a rough measure of students' skill and knowledge levels, and to help students expand their skills and knowledge through feedback incorporated into the quiz (after completing the quiz, students were provided with the correct answers to incorrectly answered questions along with brief explanations of why answer choices were correct). The quiz was not a standardized, validated test instrument.

The quiz developer granted me permission to use a version of the quiz I edited specifically for the present study. Because the original quiz questions were aimed at first and second year undergraduates and were therefore probed primarily basic skills and concepts involving lower order thinking skills, in many cases I rewrote the questions or replaced them with more challenging ones to increase the overall difficulty level, but I did not change the overall aim of the quiz. Accessed via WebCT, the information literacy quiz used in this study was presented as a 40-point, multiple-choice

quiz on topics pertaining to various aspects of information search strategy, facts about seeking, obtaining, citing, and using information appropriately, using search tools such as library catalogues, and research techniques and sources of assistance. The quiz addressed primarily technical aspects of searching involving lower order information literacy elements, and knowledge of library use and recommended research procedures. Where quiz questions addressed strategy or required evaluation (e.g., choose the “best source” for finding information on a specified topic), the multiple-choice answer format provided no opportunity for students to explain their criteria or reasons for their choices.

Each quiz iteration was unique, as a randomly selected set of questions was drawn from the question database associated with the quiz each time a participant commenced completion of the quiz. When completed and submitted quizzes were processed by WebCT, participants were presented with their quiz results, which were also emailed directly to me. By explaining why an answer was correct or incorrect, the quiz provided participants with a learning experience if they chose to review their quiz results. Appendix 9 lists the questions comprising one iteration of the information literacy quiz completed by a participant during the case study.

At the outset of the study I informed participants that they were required to complete the information literacy quiz three times during the study, the first time being as soon as possible after they received their orientation to the study. At the beginning and at the end of the Spring 2006 semester I emailed reminders to participants to complete the quiz for a second and third time, respectively.

4.4.3.3 Diarized Subject Searching

To capture as complete a picture as possible of each participant’s entire course-related subject searching activity, I asked participants to record two types of descriptive information throughout the study. The first type of information was in the form of a diary entry which I asked them to create

each time they encountered the need to engage in subject searching for academic course-related purposes. Diary methods have been used successfully in research dependent on “the examination of reported events and experiences in their natural, spontaneous context, providing information complementary to that obtainable by more traditional designs (Reis, 1994 as cited in Bolger, Davis, & Rafaeli, 2003, p. 580). To standardize the kinds of details pertaining to each diarized subject search and to make the process of creating diary entries as easy as possible, a software application called DiaryClient was developed by H. Otterdycks using data and performance specifications provided by me. The complete set of 27 questions comprising a DiaryClient entry is presented in Appendix 10.

Prior to the beginning of the study I loaded DiaryClient on each participant’s loaned laptop, and configured it to store in each completed diary entry a numeric code assigned by me uniquely identifying the participant who created the diary entry. In participants’ orientation sessions I explained that since a given subject search might entail using or consulting several different resources or tools, DiaryClient was configured to capture participant-specified details for up to 10 different resources per subject search. Each time participants created a new diary entry, DiaryClient automatically assigned a filename that included a date- and time-stamp indicating when the entry was created. Participants could begin to create a diary entry and then save and return to it multiple times if they had insufficient time to complete a diary entry in one sitting, or if a subject search took place over an extended period of time and they wished to diarize the details of their search as it unfolded.

Participants used DiaryClient to specify details of the course-related subject searching undertaken throughout the study that they were willing to allow me to examine. In the initial interview and during the orientation session I stressed that I wished to capture the most complete picture of their subject searching activities as possible. At the same time I also indicated that if participants were at all uncomfortable about diarizing or recording a particular search, they should forgo making a diary entry and recording the search if it was conducted online.

I emphasized in participants' study orientation sessions that I was interested in their entire course-related subject searching throughout the study, regardless of the types of tools or resources they used. Anticipating that a high proportion of participants' subject searching could involve online resources, at the outset of the study I asked participants to use Camtasia Studio¹⁶ 3.0 loaded on their loaned laptops to capture screen recordings of their privately conducted course-related online subject searching throughout the study.

Because participants needed to assign filenames to each Camtasia Studio recording file they created, I asked them to use the same style of filename created automatically by DiaryClient—unique participant numeric identifier, date of recording, and recording number for that date (e.g., 900-20050930-02 = the second recording of an online subject search by participant 900 on September 30, 2005). My hope was that I would be able to correlate diary entries describing online subject searches with Camtasia Studio screen recordings in order to obtain a reasonably complete picture of the topic, task and other details relating to each screen-recorded online subject search.

4.4.3.4 Demonstrated Subject Searching

One of the requests I made during participants' initial orientation sessions was that they contact me as soon as they had identified a need to conduct an academic studies-related online subject search they were willing to perform while I was present as a silent observer. I also indicated I wished to observe two additional online subject searches on course- or degree-related topics of their choosing roughly at the midpoint and toward the end of the study. I requested that participants make an appointment with me to demonstrate a second online subject search as part of my early Spring 2006 semester emailed reminder to complete the information literacy quiz for a second time. In the middle of the Spring 2006 semester I emailed a request for participants to make an appointment for their third and final online subject searching demonstration.

¹⁶ More information about Camtasia Studio may be found at <http://www.techsmith.com/camtasia.asp>

The purpose of each online subject searching demonstration session was to allow me to gather detailed, first-hand information on how participants conducted genuine (non-researcher imposed) academic subject searching at three time points: approximately the beginning, middle and end of the study. I was also interested in learning whether changes in participants' search actions or thoughts were identifiable over the course of the case study, as there was about a six- to seven-month interval between their first and last demonstrated online searches.

Each online subject searching demonstration session comprised two parts: a demonstration, followed immediately by an interview. The demonstration comprised the participant's actual online search which was performed at my office personal workstation. At the start of each demonstration my workstation desktop was visible and no applications were open. Icons representing common Web browsers (Internet Explorer, Firefox and Netscape), standard Microsoft Office applications, as well as Camtasia Studio were visible on the desktop. I began the first session by explaining its two-part nature, and the requirement for the participant to say their thoughts aloud while conducting the search. I also asked the participant to perform a talk-aloud warm-up exercise. Details of my explanations and the warm-up exercise are provided in Appendix 11.

Before each subject searching demonstration began, I asked participants to attach a lapel microphone to the front of their clothing to capture their spoken thoughts, and then I asked participants to turn on Camtasia Studio to record everything displayed on the workstation screen as well as all audio data during the online search. The same preparatory procedures were used for the second and third demonstration sessions, except that I asked participants whether they wished to run through the talk-aloud warm-up exercise again; in all cases they declined, stating that they understood what was involved in the talk-aloud protocol. The only instruction provided to participants on the content of their demonstrations was to begin by stating aloud the topic of their subject search.

It is important to note the non-naturalistic setting of participants' subject searching demonstration as well as the limitations of using the talk-aloud protocol to capture indications of

participants' thinking during those demonstrations. Although I took steps to minimize obtrusive environmental differences that could influence participants' subject searching behaviours in ways that were not usual or natural, unquestionably the environment in which they performed their demonstrations was different than their privately conducted online subject searching: the demonstrations took place at a private workstation that did not belong to them, they were observed by me as the investigator who also occasionally took written notes, they were asked to wear a microphone and to allow a screen-recording program to record their entire search session, and they were asked to say aloud all of their thinking during the search regardless of the quality or completeness of those thoughts.

The physical environment of participants' subject searching demonstration sessions thus represented a non-natural contextual aspect that may have influenced their demonstrated searching in ways that did not arise in diarized searching, but I determined this source of potential difference to be offset by the likelihood of gathering unique, rich data about participants' subject searching processes not captured in their diary entries or self-recorded online searches. A second non-natural aspect of participants' search demonstrations was the requirement to talk aloud while conducting their searches. My implementation of talk-aloud protocols in this study was based on the procedures for eliciting verbalizations of thoughts outlined by Ericsson & Simon (1993). I asked participants only to say aloud what they would otherwise have thought silently if they had conducted their demonstrated subject searches on their own without my presence as a silent observer. I chose to refer to this requirement as "saying" and "talking" rather than "thinking" aloud to try to avoid implying that participants needed to explain to me what they were thinking or doing.

This data collection approach involving spoken reports is known by different names that include reference to the verbal activity as talk aloud, think aloud, concurrent think aloud, think after, and verbal reporting, and to the procedure for producing the activity as protocol, technique, method, evaluation method, and methodology. Concerns have been raised about using spoken reports to

discover what people think, including observations that speaking thoughts aloud may be uncomfortable for people to perform, that asking people to speak their thoughts aloud changes what they would otherwise think and do, that eliciting spoken reports imposes a considerable cognitive load which detracts from the main task, that people think faster than they can speak, that research based on spoken reports make untenable claims on what the data show, and that researchers do not always use appropriate or consistent methods to collect spoken reports (e.g., Boren & Ramey, 2000; J. Nielsen, Clemmensen, & Yssing, 2002; Nisbett & Wilson, 1977; Russo, Johnson, & Stephens, 1989).

Others have argued that there are ways in which verbal reports can be collected and analyzed effectively from a variety of research and theoretical perspectives when used carefully and without overstepping the bounds of defensible claims (e.g., Branch, 2000; Branch, 2006; Chi, 1997; Ericsson & Simon, 1998; Leow & Morgan-Short, 2004; Smagorinsky, 1998; Yang, 2003). Branch (2006) suggested verbal reports can contribute usefully to information seeking research when the tasks on which verbal reports are sought are familiar and comfortable to perform. Debates about the validity and ontological status of data gathered through verbal reports notwithstanding, I determined participants' spoken thoughts during their subject searching demonstrations were desirable and appropriate for the present study because initial questionnaire responses indicated all students had substantial academic subject searching experience, had experienced outstanding academic success, and would therefore perhaps be less likely to lack confidence in, and be overly self-conscious about their academic subject searching abilities. Participants' spoken thoughts represented only one data source about their demonstrated searches. In addition, I was present and took notes as a silent observer, a screen recording program captured all audio and online activity during the searches, and I was able to ask for clarification of aspects of the searches I did not fully understand during the follow-up interviews.

The second part of each subject searching demonstration session involved an audio-recorded focused interview I conducted immediately after each demonstration. I used a predefined set of questions (see Appendix 12) to guide each interview. In addition, I often posed supplemental questions I had noted during the demonstration regarding participants' actions or spoken thoughts that were unclear to me. Occasionally after the focused interview there were some aspects of the study the participant wished to discuss (e.g., resolution of some minor technical issues involving the laptops, and whether the data files I had received appeared to contain the information I needed). I concluded each session by thanking the participant for coming in to conduct the demonstration.

4.4.3.5 Debriefing Session

After participants completed their Spring 2006 coursework as well as all case study requirements, they booked a debriefing session with me (see Appendix 13 for an outline of topics covered in each session). At each debriefing session I asked the participant to complete a Final Questionnaire (see Appendix 14), I conducted an exit interview (Appendix 15 lists the questions used to guide the interview), and I accepted the return of the participant's loaned laptop as well as any remaining data files on CD that were created for the study. At the end of the session I issued participants a \$200.00 payment for completing all case study requirements and requested that they sign a memorandum acknowledging receipt of the payment (see Appendix 16).

4.4.4 Data Analysis

Because of the enormous amount of data gathered in this exploratory study, it was necessary to select data for analysis judiciously. During the data selection process my main goal was to identify data that would adequately support compilation of the most detailed and inclusive understandings possible of the thoughts, actions and processes of participants' subject searching experiences, using the concept of information literacy as a theoretical lens. I also selectively analyzed data providing

contextual information about the tasks, topics, and subject searching resources participants worked with, as well as their overall subject searching abilities and experiences.

4.4.4.1 Information Literacy Quiz

Through the information literacy quiz I hoped to obtain a roughly objective indication of participants' basic information literacy competencies to compare with participants' self-assessments of their subject searching abilities at the beginning and conclusion of the study, and to see whether significant differences appeared to exist in competency levels across participants. I performed only descriptive statistical analyses on quiz scores. Corruption of completed quiz data files after a WebCT software upgrade prevented further analyses of quiz results. Table 7 provides an overview of the information literacy quiz results of participants as a group, which indicates average quiz results remained more or less the same over the first two completions, but rose somewhat in the third completion. Quiz results for individual participants are included in the subject searching profile and background of each participant presented in chapter five, with participant names anonymized in all instances throughout the study.

Table 7

Information Literacy Quiz Results (8 Study Participants)

	1 st Completion	2 nd Completion	3 rd Completion
Average score	63%	64%	70%
Highest score	78% (2 participants)	78% (1 participant)	83% (2 participants)
Lowest score	53% (3 participants)	53% (2 participants)	55% (1 participant)

4.4.4.2 Questionnaires

Completed initial and final questionnaires were additional sources of data I drew on while compiling participant profiles in chapter 5. In both questionnaires I asked participants to assess their own subject searching abilities.¹⁷ Participants' subject searching self-ratings appeared to shift somewhat over the course of the study. Initially most participants rated their subject searching abilities in general to be "very good" (in the initial questionnaire I did not ask them to differentiate between their searching abilities in general, and abilities within their degree majors), but by the end of the study most participants rated their subject searching abilities to be "moderately good," with only three participants providing a self-rating of "very good." Summaries of all other responses to questions about subject searching experiences and tool use are provided in Appendix 17.

4.4.4.3 Diarized Subject Searching

To analyze the content of subject searching diaries I imported each participant's diary entries into an Excel spreadsheet—one spreadsheet per participant—which allowed me in one file to scan across and within each participant's total diary entries. These spreadsheets formed the basis for other spreadsheets created to tally and pinpoint diary entry data pertaining to specific issues such as the total number of subject searches conducted privately by each participant, and the topics they pursued in their diarized subject searching which are described in chapter 5.

At the outset of the study I hoped it would be possible to correlate participants' diary entries describing privately conducted online subject searches with matching Camtasia Studio screen recordings. Although I was able to identify matches between diary entries and screen recordings for some diarized online subject searching, on the whole the match rate was not high. Among the types of discrepancies that occurred in participants' diary entries and online subject searching screen recordings were the following:

¹⁷ Participants' subject searching self-assessments are included in Table 8, chapter 5.

- Participants sometimes failed to submit screen recordings of online searches they described in diary entries;
- For some submitted screen recordings I found no corresponding diary entries to explain the purpose and context of the recorded online search;
- Some diary entries were only partially completed, which sometimes made it difficult to determine what type of searching had occurred and whether these entries related to particular screen recordings;
- Participants occasionally reported encountering technical difficulties in creating screen recordings which prevented them from recording some of their online searches;
- Some submitted screen recordings appeared to be truncated or captured only still screens;
- Isabel reported that her practice was to create diary entries only after she had completed the associated research or course-related task. This made it difficult for me to use the date-stamped diary entry and screen-recording file names to facilitate diary entry-screen recording file matching.

Diary entries describing subject searching that involved online searching contained useful data even in the absence of screen recordings of the online searches themselves. The reverse was not true, however: a screen recording of an online search with no accompanying diary entry tended to provide insufficient information for me to ascertain relevant details such as what the participant was looking for, the nature of the underlying task, how difficult or easy the search was, or whether the search was successful. I therefore used participants' submitted online subject search recordings primarily to verify or provide details missing from corresponding diary entries, and did not attempt a systematic analysis of the content of participant-recorded online searches.

4.4.4.4 Demonstrated Subject Searching

I gathered basic descriptive data for each subject searching demonstration using screen recording duration data present in the Camtasia Studio files as well as participants' statements about the topic and the course pertaining to their demonstrations. Participants' thoughts spoken aloud during subject searching demonstrations were part of the Camtasia Studio audio-visual recordings capturing all sounds that occurred during the demonstrations as well as all data that were displayed on the demonstration workstation screen.

Using Camtasia Studio to play back each recording, I transcribed participants' spoken thoughts in Microsoft Word, where necessary anonymizing terms and names that could identify the home university and study participants. Transcriptions of the audio-recorded focused interviews that followed each subject searching demonstration were prepared by a hired professional transcriber and submitted to me as Microsoft Word documents. I reviewed and edited each of these prepared transcriptions to ensure their accuracy and to anonymize named entities where necessary.

In addition to participants' diary entries, transcriptions of participants' talk-aloud protocols and interviews conducted with participants after their subject searching demonstrations and at the conclusion of the study comprised the main data sources analyzed to explore possible answers to the study's research questions. I analyzed transcriptions by carefully reading and re-reading them to understand as thoroughly as possible what was said. I then considered the transcriptions through the theoretical lens of information literacy abilities and experiences involving the use of strategy, evaluating, and constructing knowledge, and also considered contextual variables relating to those occurrences. In general my data analyses were informed by the qualitative research processes described by Corbin and Strauss (2008). Further details of methods I employed to analyze transcriptions of participants' spoken thoughts are described in chapter 6.

4.4.4.5 Data Analysis and File Management

A challenge I faced in this multiple case study was finding an effective way of managing the many different kinds of data files that I amassed over the course of the study and during data analysis. I selected the NVivo¹⁸ qualitative software program because it offers file management capabilities for a variety of file formats as well as a suite of text analysis tools suitable for assisting with analyses of participants' transcribed talk-aloud protocols and interview data as well as the content of their diary entries. I loaded into NVivo as internal documents all text files containing participants' diary entries, and Microsoft Word documents containing transcriptions of participants' talk-aloud protocols from their online subject searching demonstrations and their audio-recorded interviews. I linked into NVivo as external data the digitized versions of all interview audio-recordings as well as Camtasia Studio recordings of participants' online subject searches, Microsoft Excel data analysis spreadsheets, and SPSS data summary files for quiz responses. This arrangement facilitated easy access to data source files of all types for verifying the accuracy of data and to compare different data files.

4.4.4.6 Data Sources

One of the two primary sources of data gathered in this study was participant-created data files comprising diary entries for privately pursued subject searches coupled with screen recordings of searches occurring online. The other primary source of data was researcher-compiled data that included my observations, Camtasia recordings of participants' online subject searching demonstrations and spoken thoughts, as well as audio-recorded interviews I conducted with participants. These primary sources were supplemented by questionnaires and information literacy quizzes completed by participants.

On the one hand, participant-gathered data provided the most complete picture of the range of participants' search topics, underlying tasks, and the resources they used in their subject searching

¹⁸ More information about NVivo may be found at http://www.qsrinternational.com/products_nvivo.aspx

processes throughout the eight-month multiple case study. On the other hand, although DiaryClient provided opportunities for participants to include free-text comments and observations in their diary entries, such comments were relatively few, leaving us with pictures lacking contextual details of their diarized subject searching processes such as whether the nature of their searching changed during a given search, what they were thinking about, how they dealt with search difficulties if any were experienced, and how they made decisions during their searching. As mentioned in section 4.4.4.3, I excluded participant-gathered Camtasia screen recordings from data analyses beyond the compilation of simple descriptive statistics because attempts to match participants' screen recordings of privately pursued online subject searching to corresponding diary entries proved to be unproductive.

The data I gathered in the role of researcher by observing and recording participants' online subject searching demonstrations and conducting interviews had the opposite strengths and weaknesses. As each of the eight participants demonstrated only three online searches, the resulting 24 searching sessions represented a small subset of the whole of participants' subject searching during the study. At the same time, the recordings and transcriptions of these demonstration sessions comprised a rich and varied set of data providing many contextual details in addition to aspects of search task and topic such as participants' search techniques and strategies, rationales for search choices, moves, and decisions, their thoughts about and understandings of the search topic and task, and how they felt during the subject searching process.

Both participant-gathered and researcher-gathered data proved useful for exploring answers to this study's first research question about the contexts of study participants' naturally occurring subject searching needs. The much greater depth of researcher-gathered data on participants' searching demonstrations, however, rendered them considerably more useful than participants' diary entries for exploring possible answers to the second research question about the extent to which participants' search actions and thoughts provided indicators of the kinds of complex thinking

associated with information literacy competencies. Camtasia recordings captured participants' spoken thoughts as well as details of their search actions including, among other things, the search techniques and manoeuvres they used which were not always voiced.

Further details of data analyses I used to explore ways to organize and code participants' spoken thoughts about their demonstrated subject searching are provided in chapter 6. In the next chapter I describe the broad contexts of this study in terms of its setting, the individuals involved, as well as contextual aspects of study participants' diarized and demonstrated subject searching.

Chapter 5 Subject Searching Contexts

5.1 Chapter Overview

The purpose of chapter 5 is twofold: it addresses the study's first research question about the characteristics and contexts of participants' subject searching, and also sets the stage for an in-depth exploration of the second research question in chapter 6 about the extent to which participants' subject searching reflected information literate thinking and practice. I present context in terms of the study's institutional and library settings in sections 5.2 and 5.3, and outline my background as the study investigator in section 5.4. In section 5.5 I profile the study participants, their subject searching and information literacy abilities and experiences, and the courses they were pursuing. Using participants' diary entries and subject searching demonstration sessions, I describe in section 5.6 broad characteristics of their subject search relating to the contextual aspects of search tasks, resources, topics, search ease, research stage, and subject searching outcomes.

5.2 Institutional Setting

This study took place on the main campus of a small¹⁹ Canadian university (the "home university") which offered predominantly four-year undergraduate programs with a liberal arts focus, along with several masters and doctoral degree programs. The curriculum was delivered through faculties or schools of arts and science, education, fine arts, management, health sciences, and graduate studies. Most main campus students lived off-campus, as on-campus residences accommodated about 600 students. The university also had smaller campuses in two other cities within the same province, each serving about 500 enrolled students.

¹⁹ The university size classification applied here is the one employed by *The Globe and Mail* in its annual report on Canadian universities (Globe and Mail) based on enrolment. According to this scheme, small universities have an enrolment between 4,000 and 12,000 students.

5.3 Library Setting

The physical building housing the home university's library ("home library") was a relatively new facility accommodating traditional print and other physical collections of information resources, a variety of study spaces, wired and wireless Internet connections and workstations for students, and several classrooms embedded in the library space. The home library's website offered a variety of information and instructional pages, as well as online information resources including the online catalogue which described and provided access to the library's physical and online resources, and a broad selection of licensed indexing, abstracting and full-text databases, many of which were made available with the assistance of the federally funded Canadian national universities partnership initiative known as the Canadian Research Knowledge Network.

The home library offered a variety of services, resources and instructional programs to help students and other library users identify and locate needed information sources. Among these sources of assistance were many online "how to" guides pertaining to library-based scholarly and research activities, reference desk service, information literacy classes and courses taught by librarians, library tours, and library research skills workshops. Students and other researchers were also free to make appointments to consult with subject librarians specializing in instruction and collection development for designated subject areas of the home university's curriculum.

At the time of the study the home library subscribed to a commercial link resolver service supporting linking from major licensed indexing and abstracting databases to full-text sources at the journal title level, as well as an integrated A to Z index of the library's physical and online journals. Open URL linking to the article level, however, was not yet available. When needed documents such as books and journal articles were not available at the home library, submitting interlibrary loan requests involved manual entry of appropriate citation information into the library catalogue's interlibrary loan request forms. Off-campus access to almost all licensed resources was available for the home university's current students and staff via proxy server authentication. Home university

students and staff were also entitled to obtain free of charge a library card permitting borrowing from many other libraries within the province including the local public library, as well as an additional card providing reciprocal borrowing privileges at participating university libraries across Canada.

5.4 Study Investigator

When I initiated this study I had more than 15 years' experience as a librarian in an academic environment, with additional previous library work experience in public and special libraries. Among my academic librarian experiences were management of technical services and operations, management of contractual library services to a government agency, reference services, information literacy instruction, collection development, and university library administration.

My interest in subject searching stemmed from many years of working directly with students at the home library's reference desk and instructing students in information literacy concepts and skills in the classroom, while at the same time monitoring the transaction logs of the home library's catalogue. Assisting students with their subject searching needs at the reference desk and teaching them basic subject searching theory and practice suggested to me that effective subject searching was a challenging skill to master. This impression appeared to be substantiated somewhat by the catalogue transaction logs which typically showed that most searching activity took place in the keyword and subject indexes, and that the second-highest concentration of searches resulting in no exact matches usually took place in the subject index (the highest proportion most often occurred in the title index).

My relatively brief and sporadic encounters with students while they were engaged in or learning about subject searching, combined with a lack of contextual information associated with the subject searching transaction log data from the library catalogue over time led me to conclude that I needed more detailed information in order to gain a more complete understanding of students' subject searching processes, how they thought about subject searching, and where their greatest subject

searching challenges lay. I thus conceived this study as an exploration of some of those additional detailed pieces of information that may contribute to assembling a more complete picture of students' processes of subject searching, the challenges they encounter, and the extent to which students become information literate during their undergraduate studies.

5.5 Study Participants

At the commencement of this study all participants were upper-level undergraduate students who were on the Spring 2005 Arts and Science Dean's Honour List²⁰, and had completed at least one full year of studies at the home university. Using initial and final questionnaire²¹ responses, information literacy quiz results, interviews, and my notes from observing participants' online subject searching demonstrations, section 5.5 profiles participants' academic backgrounds, subject searching experiences and abilities, and views on participating in this study.

Table 8 presents an overview of participants' year of study, majors, and subject searching abilities and knowledge. Most participants were beginning the fourth year of their degree program, and were pursuing humanities or social science majors. Participants' subject searching self-ratings in their initial and final questionnaire responses tended to be relatively modest and remained the same or fell slightly over the course of the study. While no student's information literacy quiz average score (over three iterations) was exceedingly high, two groupings emerged: participants with average scores of 72% or higher, and those with average scores of 63% or lower. These two groups were aligned with two levels of final subject searching self-ratings: all participants in the lower average quiz score group rated their general subject searching abilities at the end of the study as "moderately good," whereas all participants in the higher average quiz score group rated their subject searching abilities as "very good."

²⁰ While the minimum GPA for membership on the Dean's Honour List was 3.75, the actual average GPA for Spring 2005 List members was 3.89 (personal communication, November 14, 2007).

²¹ Initial and final questionnaire responses about subject searching not addressed in the profiles of individual participants are summarized in Appendix 17.

Table 8
Overview of Participant Profiles

	<u>Years of University Study (Fall 2005)</u>	<u>Degree + Major(s)</u>	<u>Subject Searching Self-Rating (Fall 2005)</u>	<u>Subject Searching Self-Rating (Spring 2006)</u>	<u>Average Quiz Score (3 iterations)</u>
Annette	2 ½	(BA) Sociology & Religious Studies	Very good	Very good	77%
Bonnie	3	(BA) English	Very good	Moderately good	58%
Carol	3	(BA./BSc) Sociology & Psychology	Moderately good	Moderately good	60%
Ellen	3	(BA) General Humanities	Very good	Moderately good	63%
Frances	3	(BA) English	Excellent	Very good	79%
Gail	3	(BSc) Neuroscience	Very good	Moderately good	57%
Howard	6	(BA) History	Very good	Very good	72%
Isabel	3	(BA) General Humanities	Very good	Moderately good	60%

Several items in the initial questionnaire completed by participants as part of the recruitment process for this study probed aspects of their subject searching over the year preceding the commencement of this study. Table 9 summarizes responses to questions about the frequency of their previous use of different types of subject searching tools, and how often they engaged in subject searching to complete class assignments. Most participants used library catalogues, indexes/databases (e.g., Sociological Abstracts, JSTOR) and Internet search tools (e.g., Google, Wikipedia, Yahoo) weekly or daily, and everyone had pursued academic studies-related subject searching at least weekly. No participant indicated that use of these types of subject searching tools over the preceding year had been less frequent than monthly or that subject searching for academic needs had been less frequent than weekly.

Table 9

Frequency of Online Search Tool Use and Academic Subject Searching Over Year Prior to Study

	Daily				Weekly				Monthly		
	Online Catalogue Use	Index/ Database Use	Internet Tool Use	Academic Subject Searching	Online Catalogue Use	Index/ Database Use	Internet Tool Use	Academic Subject Searching	Online Catalogue Use	Index/ Database Use	Internet Tool Use
Annette			U	U	U	U					
Bonnie	U	U		U			U				
Carol				U	U		U			U	
Ellen			U		U	U		U			
Frances			U		U			U		U	
Gail			U			U		U	U		
Howard					U	U		U			U
Isabel					U	U	U	U			

Tables 10 and 11 provide overviews of participants' diarized (privately conducted) and demonstrated subject searching captured in the study. The length and frequency of subject searching sessions varied widely across participants. It is notable that in both diarized and demonstrated searching, the average lengths of Bonnie's online searches were the shortest across all participants, and those of Carol and Ellen were the longest. The median of the average durations of participants' online subject searches were 16 minutes for diarized searches, and 22 minutes for demonstrated searches.

Table 10

Overview of Diarized Subject Searching

	# Diary Entries	# Screen Recordings	# Screen Recording Days ²²	Total Screen Recordings (min)	Range of Screen Recording Durations (min)	Average Screen Recording (min)
Annette	19	26	19	397	1 – 53	16
Bonnie	49	47	27	109	0.13 – 18	2
Carol	36	36	26	697	1 – 82	19
Ellen	32	27	26	1036	4 – 113	39
Frances	14	11	7	98	0.37 – 20	9
Gail	13	19	17	270	0.73 – 44	16
Howard	28	24	19	295	0.1 – 37	13
Isabel	10	8	7	113	9 – 19	15
Averages	25	25	19	377	2 – 48	16 ²³

Table 11

Overview of Demonstrated Online Subject Searching

	Degree Major(s)	Demo 1 Course Subject Area	Demo 2 Course Subject Area	Demo 3 Course Subject Area	Demo Average Duration (min)	Interview Average Duration (min)
Annette	Religious Studies/ Sociology	Sociology	Sociology	Sociology	25	18
Bonnie	English	English	English	Anthropology	8	25
Carol	Sociology/ Psychology	Psychology	Psychology	Psychology	49	19
Ellen	General Humanities	Philosophy	Women's Studies	Women's Studies	42	20
Frances	English	Women's Studies	Library Science	[not analyzed]	14	19
Gail	Neuroscience	Philosophy	History	Neuroscience	31	24
Howard	History	History	History	History	18	19
Isabel	General Humanities	English	History	English	19	21

²² The number of days on which at least one online subject search was screen-recorded.

²³ The median of the average screen recording durations across all participants.

While observing participants' online subject searching demonstrations I looked for indications of their comfort level in being observed and in speaking their thoughts aloud while conducting their searches. In general participants appeared to undertake their search demonstrations with poise and confidence, and to talk aloud naturally without being overly self-conscious. Only Bonnie seemed to find the requirement to talk aloud somewhat uncomfortable, but her discomfort seemed to dissipate over the three demonstration sessions. In the focused interview following her first online searching demonstration, Bonnie said, "I wasn't exactly sure what I should be doing because it was kind of abstract or I wasn't that clear on what I should search. . . . and I was real stressed out. . . . Plus I'm shy, and I don't know, I'm being taped, and you know it was just, it's stressful." In the final interview concluding her participation in the study when I asked her to reflect and comment on her overall experiences as a study participant, however, Bonnie did not mention feelings of discomfort or stress associated with her subject searching demonstrations.

During participants' search demonstrations I also watched for possible indications that participants were perhaps thinking silently rather than talking aloud for prolonged periods, or that they were uttering thoughts they may not have had if they were not being observed. The overall sense I had of participants' voiced thoughts was that they seemed to be naturally articulated with few pauses—I had to remind only Isabel on one occasion to keep talking aloud, which she responded to readily and with composure—and that the thoughts were genuine rather than fabricated for my benefit. Howard seemed on occasion during his first two demonstrations to voice some comments on his usual subject searching practices rather than confining his thinking to the subject search he was demonstrating at the time. This slight tendency, too, however, dissipated over the three demonstrations and I did not notice it at all in his third demonstration.

While most participants' written responses to question three in the final questionnaire (see Appendix 14) indicated that little or no change had occurred during the study in their subject searching approach, Frances and Howard said moderate change had occurred. Frances wrote, "I

learned to think about the structure of my searches, and was more compelled to re-word and/or reorganize searches that didn't work very well for me," while Howard noted, "I took more time to consider the sources that I was using for subject searching. I also became more aware of patterns within my searches and it challenged me to seek more options." Only Ellen indicated major changes had occurred in how she approached subject searching: "I was definitely more aware of the steps and decisions I was making while searching. I was also more willing & eager to try new or less comfortable searching techniques or tools (on occasion)."

Although I informed participants that I was specifically interested in their subject searching relating to academic tasks, some searches captured in the study were unrelated to academic tasks. See Appendix 18 for an overview of the total numbers of participants' diarized and demonstrated searches captured in the study, as well as the numbers of searches in each mode of searching I analyzed that addressed academic tasks. All subsequent analyses of participants' subject searching in this study, including the totals reflected in Tables 10 and 11, take into account only the 201 diarized and 23 demonstrated subject searches they conducted to advance their academic studies in some way.

5.5.1 Annette

At the study's commencement in September 2005, Annette was midway through her third year of a Bachelor of Arts degree, majoring in religious studies and sociology. She began her university studies at the start of the Spring 2002 semester in January, and then took two semesters off (Fall 2002 and Spring 2003) before resuming her full-time studies in the Fall of 2003.

In the initial questionnaire Annette rated her subject searching abilities as "very good," noting that she had "extensive experience with various sorts of databases" through her research assistant job, and was "very good at figuring out the salient search terms in order to find out" what she was looking for. Annette's self-rating of her subject searching abilities both in general, and specifically in her subject majors remained "very good" at the end of the study. Her overall self-rating was corroborated

by her average information literacy quiz score over her three quiz completions, which was the second-highest (77%) among all participants.

All of the courses Annette completed during the study were in her degree majors: eight were in sociology, and one was in religious studies. All three of Annette's online subject searching demonstrations as well as all of her diarized subject searching and self-recorded online searching were therefore in subject areas that were broadly familiar to her. Annette's diarized subject searching totalled 19 searches, which was somewhat fewer than the average of 25 searches per participant. The average durations of Annette's privately pursued and demonstrated online subject searches, however were both very close to the overall median of the average durations across all participants (16 minutes, and 22 minutes, respectively).

Annette seemed to be very comfortable performing her subject searching demonstrations while under observation, even when she assessed the outcome to be unsuccessful. At the end of the study Annette indicated she had acquired a greater awareness of the different resources available, which developed out of her repeated encounters with the DiaryClient questions about what sources were used for the particular subject search being diarized (see Appendix 10, questions 14 to 23). Annette's overall assessment of her experience of participating in the study was that it was a "good experience," and that "just having the laptop for the year made it worth it, I would have done even more than you asked, just to have the laptop for the year." At the study's conclusion Annette had one more semester of full-time studies to complete before graduation.

5.5.2 Bonnie

Like the majority of study participants, at the commencement of the study Bonnie was beginning her fourth consecutive year of university studies, having begun her degree program three years earlier. Bonnie was enrolled in a Bachelor of Arts program majoring in English, and completed seven courses during the study: two in English, as well as two in anthropology, two in religious

studies, and one in sociology. Bonnie noted that in the previous year she had taken a writing course where she “learned a few research techniques”, and because she was majoring in English, she “had to research a lot for essays.”

At the study’s outset Bonnie rated her subject searching abilities as “very good,” noting “I feel my skills have improved [over the previous year] because of the amount of research [and] subject searching that I have done. I also find I learn the most from this process.” Although her self-rating at the end of the study was “moderately good” for subject searching in general, and “very good” for subject searching in her degree major, Bonnie’s 58% average information literacy quiz score was the second lowest among all participants.

Bonnie’s online subject searching was distinctive for two reasons: she completed the greatest number of diarized online subject searches, and their average duration was by far the shortest among all participants as was the average duration of her subject searching demonstrations. The brevity of Bonnie’s diarized, as well as demonstrated online subject searches (two for English assignments, one for an anthropology assignment) gave her searches a compartmentalized character that seemed to be focused on search goals that were smaller and more discrete than that of other participants. Her demonstrations took place in one or two resources, involved one or two queries or browsing, and tended to be over in a matter of minutes after she identified a single potentially useful item. In their demonstrated subject searching, other participants tended to engage in more sustained interactions with their resources and to spend more time considering a greater number of items in query results.

Bonnie seemed unsure of what she was being asked to do during her first two online subject searching demonstrations, and occasionally directed questions to me about what to do next. She clarified in the interview portion of her demonstration sessions that the first two were primarily recreations of searches performed prior to the demonstration sessions. As well, some of Bonnie’s verbalizations during her first two demonstrations were on occasion expressed as suppositions about what she would do, rather than as thoughts she was actually experiencing at that moment.

At the end of the study Bonnie noted “I’m not sure if my understanding of the library catalogues changed, or if I just got more comfortable using them. I have noticed huge improvements in the way I subject search from my first year to this year, my last year.” She also noted that a portion of the small degree of change in her subject searching approach during the study was because “I used tools like Google to aid me in things like spelling and general knowledge to enhance my ability to better use key words when searching in scholarly databases.” Bonnie characterized her overall experience of participating in this study as “fairly positive” and that “the most positive thing that was involved in the study for me was the use of the laptop for eight months. That was fantastic. I don’t know how I ever lived without a laptop.” Bonnie was ready to graduate by the end of the study.

5.5.3 Carol

At the beginning of this study Carol was about to start her fourth consecutive year of undergraduate studies in her Bachelor of Arts and Science degree program, majoring in sociology and psychology. In the initial questionnaire Carol said she used Internet search tools during the previous year for a variety of personal and academic purposes including completing her work as a part-time research assistant for two sociology professors. Throughout the study Carol mentioned several times that Google and Google Scholar were her favourite subject searching tools.

Carol’s initial rating of her subject searching abilities as “moderately good” remained unchanged by the end of the study in general subject searching as well as within her subject major, although she commented on having progressed a bit in her final interview. Carol’s average score on the information literacy quizzes was 60%, just below the median of the average scores which was 61%. Carol noted that prior to this study she had completed a full credit, one semester library science course required for her degree program, and that her program of studies “forces me to use different types of databases and search for different kinds of information, hard science (neuropsych) and social science (soci). I do a lot of research for classes, most notably sociology.”

During the study Carol completed eight courses, all but one of which were in her subject majors: four in psychology, three in sociology, and one in music. Carol completed the second-highest number of diary entries and self-recorded online searches. The average duration of Carol's self-recorded online searches was slightly higher than the average across all participants, but the average duration of her online subject searching demonstrations was more than twice as high as the overall median of the average durations, 22 minutes.

Each of Carol's three subject searching demonstration topics was in psychology, and all topics were variations on a common theme that served as the focus of two of her courses involving independent research. Carol's original plan was to do an honours thesis in her fourth year, but she abandoned this plan at some point near the middle of the study. Carol arrived for her online searching demonstrations ready to make herself at home and to immediately settle into her subject search. Carol's verbalizations included commentaries on what she was doing, and sometimes why, as well as what she was feeling. Her verbalizations also occasionally included responses to matters extraneous to her subject searching, such as the room temperature.

At the end of the study Carol was one course shy of completing all academic requirements for graduation. She felt that little had changed in her approach to subject searching, other than having begun to consult fellow psychology lab members for help, and to use journal article reference lists more often to find additional articles. In her final interview Carol noted "I don't think I'm a really good subject searcher," and that she tended to "putz around" most of the time. She indicated that participating in the study "wasn't that bad" and "was kind of interesting."

5.5.4 Ellen

At the outset of this study Ellen was beginning her fourth consecutive year of undergraduate studies in pursuit of a Bachelor of Arts degree. Ellen's chosen major was general humanities which required at least half of the courses she completed toward her Bachelor of Arts degree to be

designated as humanities²⁴; her degree focus was primarily on art, religious studies, and philosophy. In addition to course-related and personal tasks, some of Ellen's subject searching in the previous year was conducted to find information on music and activism for her campus radio show.

At the beginning of the study Ellen rated her subject searching abilities as "very good," noting that "I feel comfortable using the library's print collection and am becoming more familiar with online indexes." Ellen was the only participant to downgrade (to "moderately good") her subject searching self-rating at the end of the study both in subject searching in general, as well as searching within her subject major. While Ellen's information literacy quiz scores improved with each quiz completion, her average score was only slightly above the median of the average scores, 61%, across all participants.

During the study Ellen completed eleven courses: three in philosophy; two each in religious studies and women's studies; and one each in English, health sciences, liberal education, and physical education (a half-credit physical activity course). Two of Ellen's online subject searching demonstrations were for women's studies courses, and one was for a philosophy course. Ellen completed 32 subject search diary entries and 27 self-recorded online subject searches during the study which tended to be quite long in duration. The average duration of Ellen's self-recorded online searches was more than twice as long as the average duration for self-recorded online searches across all participants, and the average duration of Ellen's three online subject searching demonstrations was the second longest overall.

Of all study participants, Ellen appeared to voice her inner reflections, uncertainties, and observations about her subject searching process the most naturally, spontaneously, and consistently during her subject searching demonstrations. In particular, in her first two demonstrations Ellen's verbalizations evidenced a dynamic interplay between her assessments of retrieved information and her understanding of her search topic and task through what appeared to be unselfconscious musings,

²⁴ Humanities subjects at the home university included English literature, other modern and classical languages and literatures, art, dramatic arts, music, history, Native American studies, philosophy and religion.

sometimes barely audible, as she pondered different ways of conceptualizing and shaping them as the searches progressed.

In addition to being the only participant to state that a major change had taken place in terms of her approach to subject searching, Ellen indicated in the final questionnaire that a major change had also occurred in her understanding of subject searching using library indexes and databases, as she now “used more indexes and databases and paid more attention to the specifics about searches in order to modify and focus search efforts.” Ellen stated that she had enjoyed participating in the study, and reflected that “I think it had actually helped me, so it was ... interesting to do but it was also I think it had some benefits for me ... as a researcher and as a student.” At the end of the study Ellen had one and a half courses as well as approximately two planned work co-op placements to complete, which totalled roughly one more year left in her degree program.

5.5.5 Frances

When the study began, Frances, like Bonnie, was beginning her fourth consecutive year of undergraduate studies, majoring in English. In the initial questionnaire Frances was the only participant to rate her subject searching abilities as “excellent.” She noted that “friends and family always come to me to help them find more information or to help them understand the information they have gathered on a subject; by using as many avenues as I can think of, I can always find them the answer they are looking for!” At the end of the study Frances rated her subject searching abilities in general as “very good,” while her self-rating in subject areas associated with her degree major remained “excellent.” Frances’ subject searching abilities self-rating was substantiated by her average information literacy quiz score, which was the highest among all participants (79%).

During the study Frances completed diary entries for 14 subject searches and she recorded 11 online subject searches. Frances’ demonstrated and independently pursued online subject searches were relatively short, although they did not rival the brevity of Bonnie’s online searches. One of the

six courses she completed was an English undergraduate thesis course worth twice the number of credits as a regular course. Frances also completed one other English course, as well as two courses in women's studies, one in philosophy, and one in library science during the Spring 2006 semester. The library science course covered, among other topics, the conceptual framework and basic skills necessary to identify, locate and use a variety of information sources in various disciplines and types of libraries, which possibly influenced Frances' subject searching during the second half of the study.

The nature of Frances' third online subject searching demonstration differed from all other search demonstrations. The subject searching need stemmed from an art history course Frances planned to take place in the semester following the study's conclusion. The course was graded pass/fail and involved participation in class tours of selected Paris art museums, with no requirement to complete any academic tasks. Because the topic of this search demonstration—recreational activities to pursue in Paris outside of scheduled course-related museum tours—was not related to an academic task, I excluded it from this study's analyses.

Reflecting on her experiences as a study participant, Frances indicated “there were times when it felt like ... I would have to plan more when I would do a search because I would have to make sure I was near the laptop ... but for the most part, I think it was a good experience. It really made me think about what I was searching and what results I'm getting and how to articulate those by answering questions.” At the end of the study Frances was ready to graduate, since the summer art history course would not contribute toward the requirements of her degree program. She planned to begin a Masters degree in English at another Canadian university in the following fall semester.

5.5.6 Gail

Along with the majority of study participants, at the beginning of the study Gail was in her final year of a four-year degree program, having begun her university studies three years earlier. Gail was the only study participant to pursue a Bachelor of Science degree, majoring in neuroscience.

Although her English language skills were very good, early in the study Gail disclosed voluntarily that her first language was a Western European language other than English.

In the initial questionnaire Gail rated her subject searching abilities as “very good.” She noted having taken “several classes which required papers and/or assignments. In order to complete these assignments I used the library catalogues and library online databases very often.” She also mentioned a science research methods course she had completed the previous semester for which she had “to write a paper every week on a different topic. . . .This gave me a lot [of] experience with the library online databases.” At the end of the study Gail rated her subject searching abilities in general as “moderately good” but retained her original “very good” subject searching self-rating in subject areas pertaining to her degree major. While Gail’s information literacy quiz scores remained the same for the first two quizzes and for the third quiz improved by more than 10%, her average quiz score of 57% was the lowest among all participants.

During the study Gail completed ten courses, the majority of which were related to her degree major: six courses were in neuroscience, as well as one each in biology, history, kinesiology, and philosophy. Gail was the only study participant to demonstrate online subject searching on topics that were in completely unfamiliar subject areas. The first two of Gail’s online subject searching demonstrations were in philosophy and history, and only the third was in her degree major, neuroscience. Over the course of this study Gail completed 13 diary entries and 17 self-recorded online subject searches related to academic tasks. The average duration of her self-recorded online searches was the same as the median of the average diarized online search durations across all participants, and the average length of her online searching demonstrations was moderately greater (9 minutes longer) than the overall median of the average durations across all demonstrations.

During her subject searching demonstrations Gail occasionally directed questions or comments to me but they always appeared to be motivated not by uncertainty about what to do next but rather by a concern for providing what was needed for the purposes of the study as accurately and

efficiently as possible. More than any other participant, Gail verbalized thoughts during her online searching demonstrations providing glimpses of her sense-making process while actively engaged in trying to understand and evaluate retrieved information sources when her searches involved unfamiliar topics and subject areas.

The overall experience of participating in this case study for Gail was “interesting.” She further explained, “well, more interesting in my head I guess... I didn’t mind it, and it was also handy to use the laptop ... no, I didn’t mind it at all.” Gail was ready to graduate by the end of the study, and planned to commence a Master of Science degree program at the home university in the subsequent fall semester.

5.5.7 Howard

Howard had the most extensive postsecondary experience of all participants, which began nine years prior to the commencement of this study when he initiated a four-year college degree. After completing the college degree and working in the associated field for several years, Howard began a graduate degree program at a new institution in the fall of 2003 which he abandoned a year later in order to transfer to the home university to pursue a new undergraduate degree. At the beginning of this study Howard was commencing his third year²⁵ of an anticipated five-year combined Bachelor of Arts/Bachelor of Education degree program.

In the initial questionnaire Howard rated his subject searching abilities as “very good,” which, for subject searching in general, remained unchanged at the end of the study. For subject searching in areas of his degree major, however, Howard, like Frances, rated his searching abilities as “excellent” at the end of the study. Howard’s average information literacy quiz score was 72%, the third highest among all participants.

²⁵ Howard had received transfer credits toward his enrolled Arts and Science degree program at the home university for courses completed at previously attended higher education institutions.

Four of the ten courses Howard completed during the study were in his degree major, history. The other courses he completed included two courses in German, and one each in archaeology, geology, music, and sociology. During the study Howard submitted 28 diary entries and 22 online subject search self-recordings. The average durations of Howard's privately pursued and demonstrated online subject searches were both slightly (three to four minutes) shorter than the median of the overall averages. Howard's online subject searching demonstrations were all on topics within his degree major, history.

At the end of the study Howard felt there had been a moderate change in his understanding of subject searching in library indexes and databases. He articulated some of those changes in the following way, "I learned about overlap between the different databases. I also learned that if a source is not available, articles come very quickly through interlibrary loans." Regarding his overall experience as a study participant, Howard commented "it's interesting to be part of a learning environment . . . I thought it was interesting to see how different faculties and departments do research and stuff like that . . . I just thought it was a good experience overall, just being part of it." At the end of the study Howard anticipated being accepted into a Bachelor of Arts/Bachelor of Education combined degree at the home university which he expected to complete in two years.

5.5.8 Isabel

At the outset of the study Isabel was beginning her fourth consecutive year of a Bachelor of Arts degree she had begun in the Fall 2002 semester at another university in the same province. Isabel's degree major was in general humanities, with a focus in English. Although she had plans to acquire a Bachelor of Education degree as did Howard, Isabel chose a different avenue by opting to complete a Bachelor of Arts degree first, after which she would make a decision about where to pursue a teaching degree.

In the beginning Isabel rated her subject searching abilities as “very good,” noting “I have taken a broad range of classes at university – both science, humanities, and social sciences, and have been very successful. I correlate much of this success to class instruction that has occurred several times in different classes that have focused on subject searching techniques.” At the end of the study Isabel rated her subject searching abilities in general as “moderately good,” and her abilities in subject areas associated with her degree major as “very good.” Her average information literacy quiz score, like Carol’s, was 60%, just below the overall median score of 61%.

Isabel completed ten courses during the study: four in history, three in English, as well as one each in geography, religious studies, and Spanish. All of her online subject searching demonstration topics were within her degree major, two of which were in English, and one in history. Isabel completed ten diary entries and eight self-recorded online subject searches. The average lengths of her self-recorded and demonstrated online searches were between one and three minutes shorter than the median of the average durations across all participants.

I discovered in my final interview with Isabel that her approach to diarizing her independently pursued subject searching was quite different than that of other participants. Isabel said she kept a handwritten log of her diarized searching throughout the study to “record the date that I did a search and kind of what I had done,” which she later used to create a DiaryClient entry only “after I had gotten my results back from the paper, because I really wouldn’t know how the sources were until the paper had been graded . . . like I maybe knew it was a good paper, but you don’t know until you kind of get that review back.” Thus a distinctive aspect of Isabel’s diarized subject searching was her use of the grade she achieved on the associated assignment as an indicator of search success. Another distinctive aspect was Isabel’s amalgamation of all subject searching conducted for a given assignment into a single diary entry, some of which had taken place over multiple search sessions. Isabel said she made one diary entry per assignment because “I only have

pretty much one major assignment for each class.” Among other participants’ diary entries I often found more than one diary entry for a subject search relating to the same task or assignment.

Isabel commented that “it was really easy to be in [the study], it ... was good, I enjoyed being in it,” and that “it was strange to have to think about things that you just do unconsciously, but it was a good experience, I thought.” At the study’s conclusion Isabel had completed her Bachelor of Arts degree requirements, and anticipated beginning a Bachelor of Education degree that fall at a yet to be selected university.

5.5.9 Participants’ Enrolled Courses

Participants’ subject searching topics were usually aligned with the subject areas of their enrolled courses, which represented another aspect of context related to this study. Figures 1 and 2 present all courses pursued by participants during the Fall 2005 and Spring 2006 semesters, respectively, grouped by broad disciplinary area. Each course is identified by its subject domain and a course number I assigned, of which the initial digit indicates the course level: course numbers in the range 100 – 199 indicate introductory courses usually taken during the first year, 200 – 299 indicate intermediate courses usually taken during the first and second years, 300 – 399 indicate senior courses usually taken during the third year, and 400-499 indicate senior courses usually taken during the fourth year²⁶. The second and third digits in each course number represent consecutively assigned two-digit numbers to identify each course uniquely.

The level of participants’ courses did not always coincide with their year of undergraduate studies. If we understand first- and second-year courses to be lower-level and third- and fourth-year courses to be upper-level courses, then all participants pursued a mix of lower- and upper-level courses during the study. For instance in the Fall 2005 semester Gail was beginning her fourth year of studies but was enrolled in a first-year philosophy course. In both semesters each participant’s

²⁶ The approach to numbering courses I used for the purposes of this study was adapted from the course numbering system described in the home university’s academic calendar for 2005-2006.

enrolled courses included at least one lower-level courses except for Carol who took only upper-level courses in the Spring 2006 semester. All participants took one or two fourth-year courses during the study, but no student enrolled in more than one in a given semester. About 42% of the courses completed during the study were lower-level, and about 58% were upper-level courses.

Gail majored in a science, and Carol majored in a science and social science. Although all other participants majored in humanities and/or social sciences, a mix of disciplinary areas in the humanities, social sciences, and sciences were represented in the courses pursued over both semesters: about 46% of enrolled courses were in the humanities, 29% were in the social sciences, 18% were in the sciences, and the remaining 6% were in other disciplinary areas. Except for Annette, all participants completed at least one course during the study outside of their degree major²⁷.

Five participants were enrolled in at least one independently pursued course during the study. The content of independently pursued courses is negotiated between the student and the course supervisor or supervisory committee, and is customized to focus on mutually agreed topics, processes and assignments involving only the one student. Independently pursued courses are of three types. An *independent study* is “a course for which credit is earned through individual study under the supervision of an instructor;” an *applied studies* course is “an opportunity for students to gain University course credit for volunteer or employment experience;” and an *undergraduate thesis* course involves a written thesis—“a sustained piece of supervised research demonstrating a superior level of academic ability on a matter approved by the Supervisory Committee”—and an oral defence—“a formal oral presentation demonstrating the ability to articulate clearly the nature of the project undertaken, the research methodology, and the results of the project.”²⁸ In Figures 1 and 2, independently pursued courses are indicated by an asterisk* following the subject domain of each named course.

²⁷ The home university’s liberal education focus required all undergraduate degree programs to include a specified number of courses in disciplinary areas outside of a student’s declared major. This specified number of courses varied by degree major.

²⁸ Definitions excerpted from the home university’s 2005-2006 academic calendar.

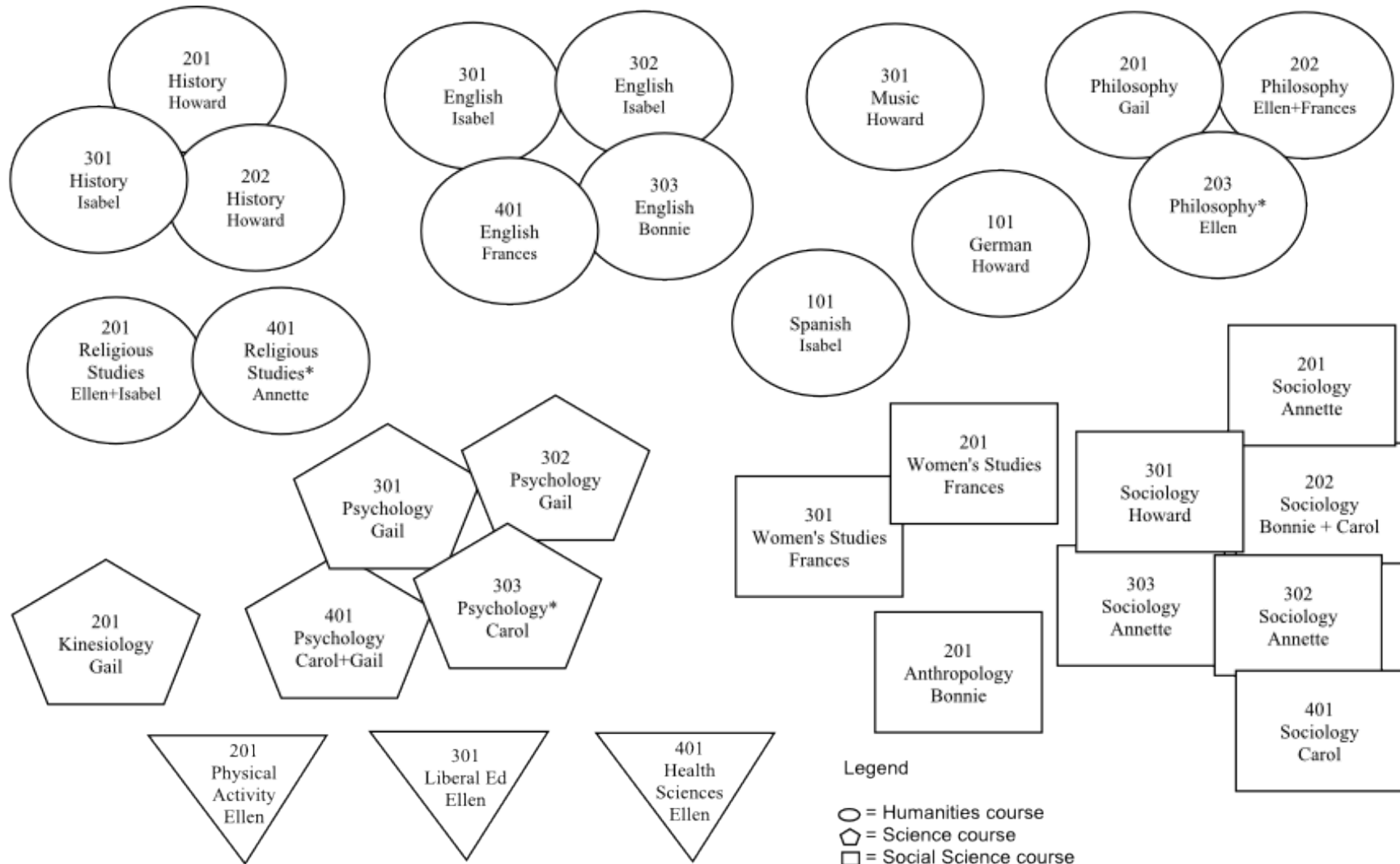


Figure 1. Fall 2005 courses taken by participants, by disciplinary area and course level.

Legend
 ○ = Humanities course
 ⬠ = Science course
 □ = Social Science course
 ▽ = Other course
 * = independently pursued course
 Course number first digit = course level
 Course number last digit = course unique identifier
 (e.g., 201 = 2nd year course, course 1)

5.6 Participants' Subject Searching Contexts

Diary entries on participants' privately pursued searching represented 90% of their academic subject searching during the study, and were therefore a rich source of contextual details covering the breadth of their searching. In contrast participants' demonstrations represented only 10% of searching captured in the study, although they yielded abundant details about specific thoughts, actions and personal experiences that were largely absent from diary entries. In this section I use participants' diary entries and comparative data from demonstrated searches when available to answer a variety of questions about contextual elements of their subject searching including the tasks that underlay subject searching sessions, resources employed, search topics and topic knowledge, types and amounts of needed information, search ease, participants' research stage, and search outcomes. Since looking at these contextual elements individually in fact lifts them out of the contexts of the specific searches in which they occurred, I included selected comments from diary entries when they illuminated how participants viewed those elements in relation to their subject searches.

5.6.1 Tasks

Contexts of subject searching such as the underlying tasks and goals are of interest because, as Vakkari (2003, p. 413) observed, "our understanding of information searching is only partial, if we are not able to connect aspects of searching to the related task". In addition, Gross (1995) distinguished between imposed tasks (e.g., research papers assigned to students by their instructors), and self-generated tasks. What kinds of tasks underlay the subject searching captured in this study, and how frequently did those tasks arise? I found the tasks underlying participants' 201 diarized subject searches and 23 demonstrated online subject searches to be strongly similar in terms of their source of origin, task type, frequency, and distribution across participants and their enrolled courses.

The majority of tasks underlying participants' subject searches had externally imposed origins: 179 diarized and 22 demonstrated subject searches (89% and 96% respectively) were for

assignments of various types imposed by course instructors. At times participants volunteered comments about the imposed tasks underlying their diarized searches. An example was Howard's diarized observations about the purpose of a short research paper: "This research is for an article review assignment. I have to evaluate . . . the historiography of four American historians. . . . The crux of this assignment is to outline the reasons for their different interpretations of what happened at the Jamestown settlement."²⁹ Isabel similarly pinpointed the pedagogical goals of a short answer assignment she was pursuing in a diarized search, "The assignment was to test our writing ability and address problems with it before the major paper came due. It was also to evaluate how we were able to effectively interpret and analyze primary source material."

Of participants' 22 diarized self-generated subject searches not directly linked to class assignments, 14 were conducted to satisfy personal interest or curiosity, 5 were conducted to prepare for an upcoming class, 2 were in preparation for student research conferences, and 1 was in preparation for a subject searching demonstration for this study. Table 12 presents examples of topics and associated self-generated tasks that underlay diarized searches.

Table 12

Examples of Tasks Unrelated to Class Assignments in Diarized Subject Searching

<u>Participant</u>	<u>Search Topic</u>	<u>Self-Generated Task</u>
Annette	"Thorstein Veblen"	"The prof mentioned him specifically and I wanted some background information on his theoretical framework... I know that we will be talking about Veblen in class quite a bit"
Bonnie	"The white paper"	"I just want to know what it was... I am reading V.S Naipaul's The middle passage. It is a travel narrative about the middle passage. There is a lot of history of the Caribbean, and of places like British Guiana that I don't know."
Frances	"The definition of the word 'auteur[e]'"	"This is a word that arose in my readings for this course, and I have no idea what it means. The point of this search is just to find a definition and get a better grasp on the concept."
Gail	"Greyhound trip"	"cost of the trip" [to attend an undergraduate research conference]

²⁹ All quotes from diary entries were transcribed verbatim including participants' spelling and capitalization.

The only demonstrated online subject search I analyzed that was not directly linked to a class assignment was conducted by Annette. In Annette’s follow-up interview she explained “*we don’t actually have an assignment specifically where I think I’m going to use this, but . . . it is what I want to do my Masters on, so I’m trying to . . . do some research . . . so I can talk to my sociology of religions prof about how . . . I can use this in the future*” (interview2). Thus, the most common motivator of self-generated subject searching in diarized searching—personal interest—was also the impetus for the sole self-generated task pursued in demonstrated subject searching.

The types of tasks relating to participants’ diarized and demonstrated subject searching are summarized in Appendices 19 and 20, respectively. Research papers of varying length were the underlying task for more than 50% of all subject searching. Other assigned tasks pursued 10 or more times in diarized searching included class presentations, reviews of works, and annotated bibliographies. Besides research papers, only class presentations were pursued more than once in demonstrated subject searching. The types of assigned tasks pursued in diarized and demonstrated subject searching were very similar, as 10 of the 11 task types pursued in demonstrated subject searching were also among the 17 types of instructor-imposed tasks that underlay diarized searching. Table 13 provides an overview of the numbers of research papers, other assigned (course-related) tasks, and self-generated tasks pursued by each participant in diarized and demonstrated searching.

Table 13

Overview of Tasks Underlying Diarized and Demonstrated Subject Searching

	<u>Annette</u>	<u>Bonnie</u>	<u>Carol</u>	<u>Ellen</u>	<u>Frances</u>	<u>Gail</u>	<u>Howard</u>	<u>Isabel</u>	Totals
<u>Diarized Searching</u>									
Research papers	9	24	17	17	6	8	16	7	104
Other assigned tasks	5	18	15	15	4	3	12	3	75
Self-generated tasks	5	7	4		4	2			22
Total Searches	19	49	36	32	14	13	28	10	201

Table 13

Overview of Tasks Underlying Diarized and Demonstrated Subject Searching

	<u>Annette</u>	<u>Bonnie</u>	<u>Carol</u>	<u>Ellen</u>	<u>Frances</u>	<u>Gail</u>	<u>Howard</u>	<u>Isabel</u>	Totals
<u>Demonstrated Searching</u>									
Research papers	2		2	1	1	3	3	3	15
Other assigned tasks		3	1	2	1				7
Self-generated tasks	1								1
Total Searches	3	3	3	3	2	3	3	3	23

Were the academic tasks pursued in subject searching relatively evenly distributed across all participants and the courses they were taking? By comparing the courses referenced in participants' diary entries and subject searching demonstration sessions to their enrolled courses I discovered about 79% of all enrolled courses were associated with at least one diarized or demonstrated subject search, indicating that participants conducted subject searching for most of their courses. Individually, the proportion of participants' courses for which they conducted at least one subject search ranged from 60% (Gail and Howard) to 100% (Ellen).

5.6.2 Resources

Did the shared similarities in terms of origins and types of tasks motivating diarized and demonstrated subject searching also apply to the resources used to conduct those searches? As participants were free to choose any type of resource in diarized subject searching, not unexpectedly the range of resource types used there was markedly wider than those used in demonstrations where, for pragmatic reasons, participants were limited to online resources. In diarized subject searching participants used 46 different online resources and physical resources falling into 14 categories that included human and print resources as well as the physical activity of library shelf browsing, while in demonstrated searching they used a total of 25 unique online resources. Appendices 21 and 22 list all resources used in diarized and demonstrated subject searching, respectively.

Table 14 summarizes the types and use frequencies of diarized subject searching resources in two broad categories: online and physical resources. Online resources represented about 85% of all resources used in diarized subject searching, with the use frequency by individual participants ranging from a low of 66% (Isabel) to a high of 96% (Bonnie).

Table 14

Types and Use Frequencies of Resources Used in Diarized Subject Searching

Resource Type	Use Frequency								Totals
	<u>Annette</u>	<u>Bonnie</u>	<u>Carol</u>	<u>Ellen</u>	<u>Frances</u>	<u>Gail</u>	<u>Howard</u>	<u>Isabel</u>	
<u>Online</u>									
Library Catalogue	5	29	4	10	7	1	17	10	83
Index/Database	7	32	9	28	3	11	16	11	117
Internet Resource	14	12	30	11	5	5	5	2	84
Online Totals	26	73	43	49	15	17	38	23	284
Percentage of Total Resources Used	79%	96%	83%	91%	75%	94%	84%	66%	85%
<u>Physical</u>									
Professor	2	2	1	2			1	9	17
Other Expert	2		2	1					5
Library Staff							1		1
Fellow Student			2						2
Printed Resource	3	1	4	1	5	1	4	3	22
Browsing				1			1		2
Physical Totals	7	3	9	5	5	1	7	12	49
Percentage of Total Resources Used	21%	4%	17%	9%	25%	6%	16%	34%	15%
Total Resources Used	33	76	52	54	20	18	45	35	333

All participants used freely accessible Internet resources, as well as online catalogues, indexes and full-text databases maintained or licensed by their home library at least once in diarized searching. Library catalogues and Internet tools each represented about 30%, and indexes/databases

represented about 40% of the online resources used in diarized searching. Print resources were the only type of physical resource used at least once by each participant. Course professors were the most frequently used human resource.

Use frequencies for the types of resources participants used in demonstrated subject searching are presented in Table 15. Once again each participant used online resources in all three categories, with library catalogues and Internet resources each accounting for roughly 25%, and indexes/databases representing about 50% of all resources used in demonstrated subject searching. Although the number of online resources used in diarized subject searching was three times larger than the total used in demonstrated searching, the relative proportions were about the same: library catalogues and Internet resources each represented roughly 25% to 30%, and indexes and databases represented about 40% to 50% of the online resources used in both diarized and demonstrated subject searching.

Table 15

Use Frequencies of Resources Used in Online Subject Searching Demonstrations

Resource Type	Use Frequency								
	<u>Annette</u>	<u>Bonnie</u>	<u>Carol</u>	<u>Ellen</u>	<u>Frances</u>	<u>Gail</u>	<u>Howard</u>	<u>Isabel</u>	<u>Totals</u>
Library Catalogue	2	2	2	3	2	2	2	3	18
Index/Database	7	1	9	4	2	4	4	5	36
Internet Resource	1	2	2	3	2	4	2	2	18
Total Resources Used	10	5	13	10	6	10	8	10	72

It became clear in both diarized and demonstrated searching that Isabel viewed her course professors as important subject searching resources. In post-demonstration interviews, Isabel and several other participants mentioned consulting with their professors, but only Isabel said she consulted with her professors for all research assignments. In a diary entry Isabel commented, "One of the things that I was told by my professor to keep in mind was the scholarship done by feminists

and sociologists because he said that some of their work was one sided, and he was skeptical of it. Therefore, I considered sources more carefully, considering he would be the one marking the paper and he works in the field of [search topic].” Isabel listed her professors as subject searching resources in all but one of her diary entries. While no other participant emphasized professors as a major subject searching resource, in diarized and demonstrated searching Carol said she relied on discussion with other students and her instructors. One example is her diary entry comment, “I feel that discussion is really important to my success as a student and I utilize friends and profs.”

Given that the relative proportions of subject searching involving library catalogues, indexes or databases, and Internet resources were roughly the same in diarized and demonstrated searching, were the use frequencies for individual online resources comparable as well? In both modes of searching I found the top seven online resources represented more than two-thirds of all resources employed. Each of the top seven resources was used in at least 10 different diarized searches and in at least 3 different demonstrated searches. Comparison of the top seven online resources in diarized and demonstrated searching (see Table 16), revealed five to be common to both modes of searching: the home library catalogue (CatHome), Google, JSTOR, Academic Search Premier (ASP), and the Modern Languages Association (MLA) Bibliography.

Were participants overly dependent on resources that were not scholarly³⁰ when their subject searching was conducted online? Table 16 indicates that study participants did use Google frequently in diarized and demonstrated searching, but not as heavily as some have feared or observed (Ghahery, 2004; Haglund & Olsson, 2008; C. Thompson, 2003). Instead library catalogues were the most frequently used online resource in both diarized and demonstrated searching by a significant margin, an interesting finding in light of strong scepticism regarding their current utility and future viability

³⁰ Scholarly search tools and information sources provide access to or are instances of scholarly communication, “the means by which individuals engaged in academic research and creative endeavor inform their peers, formally or informally, of the work they are engaged in or have accomplished . . . includ[ing] not only the creation and dissemination of scholarly works but also evaluation of quality (peer review) and preservation for future use” (Reitz, 2007).

(Eden, 2008; Tennant, 2003, 2007; Wolverton & Burke, 2009). Of the top seven most frequently used online resources in both modes of subject searching only Google and Wikipedia did not cover primarily scholarly communication.

Table 16

Top Seven Most Frequently Used Resources in Diarized and Demonstrated Subject Searching

Diarized Subject Searching

CatHome ³¹	Google	JSTOR	ASP	MLA	CatExternal	Wikipedia	Other	Totals
25.7%	16.9%	7.4%	6.7%	4.6%	3.5%	3.5%	31.7%	100%

Demonstrated Subject Searching

CatHome	ASP	Google	JSTOR	MLA	GoogleS	SocAbs	Other	Totals
23.6%	12.5%	11.1%	8.3%	4.2%	4.2%	4.2%	31.9%	100%

Across all resource types, how frequently did participants choose scholarly subject searching aids? If we consider library catalogues as well as indexes and databases in general to be tools for finding information of a chiefly scholarly nature, roughly 75% of online resources used in demonstrated subject searching were scholarly. Online catalogues, indexes and databases represented 60% of resources used in diarized subject searching but if we add professors as well as printed resources, most of which were stated or implied in participants' diary entries to be scholarly, then the percentage of scholarly resources used in diarized searching exceeded 70% as well.

Despite its first place showing in diarized and demonstrated searching, participants sometimes expressed dissatisfaction with the search results produced by their home library catalogue. For example Ellen made the following comment in a diary entry for a search on art depicting an epic poem of India, "I am frustrated at the use of "Indian" to mean First Nations People in North America and found it discouraging in doing the library catalogue search." As well, Frances included this

³¹ Resource name abbreviations are explained in Appendices 22 and 23. "Other" comprises all resources used other than the top seven.

comment in a diary entry describing a search in the home library catalogue in which she found only a little bit of needed information, “Some of the search terms returned irrelevant results or few results.”

Indexes/databases represented the most frequently used category of subject searching resources, but here, too, participants offered some criticisms in their diary entries. Ellen identified positive and negative aspects of using online indexes/databases in a “somewhat easy” search that had a successful outcome, “I enjoy being able to download the articles onto my computer (from online indexes/databases) to refer to later. Not finding full text is frustrating because in general a simple reference and VERY short summary are not enough to be useful.” Annette’s comments pertaining to a search that was somewhat difficult and produced some of the needed information also mentioned frustrations, “I was able to find a lot of relevant articles, but it was tough to find the right search terms, tough to sort through hundreds of articles. I also accidentally erased my "marked items" list . . . This was my fault, but still frustrating. It was also frustrating how few of the articles were either a) available at the library, or b) available online.”

5.6.3 Topics and Degree Majors

What kinds of topics were searched, how often did they fall within participants’ degree majors, and how similar were they across diarized and demonstrated searching? Participants’ subject searching topics varied widely across arts and science disciplinary areas with a concentration in humanities areas. The following topics were among those addressed in diarized searching: Swami Sivanandha Radha, alcoholism in O’Neill’s *Long Day’s Journey Into Night*, polysynaptic feedback, the problem of genocide, Blake’s *Book of Ahania*, the optokinetic nystagmus paradigm, Mennonite immigration to Canada, and the myth of Theseus as Greek propaganda. All topics pursued in demonstrated subject searching are included in Appendix 23’s summarization of contextual details of each demonstrated subject search, and are similarly spread across subject areas in the humanities, social sciences and sciences.

How often did the same topic overlap both diarized and demonstrated searching? Of the 23 demonstrations I analyzed, 19 were associated with tasks for which participants had also diarized at least one search, and 16 of those 19 demonstrations (70% of the 23 demonstrations) addressed an identical topic and task pursued in diarized searching. Thus topic as an aspect of subject searching context was similar across diarized and demonstrated searching in terms of the proportion of search demonstration topics that also showed up in at least one diarized search for the same task.

How often were the tasks underlying participants' subject searches within their degree majors? This is of interest because we generally understand subject searching for tasks relating to courses within upper-level students' degree majors to be more strongly associated with familiar topics, search tools and domain literature than subject searching for tasks for courses outside of their degree majors. Table 17 indicates that the majority of participants' subject searching during the study was associated with tasks within their degree majors, although Ellen was an exception in diarized subject searching, and Ellen, Frances and Gail were exceptions in demonstrated subject searching.

Table 17

Relationship of Subject Searching Tasks to Degree Majors

	<u>Annette</u>	<u>Bonnie</u>	<u>Carol</u>	<u>Ellen</u>	<u>Frances</u>	<u>Gail</u>	<u>Howard</u>	<u>Isabel</u>	<u>Totals</u>
<u>Diarized Searching</u>									
Tasks Within Major	19	38	32	11	8	10	24	10	152
Tasks Outside Major	0	11	4	21	6	3	4	0	49
Totals	19	49	36	32	14	13	28	10	201
Percentage of Tasks Within Major	100%	78%	89%	34%	57%	77%	86%	100%	76%
<u>Demonstrated Searching</u>									
Tasks Within Major	3	2	3	1	0	1	3	3	16
Tasks Outside Major	0	1	0	2	2	2	0	0	7
Totals	3	3	3	3	2	3	3	3	23
Percentage of Tasks Within Major	100%	66%	100%	33%	0%	33%	100%	100%	70%

To what degree were search topics associated with tasks in participants' degree majors more familiar than topics associated with tasks outside their majors? I regarded "familiar" topics to be those for which participants said they had "moderate," "good" or "extensive" knowledge, and "unfamiliar" topics to be those for which they had "very little" or "no" knowledge. I categorized familiar and unfamiliar search topics according to whether or not the course (or subject area of self-generated tasks) to which they belonged was within or outside of participants' degree majors. Table 18 presents an overview of the percentages of diarized and demonstrated subject searches that were on familiar/unfamiliar topics and were associated with courses or subject areas within/not within participants' degree majors.

Table 18

Topic Familiarity and Course Subject Area in Diarized and Demonstrated Subject Searching

	<u>Familiar/ Within Major</u>	<u>Unfamiliar/ Within Major</u>	<u>Unfamiliar/Not Within Major</u>	<u>Familiar/Not Within Major</u>	<u>Familiarity Level Not Stated</u>	<u>Totals</u>
Diarized Searches	44%	31%	14%	9%	1%	100%
Demonstrated Searches	57%	13%	26%	4%	0	100%

In general, familiar search topics were associated most often with courses within participants' degree majors. For Ellen, however, the majority of familiar topics were associated with courses outside of her degree major, and across all diarized searches 31% were on unfamiliar topics despite being associated with courses within participants' majors. This indicates that topic familiarity was not necessarily (or only) associated with courses or subject areas within one's major. Four subject searching demonstrations illustrate these points.

Bonnie's first two demonstrations were for courses in her degree major of English (categorized in Table 18 as "Within Major"), but her search topics were outside of the English

literature domain. “The idea of an imperfect copy of the world” is a philosophical concept (Plato) about which Bonnie had moderate knowledge, and “Middle Eastern country in World War I” about which Bonnie had very little knowledge, can be studied within several disciplinary realms including history and political science. Bonnie’s spoken thoughts suggested she knew little about those domains: “*Maybe the interpretive essay might have been helpful since I’m really not good on philosophy*” (demo1) and “*I’m still not really comfortable, because I don’t know a lot of the issues surrounding . . . [Middle Eastern country] and World War I*” (interview2). It is therefore appropriate to consider these search demonstration topics to have occurred in unfamiliar domains despite the fact that the underlying tasks were associated with courses in Bonnie’s degree major.

The reverse situation was true of two demonstrations, one by Ellen and the other by Frances, associated with courses outside of their degree majors, categorized in Table 18 as “Not Within Major.” Ellen’s subject search on “a Hindu goddess and associated festival” about which she knew nothing was for a women’s studies course, but during her demonstration she discovered her topic was related to other Hindu gods she had become familiar with in another course in her degree major: “*I didn’t know it was connected to this, it’s something that I’m working at now, so it might be interesting to use some of the stuff in doing another [religious studies] class . . . that’s something I’m actually—feel a bit more familiar with*” (demo2). Frances’ subject search for “autobiographical information on a woman writer” about which she knew very little was for a library science course, but her assignment was related to her English undergraduate thesis topic about which she was building considerable understanding: “*the [library science] assignment takes a topic that you’re working on from another class, so for me this is from my honours thesis topic, and the bulk of the assignment is just to write out how you’ve researched it*” (interview2). Thus, although their tasks were for courses outside of their degree majors, the topics of Ellen’s and Frances’ second demonstrations were within the disciplinary areas of their degree majors and were related to familiar subject matter, therefore qualifying these demonstrations as having taken place largely within familiar domains.

5.6.4 Needed Information

How much and what types of information were participants looking for in their subject searching, and how soon did they need it? I did not ask participants to address these issues in their demonstrated subject searching, but participants' responses to DiaryClient questions 6, 12 and 13³² provided some answers. Table 19 summarizes participants' indications of how much information they were seeking in the 201 subject searches they diarized. For most participants the amount of information they were seeking included occasions when they needed relatively few (up to five) items as well as other times when they needed larger numbers of items (up to 20).

Table 19

Number of Information Sources Sought in Diarized Subject Searching

	<u>Just 1</u>	<u>2 to 5</u>	<u>6 to 10</u>	<u>11 to 20</u>	<u>21 to 50</u>	<u>> 50</u>	<u>Unsure</u>	<u>Unstated</u>	<u>Totals</u>
Annette	3	7	1	4	2		2		19
Bonnie	14	15	14	4				2	49
Carol	7	7	5	7	2	1	6	1	36
Ellen	6	9	10	5			2		32
Frances	5	3					6		14
Gail	3	10							13
Howard	6	2	3	15	1			1	28
Isabel	2	5	2	1					10
Total Searches	46	58	35	36	5	1	16	4	201
Percentage of Total Searches	23%	29%	17%	18%	2%	0%	8%	2%	100%

Gail was the only participant who consistently indicated she needed only small amounts of information. In a diary entry for a search requiring "2 to 5" pieces of information, however, Gail commented, "but usually ends [up] being more anyways," suggesting that she often gathered more

³² See Appendix 10 for all DiaryClient questions.

information than was actually needed. At the opposite extreme, the amount of information Howard said he needed was most often greater than 10. In a diary entry for a short research paper, he noted “For a research paper of this length I generally have at least 10 and up to 20 sources.”

The number of occasions on which participants were unsure of how much information they needed was surprisingly low (only 8% of all diarized searches). Annette commented on her uncertainty about how much information she needed in this way, “I’m not sure how I will know when I have enough sources. I think that it will be more a case of ‘I don’t have the time for any more sources’ rather than ‘I have all the information I need’.” In a similar vein Ellen remarked, “I am unsure how much I need for the assignment. We were told to ‘find a lot’. I assume this COULD be around 21-50 but I guess it will depend on how much time I have and if there is enough information by this search to finish the other parts of the assignment.”

Several participants provided comments in their diary entries on how they determined “how much information was enough.” For example Annette said, “I will know I have enough information when a) I understand the concepts, or b) I have exhausted my typical resources - even if I don’t understand,” Bonnie said, “I will know when I have enough information when I feel ready to write on my topic,” and Howard said, “I feel as though I have enough information when the sources start to repeat themselves, and when I feel as though I can anticipate their arguments [sic] before they are made. When I get to that point I feel as though I have a strong grasp upon the subject.”

I categorized the information and information sources sought by participants in diarized searching into 10 broad types, summarized in Table 20. Three types of needed information were identified at least once by all participants during diarized searching: articles, brief information, and Internet sources. Gail was the only participant who did not conduct any diarized subject searches for books, and only Isabel did not diarize any searches for word definitions. Articles, books, brief information, and definitions collectively accounted for more than 70% of all information/source types sought in diarized subject searching.

Table 20

Types of Information and Information Sources Sought in Diarized Subject Searching

	<u>Articles</u>	<u>Books</u>	<u>Brief Information</u>	<u>Definitions</u>	<u>Index Sources</u>	<u>Internet Sources</u>	<u>Experts</u>	<u>Guidance</u>	<u>Interviews</u>	<u>Other/ Unstated</u>	<u>Totals</u>
Annette	6	6	7	2	7	6	5	1	4		44
Bonnie	22	21	24	17	8	12	1			3	108
Carol	13	3	7	11	1	2		1		7	45
Ellen	19	18	10	6	10	7	7	4	2	1	84
Frances	6	7	4	4	5	1	1				28
Gail	8		3	3		1		1		1	17
Howard	15	17	4	1	3	1	1			4	46
Isabel	6	5	4		2	2		1			20
Total Sources	95	77	63	44	36	32	15	8	6	16	392
Percentage of Total Sources	24%	20%	16%	11%	9%	8%	4%	2%	2%	4%	100%

The time frame in which participants needed the information they sought in their 201 diarized subject searches is summarized in Table 21. Participants' diary entries indicated they all engaged in at least some advanced planning with respect to the date by which they needed to use the information they sought. For example, referring to a diarized search for information needed within the week, Bonnie commented "Technically my report is due on Monday the 30th, but I would like to have my research done by Wed. so I can start writing, and be done by the weekend."

Immediate (today/tomorrow) and short-term (one week) time frames each accounted for about 29% of all searches, but a surprising 39% of searches were for information needed two weeks or more into the future. Some of the longer-term information needs related to independently pursued courses. In a diary entry in which she indicated the time frame for information sought was "sometime this semester," Frances explained, "All of the subject searching for this course will correspond to the final project, which will be an extended Undergraduate Honours Thesis project." Similarly, in a

diarized search for an applied studies research paper, Carol included a note indicating the paper was not due until mid-January of the following year which was two months into the future.

Table 21

Time Frame of Information Need in Diarized Subject Searching

	<u>Today</u>	<u>Tomorrow</u>	<u>This Week</u>	<u>In 2 Weeks</u>	<u>In 3 Weeks</u>	<u>In 4 Weeks</u>	<u>In 2 Months</u>	<u>This Semester</u>	<u>Unstated</u>	<u>Totals</u>
Annette	8		2	4	1	3			1	19
Bonnie	16		25	5				3		49
Carol	10	2	4	3	5	6	2	3	1	36
Ellen	8	4	14	6						32
Frances	4	1		1			2	6		14
Gail	4	1	5	2		1				13
Howard	1	1	7	7	5	6			1	28
Isabel			2	7	1					10
Total Searches	51	9	59	35	12	16	4	12	3	201
Percentage of Total Searches	25%	4%	29%	17%	6%	8%	2%	6%	1%	100%

5.6.5 Search Ease

How easy or difficult were participants' anticipated and actual experiences of subject searching? I did not ask participants to comment on the ease of their subject searching demonstrations, but DiaryClient questions 5 and 25 asked participants to estimate the ease/difficulty of their search before they performed it, and to evaluate the actual experienced ease/difficulty after their search was completed. Responses to these two questions are summarized in Table 22. Searches that were rated "extremely" and "somewhat" easy are categorized in Table 22 as "easy," searches

rated “neither easy nor difficult” are categorized as “neutral,” and searches rated “somewhat” or “extremely” difficult are categorized as “not easy.”

Table 22

Pre- and Post-Search Ease in Diarized Subject Searching

	Pre-Search Estimates of Search Ease					Post-Search Evaluations of Search Ease				
	<u>Easy</u>	<u>Neutral</u>	<u>Not Easy</u>	<u>Unstated</u>	<u>Totals</u>	<u>Easy</u>	<u>Neutral</u>	<u>Not Easy</u>	<u>Unstated</u>	<u>Totals</u>
Annette	10	1	8		19	13	0	6		19
Bonnie	15	20	14		49	28	19	2		49
Carol	17	3	16		36	29	5	2		36
Ellen	14	6	12		32	25	3	4		32
Frances	11		3		14	13		1		14
Gail	6	2	5		13	9	3		1	13
Howard	15	7	6		28	23	4	1		28
Isabel	6		3	1	10	10				10
Total Searches	94	39	67	1	201	150	34	16	1	201
Percentages of Total Searches	47%	19%	33%	0%	100%	75%	17%	8%	0%	100%

Interestingly each participant tended to underestimate the ease and overestimate the difficulty of their diarized searches: in each case the number of “easy” ratings was lower in pre-search compared to post-search ratings, and the number of “not easy” ratings was higher in pre-search compared to post-search ratings. Across all participants 33% of diarized searches were estimated to be “not easy” but only 8% were actually evaluated as “not easy” post-search. In general, participants expected and experienced the majority of their diarized subject searches to be “easy.”

Some participants included comments about particular issues or aspects of diarized searches that influenced their post-search ease ratings. Annette rated a search as “somewhat difficult” because “I wasn't exactly sure what information the prof was looking for, so I didn't know what material was relevant. After she emailed me back with further specifications my search went easier, but it was still

a difficult question to address.” For a search rated “neither easy nor difficult” (neutral), Gail explained “using all the tools was not difficult , but actually finding a topic that I liked, or thought I good [sic] find enough information about was unsuccessful.” Howard enthused about an “extremely easy” search that produced everything he needed, “Looking up the books and browsing the shelves is a pleasure... hardly work at all. I was also very pleased that EVERY book or source that I was looking for was available in the [home] library.”

5.6.6 Research Stage

The concept of research stage derives from Kuhlthau’s (1993, 2004) six-stage information search process (ISP) model which posits that searching for information generally occurs in six stages, not necessarily linearly sequenced, characterized by differing patterns of thoughts, feelings and actions. The first three ISP stages (initiation, selection, exploration) may involve uncertainty as the searcher identifies a need for information, selects a topic, and begins to explore it. Formulation, the pivotal stage of the model, occurs when the searcher identifies a focus or a specific question to anchor the search, at which point uncertainty usually gives way to clarity. The last two stages, collection, and presentation, are characterized by mounting confidence and effective searching, culminating in completion of the search process, and organization and presentation of the information.

At what research stage did the majority of participants’ diarized subject searching take place? DiaryClient question 11 (see Appendix 10) asked about the stage pertaining to participants’ process of preparing a research paper on the assumption that one of six listed “research stages” (adapted from Kuhlthau’s six ISP stages) might be applicable to at least some of their diarized subject searching. Participants provided an indication of their research stage for about 70% of their diarized searches. Their responses to DiaryClient question 11 are summarized in Table 23.

Table 23

Research Stage in Diarized Subject Searching

	<u>Beginning</u>	<u>Generating</u>	<u>Exploring</u>	<u>Formulating</u>	<u>Collecting</u>	<u>Completing</u>	<u>Unstated</u>	<u>Totals</u>
Annette		2	2	3	3	1	8	19
Bonnie	6	12	1	14	4	3	9	49
Carol			2	1	8	1	24	36
Ellen	1	3	6	4	11	3	4	32
Frances		2	4		2		6	14
Gail		4	2		2		5	13
Howard	4	3	5	2	10	2	2	28
Isabel			4		4		2	10
Total Searches	11	26	26	24	44	10	60	201
Percentage of Total Searches	5%	13%	13%	12%	22%	5%	30%	100%

Only Bonnie and Howard diarized subject searches at each of the six research stages, and Isabel identified the fewest number of research stages pertaining to her diarized searching (two: exploring and collecting). The research stage reported most frequently in participants' diarized searching was collecting information to support a thesis statement. The next most frequently reported research stages—generating, exploring, and formulating—shared roughly equal percentages of the total number of searches. The first four stages characterized in the ISP as involving uncertainty and development of a focus represented 43% and the final two stages represented 27% of all diarized subject searching (62% and 38% of diarized searches associated with a research stage, respectively).

Participants' diary entries occasionally included comments indicating an awareness of a lack, or successful determination, of a topic or task focus. For example Bonnie indicated a search she conducted on a play by O'Casey had not retrieved any needed information, but she noted, "I need a more specific question." For a search that was at the "formulating a thesis statement" stage, Howard commented at the end of the diary entry, "My topic has been narrowed to the unique contribution that [historical figure] made toward the anti lynching cause in the late 19th century."

I did not ask participants directly about whether a research stage pertained to their demonstrated searches, but there was sufficient information in the thoughts they voiced during their demonstration search sessions to support a process of inferring whether or not they had formulated a focus for their search. I borrowed the concept of focus phase in information searching from Vakkari, Pennanen and Serola (2003) who developed this concept as part of their incorporation of Kuhlthau's ISP model into a theory of task-based information retrieval.

According to Vakkari et al. (2003) the "pre-focus" phase covers the beginning stages when a clear understanding of the underlying learning or work task is absent, leaving searchers with insufficient "discriminatory power" to specify precise search terms and identify relevant information easily. Such searchers are "unable to understand and construct the work task properly, and consequently to express specifically what information is needed to accomplish it," and further, such searchers "are able to express search terms only on a general level ... [Because they] are unfamiliar with the topic and uncertain about what information might be relevant ... [they] aim at maximizing recall" (Vakkari, et al., 2003, p. 448). The "post-focus" phase spans the final stages of a learning task when searchers have a clear understanding of the task and what is needed to accomplish it.

I used the factors presented in Table 24 to guide my process of reading demonstration and interview transcriptions several times to infer whether each demonstrated search took place in a pre-focus or post-focus phase. These factors were derived and adapted from discussions of the formulation stage (Kuhlthau, 2004) and pre- and post-focus phase searching (Vakkari, et al., 2003). I did not regard any single factor as key, but instead categorized each demonstration according to where the preponderance of factors seemed to lie.

Table 24

Pre- and Post-Focus Phase Factors

<u>Factors Suggesting Pre-Focus Phase</u>	<u>Factors Suggesting Post-Focus Phase</u>
<ul style="list-style-type: none"> • little topic knowledge • mention of need to narrow the topic • consideration of possible ways to focus the topic or task • uncertainty regarding task • lack of discriminatory power • lack of clarity about topic • lack of precise subject terms to use • lack of knowledge about disciplinary norms and resources • some change in topic from beginning to end of demonstration 	<ul style="list-style-type: none"> • good topic knowledge • firm topic parameters • knowledge of specific arguments or research questions to be addressed • clear ideas on how task will be completed • strong discriminatory power • clarity about the topic • knowledge of precise search terms • knowledge of where and how needed information will be found • no change in topic from beginning to end of demonstration

Details of the results of this analysis are available in Appendix 24 which includes excerpts from participants' spoken thoughts I interpreted as substantiating my categorizations, as well as participants' estimates of how much they knew about their search topic at the outset. Table 25 summarizes the inferred focus phase of participants' 23 demonstrated subject searches. Most demonstrations were pre-focus phase searches, which, according to the ISP model (Kuhlthau, 2004; Vakkari, et al., 2003) are more likely to involve search difficulties, uncertainty and fewer retrieved items that are judged to be definitely relevant, when compared to post-focus searches. Diarized subject searches having a research stage were also most often in pre-focus phases.

In most cases participants' spoken thoughts provided reasonably clear indications of their focus phase but for three searches it was somewhat less readily inferred. In Bonnie's first demonstration the concept of focus phase seemed not to apply, as she was merely trying to recall and verify the originator of an idea alluded to in a play she was reading. The pre-focus phase nature of Isabel's first demonstration was due not to uncertainty or lack of topic knowledge, but to her awareness that the usefulness of potentially relevant items would depend on her paper's focus, which she said she had yet to choose. Howard's thoughts about his third demonstration reflected pre- and

post-focus phase factors. Although Howard said he lacked a specific thesis for his paper, his thoughts were indicative of predominantly post-focus phase searching. He was working with a specific topic and expressed well-developed ideas on the approach and kinds of arguments he intended to use, despite being unsure of his specific arguments or the conclusions he would ultimately draw.

Table 25

Focus Phase in Demonstrated Subject Searching

	<u>Pre-Focus Phase</u>	<u>Post-Focus Phase</u>	<u>Focus Phase Not Applicable</u>	<u>Totals</u>
Annette	2	1		3
Bonnie	1	1	1	3
Carol	1	2		3
Ellen	3			3
Frances		2		2
Gail	3			3
Howard	2	1		3
Isabel	2	1		3
Total Searches	14	8	1	23
Percentage of Total Searches	61%	35%	4%	100%

Figure 3 situates participants' demonstrated subject searches within the disciplinary areas of their search topics, and indicates focus phase, topic familiarity, and task domain. Gail's first and second, and Bonnie's second demonstrations appeared to be at high risk for search difficulties because these were pre-focus phase searches on unfamiliar topics that lay in unfamiliar subject domains.

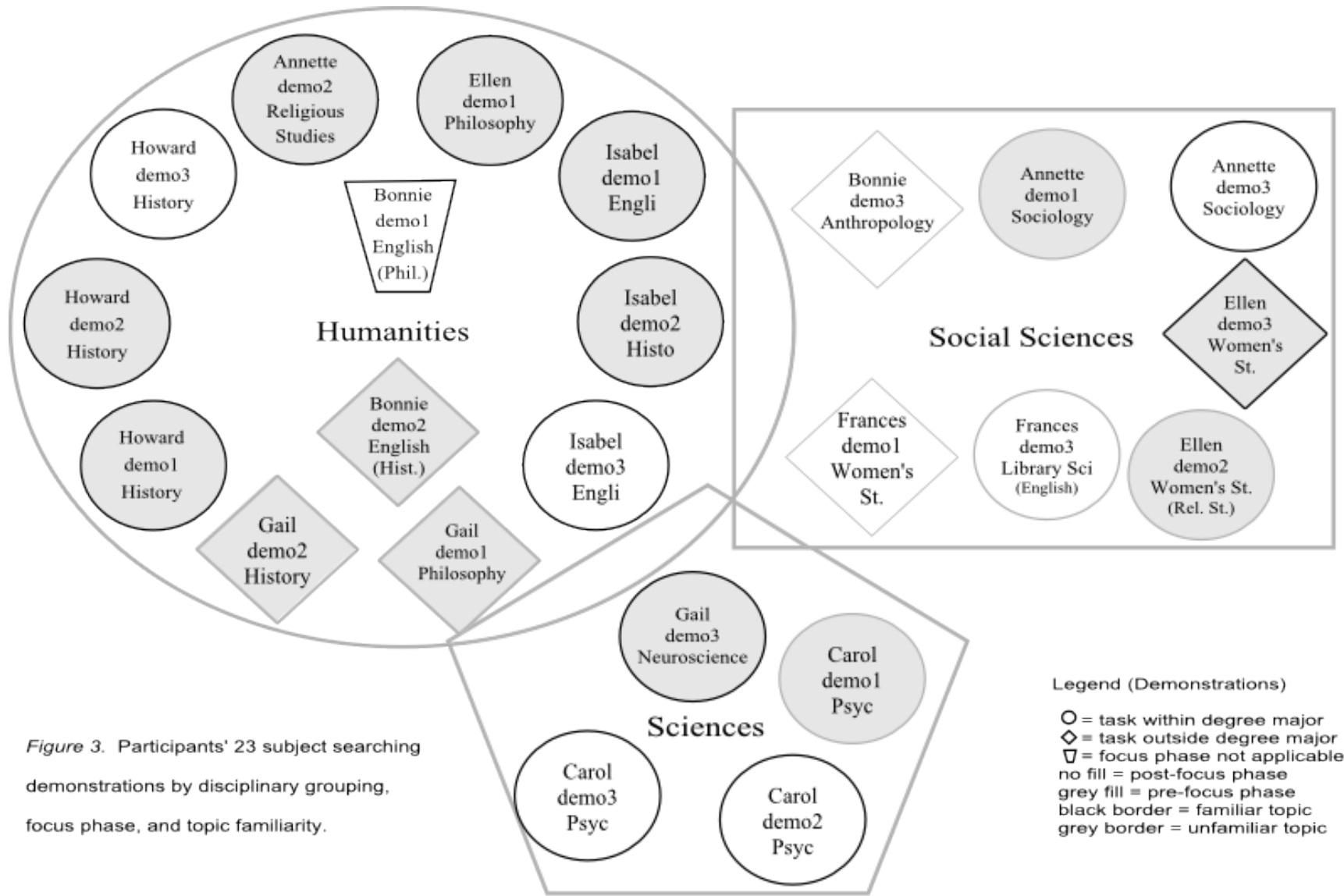


Figure 3. Participants' 23 subject searching demonstrations by disciplinary grouping, focus phase, and topic familiarity.

5.6.7 Search Outcomes

Were participants successful in finding the information they sought in subject searching? DiaryClient question 26 asked participants how much of the needed information they found in their independently pursued subject searching. Their responses to this question are summarized in Table 26. If we regard finding “all” and “most” of the needed information as indications of search success, and finding “some,” “little” and “none” as indications of largely unsuccessful searching, then collectively about 64% of participants’ diarized subject searches had successful outcomes. Complete failure to find any useful information occurred in only 7% of diarized searches.

Table 26

Success in Diarized Subject Searching: Amount of Needed Information That Was Found

	<u>All</u>	<u>Most</u>	<u>Some</u>	<u>Little</u>	<u>None</u>	<u>Totals</u>
Annette	11	3	2	3		19
Bonnie	19	3	13	5	9	49
Carol	10	10	8	6	2	36
Ellen	17	6	9			32
Frances	4	5	2	3		14
Gail	4	8	1			13
Howard	7	12	4	2	3	28
Isabel	9			1		10
Total Searches	81	47	39	20	14	201
Percentage of Total Searches	40%	24%	19%	10%	7%	100%

Individual overall success in diarized searching ranged from a high of 92% (12 of 13 searches that were successful for Gail) to a low of 45% (22 of 49 searches that were successful for Bonnie). Sometimes the lack of search success was not a serious set-back. For example, one of Bonnie’s diary entries described an entirely unsuccessful Google search for one piece of information needed that day

on a concept she was unsure of, which she explained in this way, “This wasn't [of] huge importance. I think I know what a [concept] is, but I just wanted to see if I was right. I will ask my prof in class today.” At other times a lack of search success represented a stumbling block and motivated further searching as was the case in an “extremely difficult” search diarized by Annette which yielded only a little bit of needed information, prompting the following comment, “I am very frustrated and I will have to try again. I thought of a new search term I can use, so there will be a part two to this search.” For one of Ellen’s diarized searches it was clear that search success was no accident, as she commented, “I was not going to finish the search until I found EVERYTHING I needed.”

How did participants fare in terms of the success of their demonstrated searching? In the interviews that followed each demonstration I asked participants to rate the success of their subject search. Their responses are summarized in Table 27.

Table 27

Success in Demonstrated Subject Searching: Degree of Success

	<u>Entirely Successful</u>	<u>Mostly Successful</u>	<u>Moderately Successful</u>	<u>Mostly Unsuccessful</u>	<u>Totals</u>
Annette	1	1	1		3
Bonnie	2	1			3
Carol		2	1		3
Ellen	2	1			3
Frances			1	1	2
Gail	1	1		1	3
Howard	1	1	1		3
Isabel		2	1		3
Total Searches	7	9	5	2	23
Percentage of Total Searches	30%	39%	22%	9%	100%

If we view “entirely” and “mostly” successful ratings as representing successful outcomes, and “moderately successful” and “mostly unsuccessful” as representing less than successful outcomes, then 69% of participants’ demonstrated subject searching was successful, a finding that is comparable to the level of success in diarized searching. No participant rated a demonstrated search to be entirely unsuccessful, and the outcomes of only two demonstrations were rated as mostly unsuccessful. Participants’ diarized and demonstrated subject searching was therefore successful most of the time: except for Bonnie’s diarized subject searching, more than half of each participant’s searching in both modes resulted in successful outcomes.

Summary

In this chapter I described various contexts pertaining to the study including its setting and its actors. I outlined aspects of participants’ subject searching contexts and characteristics that seemed largely typical of undergraduates in general, such as the predominance of course instructor-imposed tasks that were often in the form of research papers, the prevalence of online search tool use, and the wide variety of topics pursued in subject searching. At the same time study participants approached their subject searching tasks and their academic studies in ways that seemed more sophisticated and self-aware than those reported in other studies of undergraduate research processes and skills. They showed greater discrimination in their choice of online search tools by using predominantly scholarly tools including their home library catalogue, and avoiding overly heavy reliance on Google. Participants also showed themselves to be capable of pursuing subject searching well in advance of task due dates, they underestimated rather than overestimated the ease of their subject searches, they accurately assessed their own subject searching abilities, and they most often achieved success in their subject searching which represent behaviours and outcomes more typical of experienced scholars rather than the average undergraduate student.

These broad characteristics and contexts address the study's first research question by providing an overall sense of what participants' academic subject searching looked like. They also suggest participants had attained some of the subject searching abilities and practices we associate with search and domain experts. To explore in greater depth whether participants engaged in the kind of higher order thinking associated with search and domain experts who are understood to be information literate individuals in particular professional or intellectual realms, I adjust my analytical stance in the following chapter from broad description of subject searching contexts spanning the entire case study to a more focused examination of the quality of participants' spoken thoughts and actions during their subject searching demonstration sessions.

Chapter 6

Undergraduate Subject Searching and Information Literacy

6.1. Chapter Overview

The four information literacy models I examined in chapter 3 all embrace the idea that information literacy abilities and experiences fall into two main groupings: lower order (involving recognition of an information need coupled with basic skills and experiences in choosing and using aids to address the need), and higher order (involving advanced abilities and experiences manifested in sophisticated or complex thinking relating to matters such as search strategy, discerning information quality and personal understanding of a topic, and broader matters such as ethical and wise use of information). This study's second research question asked about the extent to which participants' subject searching thoughts and actions suggested they had acquired some of the higher order information literacy skills and experiences we usually consider to be attainable only by domain and search experts. In chapter 6 I explore this question by analyzing and interpreting participants' spoken thoughts and actions that arose in their demonstrated subject searching sessions.

In section 6.2 I define three information literacy elements involving higher order thinking—using strategy, evaluating, and creating personal understanding—and outline a two-step interpretive process and criteria I used to identify occurrences of these elements in participants' spoken thoughts and actions during their online subject searching demonstration sessions. In section 6.3 I provide details of the second step of my interpretive process, and I examine in sections 6.4, 6.5 and 6.6 the results of step two in terms of identified themes in spoken thoughts referencing the three information literacy elements that met criteria for advanced thinking. In section 6.7 I outline a three-factor filter allowing us to see which instances of advanced thinking appeared to be similar in quality to that associated with information literate practices of search and domain experts.

6.2 Using Strategy, Evaluating and Creating Personal Understanding

Five of the eight abilities and experiences constituting this study's definition of information literacy presented in chapter 3 involve complexities or challenges requiring higher order thinking, of which three are most likely to arise during subject searching: "using strategy" to find and select needed information, "evaluating" information, finding tools, the search process and one's own thinking about the needed information and underlying task, and "creating personal understanding" of the needed information or underlying task. Using descriptions of the most effortful and sophisticated aspects of information literacy embedded in the four information literacy models compared in chapter 3, I developed definitions presented in Table 28 of the three information literacy elements of central interest to the present investigation of undergraduate subject searching.

Table 28

Definitions: Using Strategy, Evaluating, and Creating Personal Understanding

using strategy	applying a specified or demonstrated approach, plan or manoeuvre for accomplishing an aspect of a subject search or its associated task
evaluating	judging or weighing the usefulness, relevance, quality, parameters or appropriateness of aspects of a search process, strategy, resource, query result, search outcome, the subject search itself, or its associated task
creating personal understanding	addressing a need for personal understanding during a subject search, or articulating a need, goal or approach relating to creating personal understanding about a search topic or task, or an aspect relating to it

I developed a two-step interpretive process informed by the analytic approach of Corbin and Strauss (2008) to probe the extent to which participants' subject searching involved these three information literacy abilities and experiences and reflected higher order thinking, which I refer to in this study as advanced thinking. First I used an inclusive approach to identify instances of thoughts spoken in search demonstration sessions that even in a minimal way referenced abilities and experiences of using strategy, evaluating, and creating personal understanding. I then reviewed

results of the first step more narrowly to assess whether each voiced thought and the situation in which it arose reflected the higher order quality or content that has been identified with the information literacy elements of using strategy, evaluating, and creating personal understanding³³. This process yielded two sets of spoken thoughts³⁴ based on the same definitions of higher order information literacy elements explored here, the first set derived by applying only Table 28's definitions, and the second set resulting from closer scrutiny of the first set for evidence of more stringent criteria associated with advanced thinking.

In the first step of exploring whether participants engaged in advanced thinking during their demonstrated subject searching, I iteratively read the search demonstration and interview transcripts, and used the NVivo qualitative software analysis program to code themes—distinct concepts, topics and issues—that emerged relating to the information literacy abilities and experiences of using strategy, evaluating, and creating personal understanding. On occasion I identified and coded multiple themes in a single voiced thought. I also coded a small number of themes pertaining to other concepts and issues outside of higher order information literacy elements when they seemed interesting and potentially relevant to the study.

During step one of coding I looked for instances of spoken thoughts that in the broadest sense related to using strategy (applying an approach or plan), evaluating (passing judgment, or indicating how or why judging occurred), or creating personal understanding (recognizing a gap in comprehension or knowledge, or articulating ways to address such a gap). My aim in identifying themes was to group participants' spoken thoughts and accompanying actions having similar content for the purposes of analysis, and to avoid masking perceived differences in their quality or content. In

³³ See discussions of qualitative differences in Association of College and Research Libraries (2000, p. 7), Bruce (1997b, p. 156), Bundy (2004, p. 6, 27), Johnston and Webber (2003, p. 341), Maughan (2001, p. 83), Society of College, National and University Libraries (1999, p. 7-8).

³⁴ The use of spoken thoughts as substitutes for participants' actual thoughts is admittedly a rough, imperfect research tool, but since thoughts are impossible to observe directly, I opted to ask participants to say aloud what they otherwise would have thought silently as they performed their demonstrations in the hope of capturing spoken thoughts that were representative reflections of their thinking during subject searching.

general I categorized spoken thoughts relating to strategy as it applied to participants' activities or experiences of evaluating to be instances of evaluating. Anticipating that creating personal understanding during subject searching could be more difficult to identify or could occur less frequently when searches were on familiar topics, I looked not only for references to this ability and experience but also for indications that participants recognized a gap in knowledge, or the need to acquire or create personal understanding of aspects of their topic, task or subject search.

To guide my interpretive process of coding transcriptions of participants' spoken thoughts about subject searching I assembled a chart of key data (see Appendix 25). This chart contains the definitions for using strategy, evaluating and creating personal understanding provided in Table 28 alongside examples and relevant descriptions excerpted from the relational (Bruce, 1997b) as well as the behaviourist/constructivist models of information literacy as propounded most fully in the ANZIIL model (Bundy, 2004). Initial coding involved repeated passes through all transcripts to identify thoughts containing themes relevant to strategy, evaluation or personal understanding, until no additional themes appropriate for coding emerged. I then reviewed, deduplicated, and adjusted categorizations, theme groupings and theme labels with the aim of reflecting as accurately and coherently as possible the content and context (interpreted meaning) of participants' spoken thoughts.

After NVivo coding was completed in step one, for each of the three information literacy elements I output NVivo coding matrices into Excel spreadsheets to tally occurrences of each coded theme identified in participants' spoken thoughts. I maintained separate tallies for themes arising from participants' demonstrations and interviews, positing that these could differ qualitatively: many thoughts arising during interviews were likely prompted or influenced by questions I posed as the interviewer/investigator, whereas my influence on the content and quality of participants' thoughts spoken during subject searching demonstrations was arguably weaker as a silent observer.

In the second step of exploring whether participants' spoken thoughts evidenced advanced thinking I looked specifically for indications of higher order ideas and processes. To carry out this

phase of analysis I reviewed each voiced thought identified in step one with the aim of compiling a subset more stringently aligned with the kind of thinking generally considered to characterize and be required by the most sophisticated and exacting aspects of information literacy. To be a potential instance of advanced thinking I considered it essential for a spoken thought referencing strategy, evaluating, or creating personal understanding to seem consciously produced or effortful rather than habitual or rote, and to convey a reflective stance. To qualify fully, however, I required at least one additional criteria of higher order thinking to be identifiable. Table 29 presents all criteria I used during the process of identifying instances of advanced thinking.

Table 29

Criteria For Advanced Thinking Relating to Subject Searching

Base requirements	<ul style="list-style-type: none"> • appear to be effortful or non-rote • convey a reflective, mindful stance
Additional requirements (at least one of the following)	<ul style="list-style-type: none"> • weigh usual preference or habit against situation-specific details of the search or task being pursued • consider a variety of perspectives • reference actions or options involving considered choices, especially those differing from usual practice or from the default settings of the resource being used • specify criteria or reasons on which actions or decisions are based • reflect thinking about the participant's own thoughts, motivations or feelings as they relate to the subject search or task • express insightful or distinctive personal ideas, goals, approaches, or perspectives • describe or reference complex (multi-step or sophisticated) processes, plans, or experiences • signify knowledge of contextual aspects of the search, topic or task at a high level of abstraction

These criteria were developed largely from descriptions of higher order information literacy standards, skills and experiences in the ACRL, relational, ANZIIL and SCOUNL models (Association of College and Research Libraries, 2000; Bruce, 1997b; Bundy, 2004; Society of

College National and University Libraries, 1999), and were informed by and are consistent with aspects of what some well-known theorists in education, philosophy and psychology call “critical thinking” (Ennis, 1987; Halpern, 2007; Paul, 2005; Resnick, 1987). The second step of analysis was not an attempt to categorize participants as having basic or advanced thinking abilities, but rather to explore the extent to which I could identify instances in their spoken thoughts and accompanying actions of advanced thinking characteristic of the quality expected of information literate individuals.

At times the intertwined nature of the concepts of strategy, evaluation, and creating personal understanding, and of the themes identified in instances of advanced thinking presented challenges during data analysis. During the first step of analysis when a given spoken thought touched on two or more of the three information literacy elements, I categorized it under all elements and themes that seemed to be strongly applicable. To avoid unnecessary repetition, however, I counted multiple occurrences of the same theme in a single demonstration or interview only once. In the second step of analysis, when an instance of advanced thinking referenced more than one theme I retained it under multiple applicable themes only when the themes referenced different information literacy elements or belonged to different theme groups or subgroups³⁵.

Completion of the first half of this two-step analysis of participants’ spoken thoughts during subject searching demonstration sessions resulted in a total of 805 thoughts broadly relating to using strategy (34%), evaluating (62%), and creating personal understanding (4%)³⁶ within which I identified a total of 124 themes. Appendix 26 lists the 43 themes identified in 275 instances of spoken thoughts relating to using strategy, which we can think of as generally addressing the question “What was the plan or approach used to carry out an aspect of subject searching?” Listed in Appendix 27 are the 77 themes identified in 499 voiced thoughts I coded as relating to evaluating which I interpreted as being instances of evaluating or deciding, or as explanations of why or how participants made subject searching decisions, judgements, or choices. Appendix 28 lists the four

³⁵ I categorized a total of 12 spoken thoughts qualifying as advanced thinking under two different themes.

³⁶ Throughout this study percentages may not total 100% due to rounding.

themes I identified within 31 instances of spoken thoughts referencing creating personal understanding or recognition of the need to do so. In this chapter, all mentions of participants' thoughts about strategy, evaluation and personal understanding refer to thoughts they voiced during their online subject searching demonstration sessions.

6.3 Advanced Thinking During Subject Searching

In the second step of my examination of participants' voiced thoughts relating to the information literacy abilities and experiences of strategy use, evaluation, and creating personal understanding, I reviewed the 805 thoughts represented in the totals summarized in Appendices 26, 27 and 28, looking for indications of non-rote or reflective thinking that referenced details, rationales, or insights meeting at least one of the additional criteria of advanced thinking outlined in Table 29. I also took into consideration the search situation in which spoken thoughts occurred. By "non-rote" and "reflective" thinking I mean a spoken thought that suggested mindful attention was focused on aspect of subject searching; the duration of such a voiced thought, however, was not necessarily lengthy. This second phase of analysis resulted in the identification of 104 themes (see Appendix 29) in 388³⁷ instances of participants' spoken thoughts evincing advanced thinking that related to using strategy (28%), evaluating (66%) and creating personal understanding (6%).

During my closer scrutiny of participants' voiced thoughts relating to strategy, evaluation and understanding, I found it relatively easy to exclude many from the narrower set evincing advanced thinking when they seemed to reflect factual knowledge, primarily habitual thoughts or preferences, or brief, uncritical thoughts³⁸. For example, I did not consider either of the following two spoken thoughts relating to strategy to have involved advanced thinking: "*Anything that [professor] has*

³⁷ This total is not a count of unique instances of advanced thinking, as 12 instances of spoken thoughts were categorized under two applicable themes.

³⁸ This is not to suggest that uncritical thoughts indicated participants were unthinking or that the quality of their thinking was wanting. I am only proposing that in these instances participants' voiced thoughts did not evidence the qualities or content meeting Table 28's criteria for advanced thinking.

published I can just get from him" (Carol, demo2), and *"I'm just going to type in the keywords scientific revolution and...see what it says"* (Gail, demo2). Carol's thought indicated only that she knew of a source from whom she could obtain certain publications, and Gail's thought described a simple keyword approach to querying an online index that was reminiscent of the proclivity of general Web searchers to use one- or two-term queries (Jansen & Spink, 2006). These spoken thoughts referenced habitual or familiar approaches to finding or obtaining information that seemed to involve little mindful reflection.

The following are two additional examples of thoughts failing to meet Table 29's advanced thinking criteria that pertained to evaluating: *"I'm gonna go and...search the library... and ...click databases, cause I need journal articles"* (Carol, demo2), and *"Hm...that's kind of interesting"* (Isabel, demo2). Carol's thought was evaluative in the sense that she indicated why she clicked the databases link, but her reason seemed to be more a matter of a common association between databases and journal articles rather than a deliberate reflection about quality, utility, or other aspect specific to her search process. Isabel's voiced thought suggests she viewed the item she was looking at in a generally positive light, but she provided no indication of why it was interesting.

The preceding examples illustrate the kinds of thinking relating to using strategy and evaluating that were strategic (purposeful) or evaluative (appraising) and seemed deliberative in a broad sense but did not reflect additional criteria for advanced thinking, thereby disqualifying them as probable instances of the type of thinking characterizing the most demanding and sophisticated elements of information literacy. I did not discount spoken thoughts referring to habitual subject searching decisions and practices automatically, however. Upon encountering them I looked for accompanying details that showed evidence of principled or situation-specific reasoning, or struck me as having qualities or content going beyond what we might generally expect of undergraduate students. In this example, *"I usually start my things in the library catalogue . . . if I find something I'll usually go into that section and . . . search through some of the books . . . I'm a hand searcher*

too” (Carol, interview1), Carol said she usually began subject searching in the library catalogue, but then went on to explain a different strategy she took to further her search (manually browsed specific sections of the library shelves) in particular situations (when she identified items of potential relevance in the online catalogue). I therefore regard this example as an instance of advanced thinking because it referenced a multi-step, intentionally applied subject searching strategy we would not necessarily expect a casual or novice subject searcher to understand and use purposefully.

All 31 instances of spoken thoughts relating broadly to creating personal understanding also qualified as advanced thinking. For example this spoken thought, “*Asphyxia—I don’t even know what it is...Hmm, don’t think I really want to go that way*” (Gail, demo3), on the surface may seem to be an unremarkable passing observation. If we apply an information literacy theoretical lens and consider aspects of the search situation, however, more details are brought into focus that reveal a problem-solving process: Gail encountered an unfamiliar term while evaluating her query results, and subsequently determined the term represented a topic she was not interested in pursuing after she looked up its definition³⁹. In addition to conveying a reflective stance, Gail’s thought referenced a complex process executed in a matter of seconds involving recognizing a gap in personal understanding about a term potentially relevant to her search, taking actions to address that gap, and then using her new knowledge to evaluate the usefulness of the item in her query results containing the term. Moreover I suspect it is far from common practice for undergraduates in general to look up the definition of an unfamiliar term immediately upon encountering it in a query results set.

In some cases deciding whether a particular thought pertained to advanced information literacy in a broad or stringent sense was a more complex process than is perhaps suggested by the above examples. The following are two instances of participants’ voiced thoughts that referenced strategic considerations for conducting a search in which the element of time is mentioned:

³⁹ Immediately after speaking the words “I don’t even know what it is,” Gail momentarily left her search resource to access Dictionary.com in a different window to look up a definition for the term “asphyxia”.

“If certain things are only available for an interlibrary loan or something, then I know how I need to limit myself if I don’t have the time” (Ellen, interview3),

and

“I’ll just use Academic Search Premier. I have a lot of time left before this is due, so I don’t have to look for full-text. I tend to prefer looking for full-text but since my paper isn’t due for several months I don’t have to” (Annette, demo1).

Clearly neither example was a brief, opaque thought such as “that’s interesting,” and neither expressed thoughts or preference acted upon by rote, or described common practice such as the use of very brief keyword queries. Both thoughts acknowledged time as an influence on the subject searching process, but do they both qualify as instances of advanced thinking?

I determined that the first example does not qualify, but the second one does. I reasoned that knowing about interlibrary loan service generally means one understands use of the service requires factoring in some time for the library to obtain the requested information elsewhere and then to arrange for its delivery to the requestor. Since Ellen’s thought indicated no more than that she was aware of this standard parameter of interlibrary loan service, I considered the first example to involve using strategy only in the broad sense that she recognized interlibrary loan as one approach to obtaining needed items that takes some time.

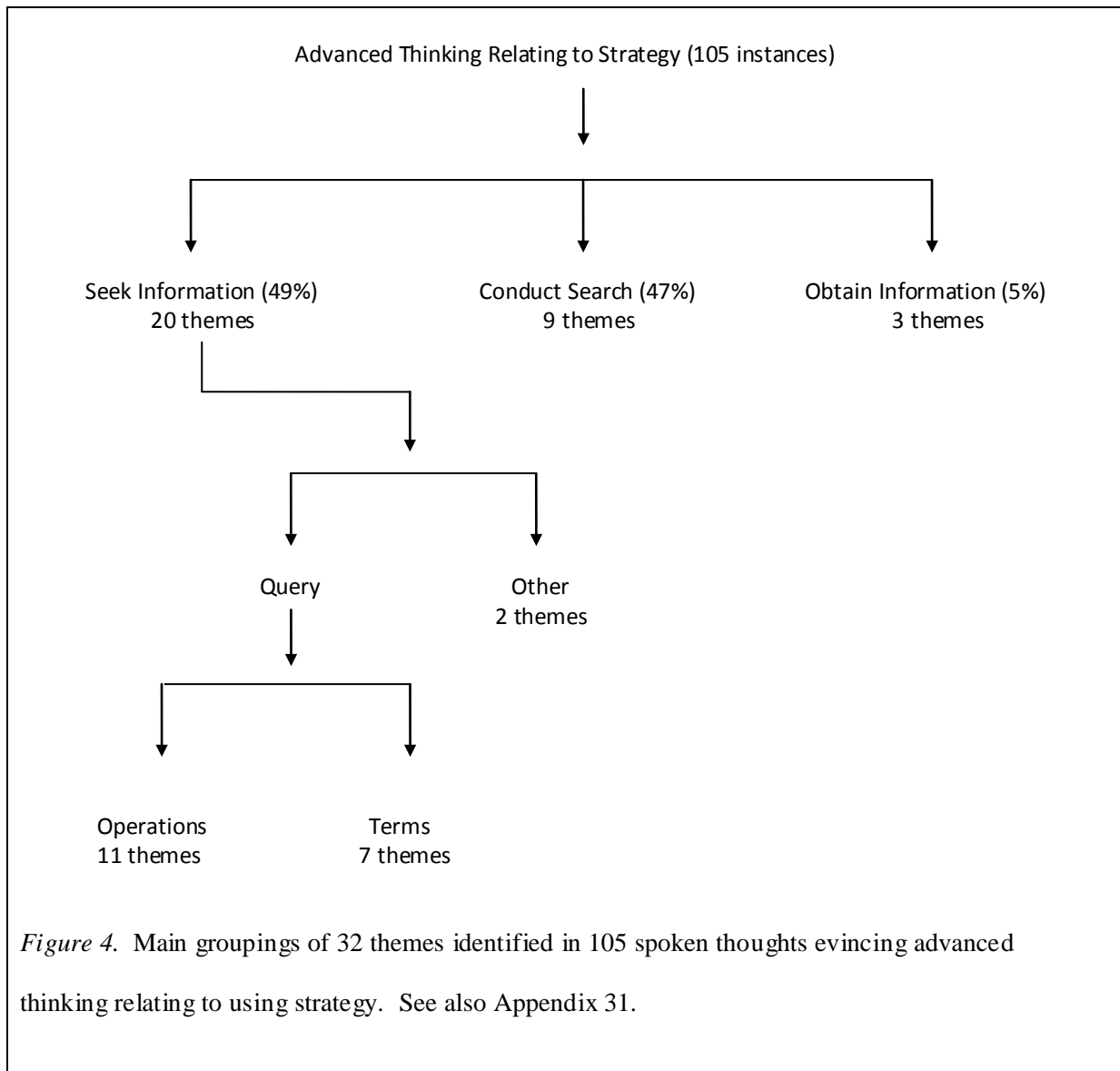
In contrast I found the second example to involve more complex thinking consisting of several connected facts and implications: that Academic Search Premier covered more than just full-text; that Annette’s habit was to look for full-text; that in this specific instance her task completion deadline was several months in the future; and that she therefore did not need to limit herself to searching only for immediately available full-text sources. A notable aspect of the second example meeting the criteria for advanced thinking is Annette’s acknowledgement and then suspension of habitual preference in light of situation-specific circumstances (the long task completion deadline that afforded enough time to try to access to more than just immediately available full-text sources).

In addition to using the criteria in Table 29 to identify thoughts evidencing advanced thinking broadly relating to strategy, evaluation and understanding, I evaluated the 805 spoken thoughts identified in step one of analysis in terms of possible correspondence to information literacy standards and conceptions in the ANZIIL and relational models, using relevant elements from these two models as guides which I compiled into one list (see Appendix 30). While I found less than 50% of the 805 spoken thoughts to evince advanced thinking, about 85% of the originally identified themes (104 of 123) were represented in the 388 spoken thoughts that qualified as advanced thinking.

In sections 6.4 and 6.5 I examine the results of this second winnowing of participants' thoughts spoken during subject searching demonstration sessions. All instances of advanced thinking referencing using strategy, evaluating, and creating personal understanding identified in step two of analysis are listed in Appendices 31, 32 and 33, respectively, organized by theme group, where applicable, and theme. For the 12 spoken thoughts I categorized under two advanced thinking themes, the cross-listed theme is noted after the quoted thought. Appendices 31, 32 and 33 include brief annotations on the criteria from Table 29 used to determine the voiced thoughts that qualified as advanced thinking, as well as references to components of the ANZIIL and/or relational model elements I identified as bearing some correspondence to the instances of advanced thinking.

6.4 Advanced Thinking in Using Strategy

I identified 105 instances of participants' spoken thoughts that met the study's advanced thinking criteria and referenced one or more of 32 strategy themes. These represented about 38% of the 275 thoughts I found in the initial step of analysis to relate broadly to using strategy. Themes in the Conduct Search and Seek Information theme groups occurred roughly equally often within advanced thinking referencing strategy, while themes in the third group, Obtain Information, occurred relatively infrequently (see Figure 4 for a breakdown of the main theme groups of advanced thinking relating to using strategy).



The Seek Information theme group comprised two subgroups—Query, which itself was subdivided into Operations and Terms, and Other—totalling 20 themes that were present in the results of step one of analysis. The Conduct Search theme group comprised nine themes, five of which were part of the original, broad analysis—*Chart Next Steps*, *Choose Topic or Focus*, *Include Multiple Perspectives*, *Decide How Much Information is Needed*, and *Handle Search Impasse*. In my second, closer analysis I replaced the sixth original theme, *Approach a Search*, with the following four more

specific themes that emerged, all still relating broadly to strategy for conducting a search: *Adjust Strategy*, *Broad Considerations*, *Choose Resources*, and *Review Results*. The theme group Obtain Information comprised three themes, *Consult Library Staff*, *Consult Professors and Subject Experts*, and *Use Interlibrary Loan*, whose labels were unchanged from my original broad look at spoken thoughts referencing strategy.

All voiced thoughts categorized as being instances of advanced thinking that referenced strategy are presented in Appendix 31, sorted into the three theme groups and subgroups where applicable. In the following three subsections I examine the content and character of the spoken thoughts that gave rise to the identified themes of using strategy within the three theme groups: Seek Information, Conduct Search, and Obtain Information.

6.4.1 Seek Information

Query

Within the Seek Information theme group I identified a total of 18 Query themes referencing Operations (11 themes) and Terms (7 themes) employed in formulating and revising queries submitted in various online search tools. Query themes referenced deliberate, purposeful moves to control aspects of search parameters. Interestingly many instances of participants' advanced thinking referencing Query themes shared similarities with search techniques identified by Bates (1979a, 1979b, 1987, 1989) and Fidel (1985, 1991a, 1991b, 1991c) as commonly used by, or directed for facilitation purposes at, professional information searchers.

Find Appropriate Search Terms

Four strategy themes in the Query subgroup touched on different approaches to finding appropriate search terms. The Query strategy theme referenced by the greatest number of participants was *Terms - Use Subject Terms Assigned to Relevant Items* which related to looking for controlled

vocabulary in records describing relevant items that could be useful in subsequent queries. The following voiced thought exemplified this strategy: *“I’m just gonna look through the descriptors and see if there are any other . . . descriptors that I think might be useful to add as search terms”* (Annette, demo3). Instances of advanced thinking referencing this theme suggest most participants were aware of the purpose of controlled subject terms and employed or considered using them in demonstrated subject searching.

I was unable to identify search moves or tactics described by Bates or Fidel that referred specifically to looking for assigned controlled vocabulary (e.g., thesaurus terms or subject headings) in records or displays of query results, but the same idea is captured more generally in the “Trace” tactic used “to examine information already found in the search in order to find additional terms to be used in furthering the search” (Bates, 1979b, p. 208) and in the operational move “Add 3, add terms occurring in records of relevant citations retrieved” (Fidel, 1991c, p. 516). “Trace” and “Add 3,” however, do seem to describe the gist of another Query strategy theme, *Terms - Select From Query Results or Full-Text Items*. While scanning the results of a query Ellen said, *“Just writing down some of these key words and points that seem to be coming up . . . some of the things that should then be of importance to...a search later”* (Ellen, demo2) as she jotted down notes to herself. Howard similarly remarked, *“from some of these [words in] titles, perhaps I can find...a new search that will...bring up something here”* (Howard, demo3). These spoken thoughts suggest participants reviewed query results not only for relevance but also as sources for new query terms.

Terms - Use Terms Known to be Relevant was a Query strategy theme relating to finding or applying appropriate terms identified in two instances of advanced thinking, one of which was this comment, *“[student] and [professor] gave me those . . . key words . . . I’ve had a lot of help in just talking to them . . . it’s . . . kind of an ongoing dialogue and you just learn the lingo”* (Carol, interview2). Carol’s strategy involved retrieving potentially useful query terms from memory, or saved notes or documents. During her first subject searching demonstration session I asked whether

it was her usual practice to begin a subject search with a prepared list of search terms as she had just done. Carol responded that it was, and that she had learned to brainstorm her terms through earlier subject searching experiences in which she found her query terms to be inadequate. Carol's references to using query terms identified through brainstorming as well as to using "the lingo" learned through dialogue with others indicated her search strategy repertoire included two idea tactics identified by Bates (1979a, p. 282): "Brainstorm, to generate many ideas" and "Consult, to ask a colleague for suggestions."

Increase Precision

Several Query strategy themes relating to improving the precision of query results were identifiable in participants' advanced thinking and were also mentioned by Bates or Fidel. The theme *Terms - Use Narrow Terms* is similar to "Narrow 3, Select a narrower concept" (Fidel, 1991c, p. 516) and is exemplified in Annette's decision to "*start with [specific search term] just to see if there's anything at all. And then I'll back up if there isn't anything*" (Annette, demo1). A reference to the theme *Operations - Specify Fields to Search or Limit By*, which bears similarity to "Weight 3, Limit free-text terms to occur in a predetermined field" (Fidel, 1991c, p. 516) was evident in Ellen's comment, "*Searching just for the subject, then. Trying to narrow it down a little bit*" (Ellen, demo2), spoken as she used a drop-down menu to reduce the breadth of content being searched from the default setting of "entire record," to "subjects."

The strategy theme *Operations - Omit Terms* was evident in two instances of advanced thinking referencing attempts to achieve better precision by excluding unwanted terms: "*So it looks like I'm back to 'religion' and 'cyberspace' or 'Internet'. Maybe I'll leave out 'online' because that one can be too broad*" (Annette, demo2), and "*I really like that search, but I think I'm going to . . . cut it down a little bit more and...not include 'treatment' and see what I get*" (Carol, demo1). Annette's thought is similar to the operational move "Eliminate, Eliminate a term from the

formulation” (Fidel, 1991c, p. 516). Carol’s thought is an example of the operational move “Negate, Eliminate unwanted elements by using the AND NOT operator” (Fidel, 1991c, p. 516) because as she spoke, Carol modified a previously executed query by appending “not” and “treatment.”

Advanced thinking relating to a third Query theme, *Operations - Search Within Relevant Source or Results*, referenced searching within a large relevant work or results to locate more precisely the smaller units of information likely to be of use. For example Bonnie said, “*I’m going to . . . search... ‘Plato’ ...and ‘forms’ and see if I can find exactly what section it is so . . . if I was going to actually get the book I’d know . . . what section in the book*” (Bonnie, demo1). Howard described a similar process he was thinking of using, but went on to say he would paste textual excerpts of the Web-accessible theological work he wished to examine into a word processing program which afforded “*word searches that are way more exhaustive than the index*” of print editions (Howard, interview3). He astutely noted that this strategy could also be used to locate passages of the work cited in printed secondary sources in order to examine first-hand the text of the referenced passages because “*chances of me having the same edition that they’re . . . referencing are pretty slim*” (Howard, interview3).

Annette mentioned the possibility of searching within a particular online journal covering the subject area of her topic after she had identified a focus for her paper: “*[journal] could definitely be a journal that I would look into more, once I’ve narrowed down my topic*” (Annette, demo2). This strategy was similar to the manual technique Bates (1989, p. 412) referred to as “journal run” in which all issues within a relevant journal’s run of volumes are scanned to identify articles of interest. “Journal run” is a format-specific information seeking strategy that is captured more broadly in the format-neutral strategy theme *Operations - Search Within Relevant Source or Results*.

Three Query strategy themes relating to improving the precision of results each occurred once in spoken thoughts evincing advanced thinking. The theme *Operations - Specify Publication Format* was present in Gail’s thought, “*I also think it would be handy if I had maybe a review paper . . . it’s*

always handy if people summarize it for you" (Gail, demo3), spoken as she looked for and found a way to limit her query results to literature reviews. This theme was similar to Fidel's operational move "Weight 5, Limit to documents of a certain form" (1991c, p. 516).

In contrast, Howard said he wished to get rid of a particular type of publication from his search results, *"I don't like getting the reviews. And there's a way I get them out of there... Can I ask you to help me with that? Ok, yeah, that works. I just don't want reviews . . . because there's tons of reviews, and it just plugs up your search"* (Howard, demo1)⁴⁰. This thought illustrated the strategy theme *Operations - Exclude Specific Publication Format*, and was the only time a participant asked me for help during a search demonstration. This theme is similar to the search tactic "Block, To reject, in the search formulation, items containing or indexed by certain term(s)" (Bates, 1979b, p. 208) although Howard wished to block a particular publication format rather than an item or term.

I identified only one instance of advanced thinking referencing the Query strategy theme *Operations - Combine Results Sets to Obtain Overlap*, *"I . . . took those two big searches and just combined them to see if there's any overlap in them, because they're both really big"* (Carol, demo1) despite the fact that Carol used this strategy in all three of her demonstrations. This approach is similar to the conceptual move "Intersect 1, Intersect a set with a set representing another query component" (Fidel, 1991c, p. 516).

Increase Recall

Three Seek Information strategy themes categorized in the Query subgroup referenced advanced thinking directed at increasing recall that shared similarities to moves or tactics described by Fidel or Bates. Carol appeared to use an apt neologism unknowingly when she said, *"maybe I should put a tunication in . . . that makes it longer, right? Like, more options, right? . . . Ok ... the*

⁴⁰ The database Howard was using permitted limiting of search results to four document categories: Article, Review, Opinion piece, and Other items. "Review" in this instance referred to reviews of any type including book reviews and literature reviews.

tunigation, the dollars sign...means . . . you take it and it halves it, right? So anything after that, like it'll be just like the first half of the word" (Carol, demo1). Carol's thought references the strategy theme *Operations - Use Truncation* which represents a component of the search tactic "*Fix, to try alternative affixes, whether prefixes, suffixes, or infixes*" (Bates, 1979b, p. 208).

Ellen referenced the Query strategy theme *Terms - Use Term or Spelling Variants* when she said, "*I want to try now, back to that...one with this new spelling . . . Just reducing [i.e., redoing] this to see if the spelling is making a difference at all*" (Ellen, demo2). This strategy theme is similar to the operational move "Add 1, Add synonyms and variant spellings," (Fidel, 1991c, p. 516) and to the search tactics "Respell, To search under a different spelling" and "Parallel, To make the search formulation broad (or broader) by including synonyms or otherwise conceptually parallel terms" (Bates, 1979b, p. 208).

Annette's spoken thought, "*I know that 'religion and the Internet' is quite broad but I think I really have to . . . start broadly with this topic because I'm not going to find the more narrow things that I'm interested in*" (Annette, demo2) reflected the Query strategy theme *Terms - Use Broad Terms* which incorporates the conceptual move "Expand 1, Enter a broader descriptor or term" (Fidel, 1991c, p. 516). In her second demonstration Annette's strategy to begin with broad terms worked well for her, as she found more relevant items than she anticipated, and was later able to narrow her search to more specific aspects of the research interests which motivated her subject search.

Increase Precision or Recall

The likely outcomes of applying Query strategy themes were in some cases situation dependent. I identified the theme *Terms - Search by Author Name* in three instances of advanced thinking that were accompanied by queries involving searching for items by particular authors, an example of which was Annette's voiced thought, "*there's one . . . author . . . I know his stuff is what I'm looking for. So maybe I'll see if he's on here anywhere and I'll see what descriptors are used to*

describe what he writes about” (Annette, demo2). This theme is related to “author searching . . . an approach that contrasts with searching by subject. . . . author searching can be an effective part of subject searching . . . when a search uses an author name to see if the author has done any other work on the same topic,” (Bates, 1989, p. 412). The relevance to the search topic of author search results is dependent on the volume of the author’s publications and the breadth of topics he or she has addressed. Annette’s use of author name in the preceding example of advanced thinking was particularly resourceful and complex. She composed a query using an author name as a stepping stone to identify items on her topic, and then looked for controlled vocabulary terms assigned to those relevant items, and finally used those controlled terms in subsequent queries to search for additional relevant items by other authors.

Gail referenced the Query strategy theme *Operations - Use ‘Find Similar’ or ‘Find Related’* when she said, “*I can also do related articles . . . ‘cause that usually gives you a lot...of similar papers*” (Gail, demo3). This strategy theme is functionally similar to *Terms - Use Subject Terms Assigned to Relevant Items*, and *Terms - Select From Query Results or Full-Text Items*, discussed above. Instead of requiring searchers to identify relevant uncontrolled or controlled vocabulary terms for inclusion in subsequent queries, however, ‘find similar’ or ‘find related’ options in search tools usually require only that searchers choose a relevant item in a query results set and then invoke the find similar/related search option⁴¹. Whether the new results set improves recall or precision at all depends on how well the searcher’s initially chosen item represents the information sought, as all other documents in the database are compared to the chosen item to determine their algorithmic degree of relatedness or similarity.

Boolean operators, which have the potential to influence search recall or precision depending on the operators chosen, were referenced in the Query strategy theme *Operations - Use or Modify*

⁴¹ As one example, a description of how PubMed retrieves “related articles” is found at: http://www.ncbi.nlm.nih.gov/bookshelf/br.fcgi?book=helppubmed&part=pubmedhelp#pubmedhelp.Computation_of_Related_Citati (Retrieved on August 28, 2009).

Boolean Operators. This theme arose in three participants' instances of advanced thinking, one being Carol's use of the "not" operator, noted earlier under the theme *Operations - Omit Terms*. Annette indirectly referred to Boolean operators when she accurately predicted the probable effect of adding two conceptually similar terms ("new religious movement" and "new age") to her query, connecting them with "or": "if I add anything it will just make it more broad . . . well, let's . . . try ... 'religion or new religious movement or new age'...which will probably ...yeah, ok, it only added a few" (Annette, demo2). Annette's thought illustrated the search tactic "Parallel, To make the search formulation broad (or broader) by including synonyms or otherwise conceptually parallel terms" (Bates, 1979b, p. 208) and the operational move "Add 1, Add synonyms and variant spellings," (Fidel, 1991c, p. 516).

Unique Strategy Themes

Two Query strategy themes appeared to lack parallels in moves or tactics mentioned by Fidel or Bates, perhaps due to an expanded range of options for specifying or modifying search parameters in today's online search tools that were less common prior to the early 1990s. Annette was the only participant to reference the theme *Operations - Modify Catalogue Scope* in her spoken thought, "[home university] no, I'll search all three libraries because I have a lot of time" (Annette, demo1). That Annette was aware of the option to expand the catalogue scope as well as the potential benefit to be gained by doing so showed a good understanding of the catalogue's coverage, and her reason for using this strategy—because she had a lot of time—suggested she knew extra time for interlibrary loan service would be needed to acquire desired materials outside of her home library's holdings.

Howard's spoken thoughts referenced the Query strategy theme *Operations - Sort Results in Reverse Chronological Order* several times while searching JSTOR. For example, he commented ironically, "there's only 4,300 hits . . . That's something I probably need to narrow down a little bit. I'll just look at the most recent ones" (Howard, demo2), as he changed the default order of his query results from relevance-ranked, to reverse chronological order. Throughout his demonstrations

Howard made repeated references to the importance of including recent scholarship in his history assignments, a point he said was emphasized by his professors.

Other

The theme that occurred most often in the Seek Information group of strategy themes was *Examine References in Relevant Source*. It belonged to the subgroup I labelled “Other,” comprising themes that did not necessarily involve querying online systems (or consulting others). Seven of eight participants voiced thoughts about why or when they found using cited references in a relevant item to be a productive approach to seeking information. Annette said looking at cited references was useful “*when I’m having a hard time finding articles*” because it “*sometimes . . . kind of snowballs my resources*” (Annette, demo1), and Frances said she looked for references to relevant items in retrieved sources which she could then “*look up by title instead of by key words that might have not found them this time*” (Frances, interview2). In general participants looked at references cited in relevant sources to identify additional useful sources. This strategy is used heavily by experienced scholars in many disciplines, and has been variously described as using “citations identified in book and journal literature” (Stoan, 1991, p. 243), footnote chasing (Bates, 1989, p. 412) and chaining (Ellis, 2005).

The second strategy theme that did not involve querying online, *Browse Library Shelves*, was referenced by three participants. Howard said he liked browsing because “*often times I’ll find more books that don’t necessarily come up in . . . my subject search that I do on the university site*” (Howard, demo1). Browsing can be a nonpurposeful as well as a purposeful approach to seeking information. This study’s participants used it purposefully to seek materials at the shelves because they knew online tools may not identify all potentially relevant items. Browsing in different environments has been found to be an information-seeking strategy used by subject experts in the physical and social sciences (Ellis, et al., 1993), and faculty in the humanities and “the more book-oriented disciplines” within the social sciences (Stoan, 1991, p. 243).

6.4.2 Conduct Search

Conduct Search was the second-largest group of strategy themes referenced in instances of participants' advanced thinking. In contrast to the Seek Information themes that were represented in moves and thoughts pertaining to micro-level technical or procedural aspects of subject searching, Conduct Search covered broader, macro-level themes addressing approaches to choosing, deciding and solving problems during subject searching that were not principally matters of search technique. We can view Conduct Search themes as strategies for approaching decision making and problem solving in subject searching situations outside of those specifically addressing information seeking (querying, searching/browsing, consulting others). I consider the nine Conduct Search themes in an order roughly approximating one we might encounter in an actual subject searching session.

Choose Topic or Focus

Having a specific topic in mind may seem to be a logical prerequisite for subject searching, but we saw in chapter 5 that the majority of diarized and demonstrated searches having an applicable research stage or focus phase were undertaken while a specific topic or focus was not yet established. Voiced thoughts referencing the theme *Choose Topic or Focus* indicated several participants hoped to gain ideas and identify information sources during their search demonstrations that would inform their topic or focus choice. Gail mentioned the kinds of issues she weighed when choosing a research paper topic: “*how important [a topic] is . . . to the world. . . . For example if a drug is often used I think it's important to address it in my paper, or else something very little, not so much. Or if. . . it's something that when it was discovered, it was kind of a shock, I'd say that, too, or something unusual somehow*” (Gail, interview3).

Several instances of advanced thinking referencing topic choice revealed a concern for issues of quality—originality, importance, alignment with the task—but some pointed out pragmatic considerations. For instance Howard noted, “*it's a seminar course, so . . . along with another student*

. . . we're presenting . . . on the topic 'the lost cause' . . . So I'm really trying to double up some of my research because I may be presenting on the same time period that I'm wanting to use in my research paper" (Howard, interview2). Other pragmatic bases for topic choice included plentiful relevant information sources, and topics on which professors had expressed their views in class.

Choose Resources

With or without a specific topic or focus in mind, commencement of subject searching is often marked by the choice of a search resource or tool. Among instances of advanced thinking in the Conduct Search theme group I noted a variety of insightful approaches referencing the theme *Choose Resources*. For example Ellen reflected on her tendency to use only one resource type in a subject searching session: "I find that when I'm doing some of my searches . . . as a general trend that I . . . tend to stick to one . . . method . . . whether it be Internet or whether it be the databases, and I find myself really focused on the one. . . . I think it's a little bit to keep myself focused in a way, so I can . . . discriminate between different searches and different kinds of things that I'll be finding" (Ellen, interview3). Ellen's preference for using one type of resource per subject searching session may have helped her navigate unfamiliar domains, as she performed considerably more searches lying outside of the domains of her degree major than did other study participants.

Include Multiple Perspectives

Which perspectives to incorporate into a research task may sometimes be determined at the outset of a subject search and at other times may arise as a consideration during subject searching. The Conduct Search strategy theme *Include Multiple Perspectives* surfaced in several instances of participants' advanced thinking. Gail referenced this theme in her voiced thought, "*Mind conscious dualism in...a certain kind of yoga philosophy . . . I always think it's interesting how in Asia they . . . sometimes have different views on things. Just to kind of see it from a different cultural perspective . .*

. *maybe that adds something in this paper*” (Gail, demo1). Participants’ spoken thoughts referencing this theme reflected an inclination toward selecting and weighing contrasting or diverse perspectives and points of view. Embracing and analyzing multiple perspectives containing conflicting, incomplete, biased, or ambiguous information is an ability and experience we typically regard to be a hallmark of an information literate individual.

Decide How Much Information is Needed

Although I did not ask participants how much information they were seeking on their demonstration search topics nor how they would make this determination, the latter issue nevertheless arose unprompted in several instances of advanced thinking referencing the Conduct Search strategy theme *Decide How Much Information is Needed*. One example was Howard’s comment, “*I’m needing to take a look at a few of these monographs and narrow it down quite substantially, so I’m not looking for an overwhelming amount of information. Part of my tendency is to over-research a lot of these things*” (Howard, demo1). Howard’s voiced thought reflected awareness of a personal propensity to collect more information than required, and was perhaps a reminder to himself that the size of his task, a short research paper, meant he needed to select supporting sources judiciously.

Review Results

Once a subject search is launched and some results are displayed, a next logical step is to evaluate the usefulness of retrieved information. The Conduct Search theme *Review Results* referenced approaches to reviewing query results. In general I categorized advanced thinking that addressed how evaluating was performed as the information literacy activity and experience of evaluating, rather than using strategy, because most often the main thrust of those voiced thoughts were evaluative in nature. The substance of some references to reviewing results, however, struck me as relating most strongly to approaches to reviewing results (strategy) rather than to judgements, or

actions or criteria used to make judgements (evaluation). For example Ellen said she tended to review many items in her query results *“because I found too many times that it’s always on the next page that there was something [relevant]”* (Ellen, interview3). She also said taking hand-written notes while reviewing results felt natural, and *“it helped me to voice some of the things better that I was thinking, because if it was really important then I was writing it”* (Ellen, interview3). Ellen’s penchant for manual note-taking seems to exemplify the search tactic *“Record, To keep track of trails one has followed and of desirable trails not followed-up on or not completed”* (Bates, 1979b, p. 208) which she and Isabel both used in more than one demonstration.

Adjust Strategy

The Conduct Search theme *Adjust Strategy* referenced awareness of a need to make changes to one’s search strategies or approach. Two participants articulated thoughts referencing this theme, one of which occurred at the beginning of a demonstration representing a second search on the same topic, *“I’ve already done some searching on this topic. I’ve looked for articles more recent than June of last year and that wasn’t very fruitful. So I’m going to . . . broaden my search”* (Annette, demo3). Spoken thoughts referencing this theme suggested that participants realized the necessity of adjusting aspects of their search approach when search results or experiences were different than originally hoped for or expected. Such experiences are reminiscent of the berrypicking model of information retrieval (Bates, 1989) which characterizes real-world academic subject searching as processes that often unfold in a meandering or opportunistic fashion as different approaches and results are considered, perhaps pursued briefly or at length, and are sometimes abandoned in favour of new query results, terms, ideas or strategies that appear to be more fruitful.

Handle Search Impasse

Part of the motivation for undertaking this study was my curiosity about what students do when they face the catch-22 situation of needing or wanting to find information on a little-known subject, but lack sufficient words to describe it. The risk of encountering such situations may be particularly high if a subject search is in a pre-focus phase which I described in chapter 5 to be characterized by lack of a clear understanding of the underlying learning or work task, leaving searchers with insufficient “discriminatory power” (Vakkari, et al., 2003) to specify precise search terms and identify relevant information easily. It was impossible to predict at the outset whether any such instances of subject searching would occur in the study, and if they did, whether participants’ approaches to handling those difficult situations could be discerned. Because only a few participants chose to demonstrate searches in domains outside of their areas of familiarity, situations ripe for catch-22 encounters were rare. Looking at matters somewhat more generally, however, several instances of participants’ advanced thinking referenced encounters with subject searching roadblocks, which I grouped under the theme *Handle Search Impasse*.

Annette struggled in demonstrated and diarized searching to meet a particular requirement of a course-related task: “*I’m having a really hard time finding recent articles that have anything to do with what I’m looking for. So I think my best bet is probably going to be asking the prof for help, because I’m not finding anything on my own*” (Annette, demo3). In her follow-up interview Annette made it clear she believed the difficulty lay not in a lack of personal understanding of her topic or deficiencies in her searching skills, but rather in the professor-imposed stipulation that she use at least one source on her research paper topic that was published within the previous eight months. Annette’s strategy for dealing with her impasse was similar to the idea tactic “Consult, To ask a colleague for suggestions or information in dealing with a search” (Bates, 1979a, p. 282), except that the planned consultation was with a subject expert (Annette’s professor) rather than a colleague.

In two demonstrations Carol voiced thoughts referencing awareness of a search impasse, but her search topics, like Annette's in the preceding example, were within the disciplinary areas of her degree majors, which is perhaps why these impasses were momentary and did not seem to cause great anxiety or derail the search: "*I don't know what to do anymore...I'm going to type in . . . 'offenders' and' family', leave out [population group], maybe that'll work*" (Carol, demo1), and "*I don't even know what to search for anymore . . . Let's go to the catalogue*" (Carol, demo3). Carol's query modification, dropping a term from her query, was an example of the information-seeking strategy theme *Query - Operations - Omit Terms*, which I noted earlier is similar to the operational move "Eliminate, Eliminate a term from the formulation" (Fidel, 1991c, p. 516). Carol's decision to change her search resource was an example of the operational move "Add 5, Move to a new database" (Fidel, 1991c, p. 516). At the same time, changing queries, changing the search resource being used, and/or changing the type of search activity are general approaches to handling a search impasse that share similarities with the idea tactic "Change, To change something, anything, in one's search behavior—to try a different source, a different term, a different subject field, etc." (Bates, 1979a, p. 282).

Gail's second subject searching demonstration was fraught with uncertainties as it involved an unfamiliar topic and, initially, an unfamiliar search tool belonging to an unfamiliar domain which likely contributed to this search impasse: "*It seems to me like the titles of the articles don't have much keyword term[s] as in scientific revolution, so I'm not too happy with this. I'm actually thinking . . . I'm on the wrong track here...and the further I go the more...lost I get. I'm just going to go somewhere else*" (Gail, demo2). Like Carol, Gail moved to another resource that was familiar to extract herself from this search impasse, but for Gail the problem was not being happy about her queries, and feeling lost and on the wrong track, rather than a momentary depletion of search ideas. Thus, changing the search resource or activity, modifying an unproductive query, and consulting one's professor were three strategies to address search impasses referenced in participants' voiced thoughts evincing advanced thinking.

Chart Next Steps

Reflection on the need for further subject searching sometimes occurred when participants concluded their subject searching demonstrations without having fulfilled or come to an understanding of their entire information need. I gathered deliberative thoughts of this nature under the Conduct Search strategy theme *Chart Next Steps*. At the end of two demonstrations Ellen and Gail said, *“I would probably stop to get the information that I have . . . and then...just have to do some . . . step-aside thinking about different things and reading through some of these things specifically to see . . . where I want to go next”* (Ellen, demo1), and *“I think I have now enough information to . . . get some initial ideas of this. . . . I don’t think there’s any point going any further . . . rather just read it and have it in . . . my head . . . then I’ll probably have a little bit better . . . idea of what I’m looking for”* (Gail, demo1). Ellen’s term for her next step, “step-aside thinking,” is apt as it implied a need to pause her subject searching to process new information, organize ideas and take stock of her progress. Gail’s plan to read the sources she had found in order to “have it in my head” referenced a similar need to spend time taking in information and sorting out ideas about her topic. These thoughts seem related to the idea tactic “Think, To stop and think about the search and try to come up with new ideas for solving search difficulties” (Bates, 1979a, p. 282) if we replace “solving search difficulties” with the broader idea of making continued progress with the underlying task. They also exemplify learning outcomes of the first (determining the nature and extent of information need) and third (evaluating information and the search process) ANZIIL information literacy standards, by re-evaluating the need, and considering whether and what kinds of additional searching might be needed (Bundy, 2004, p. 12, 17).

Although all identified instances of advanced thinking referencing the strategy theme *Chart Next Steps* related to pre-focus subject searches, the preceding examples pertained to searches for which participants’ topic knowledge ranged from very little to moderate. The kinds of thoughts about next steps Gail expressed during her third pre-focus phase demonstration session were different,

perhaps due to her extensive search topic knowledge. During her third search demonstration Gail said, “*I would . . . read over [citation and notes] and then maybe go back and . . . read the abstracts a little bit more in detail, and maybe print off some whole review articles, read it, and then . . . make my topic . . . and kind of try to organize my paper. And I’ll write it and . . . what I usually do is when I write a paper and they [relevant sources] have an interesting reference, I go back [to retrieve the cited item] and kind of go from there*” (Gail, demo3). In this demonstration all signs suggested Gail was firmly on the right track this time, as she confidently anticipated executing a series of concrete steps to use the information she had found to complete her assigned research task.

Broad Considerations

Three instances of participants’ advanced thinking were related to overall search processes, but because they were not easily subsumed under other Conduct Search themes I gathered them under the theme *Broad Considerations*. Bonnie outlined her overall approach to subject searching which represented a change from the one she had used prior to receiving guidance from a professor: “*my prof kind of taught me how to do it this way . . . I broadly look for my topic . . . [using] journals and Internet and books, and I look at the . . . descriptions and then . . . I’ll go pick up the resource . . . or I’ll order the book . . . and then I read them . . . and I’ll decide . . . if it kinda corresponds to my topic*” (Bonnie, interview1). Bonnie’s broad search approach seemed to share some similarities to the idea tactic “Wander, To move among one’s resources, being receptive to alternative sources and new search ideas triggered by the materials that come into view” (Bates, 1979a, p. 282). Being receptive to a broad range of ideas about a search or task topic increases the likelihood of noticing connections between ideas from different contexts, which in turn may give rise to new insights or unique interpretations, which are valued highly in the domain of English literature, Bonnie’s degree major.

6.4.3 Obtain Information

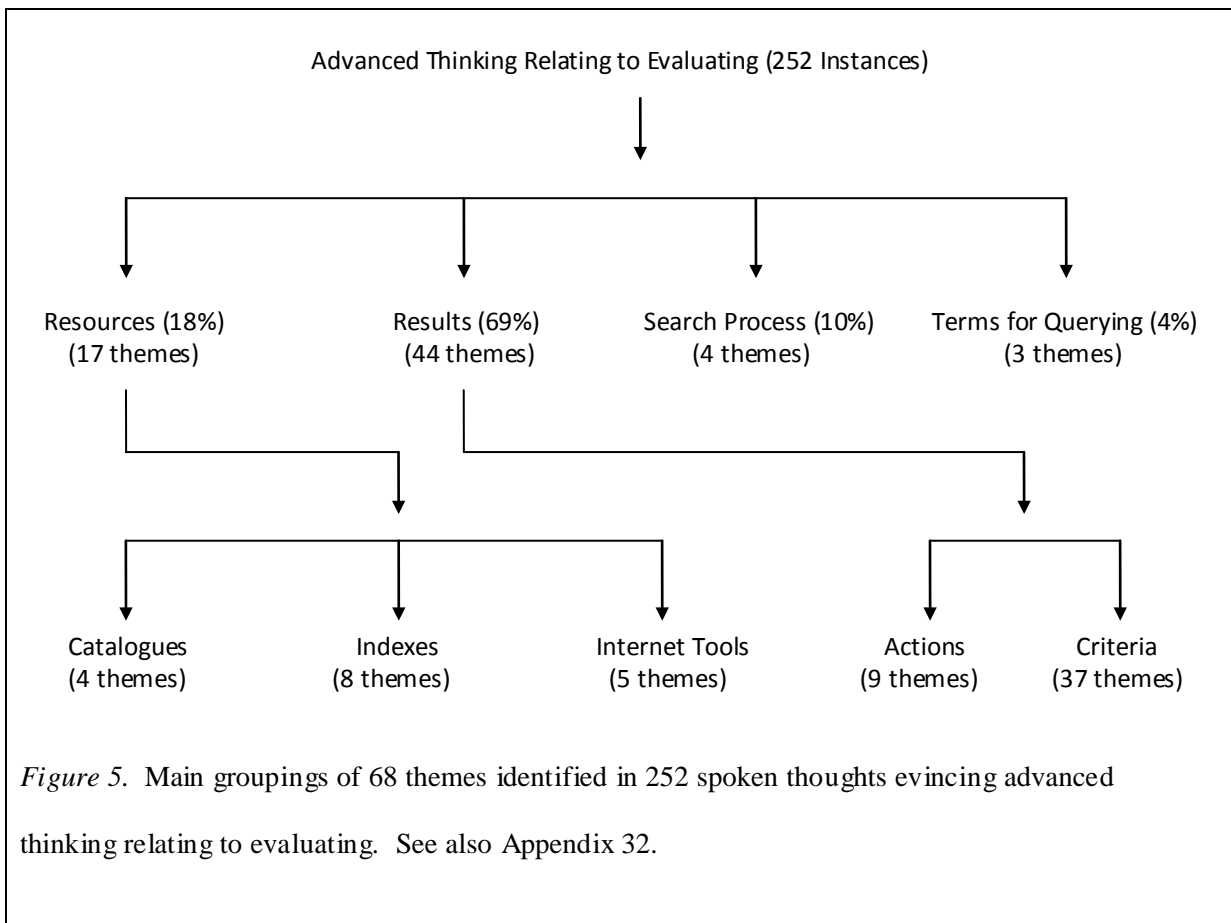
Advanced thinking in the Strategy theme group referencing ways to Obtain Information tended to address matters of procedure, policy or personal experience. For instance Ellen's spoken thought referencing the theme *Use Interlibrary Loan* indicated she had no personal experience using this service, "*I've never even looked for interlibrary loans...Not sure if I'm . . . I guess...either I'm impatient or I'm not understanding, but I don't know . . . Not sure... Not really sure what I'm doing, so I'll get back out of that one*" (Ellen, demo1). In contrast Frances had used this service so often she was close to exceeding her allotment of filled requests, "*The problem with things that I need for interlibrary loans right now is that...I have already used nearly 40, and they won't give me any more. So . . . I have to decide very carefully . . . what I want to use for interlibrary loans at this point*" (Frances, demo2). Frances' intensive need for interlibrary loan service may have been in part due to the undergraduate thesis she was researching and writing during the second half of the study.

The remaining two themes relating to strategy to obtain needed information were *Consult Library Staff*, and *Consult Professors and Subject Experts*. Referencing the former theme, the following voiced thought was one of only two instances across all participants' demonstrated searching that mentioned library staff as a potential resource: "*Just from my . . . initial search there's only six monographs that came up . . . for that time period. I really expect that I'll be bringing in some stuff. So I might talk to . . . one of the research assistants . . . downstairs, maybe they can help me come up with something more, but I don't know, we'll see*" (Howard, demo2). The implication behind Howard's tentative plan was that library reference staff would perhaps be able to point out other locally available relevant resources that could reduce his need to use interlibrary loan service. Referencing the latter theme, Isabel said, "*my prof. . . because he's a Renaissance scholar, he has a lot of subscriptions...some of the magazines, the journals that sometimes aren't available to libraries . . . So maybe I would consult him and . . . have him direct me a little bit more*" (Isabel, interview1). These two themes bear similarities to the "Consult" idea tactic (Bates, 1979a, p. 282) if we expand it

to refer to professors and library staff, in addition to colleagues. I also noted earlier that this idea tactic, in modified form, seemed similar to a strategy used to handle search impasses.

6.5 Advanced Thinking in Evaluating

My first look for thoughts spoken by participants that broadly related to evaluating an aspect of their subject search or explained why or how evaluations, decisions or choices were made yielded 499 thoughts within which 77 themes emerged. In my second more focused review of those thoughts I used the criteria in Table 29 to identify 252 spoken thoughts representing advanced thinking (51% of the original total) covering 68 themes within evaluative thinking (see Figure 5 for a breakdown of the main theme groups of advanced thinking relating to evaluating).



By far the largest group of themes was related to evaluating Results, which was subdividable into themes referencing Actions and Criteria used to carry out those evaluations. Much smaller theme groups addressed why different search Resources (subdivided into Catalogues, Indexes, and Internet Tools), Search Processes, and Terms for Querying were used or judged to be potentially useful. All spoken thoughts I categorized as being instances of advanced thinking relating to evaluating are presented in Appendix 32. In the following four subsections I examine the content and character of the spoken thoughts that gave rise to the identified themes of evaluating within the four theme groups: Resources, Results, Search Process, and Terms for Querying.

6.5.1 Resources

The Resources group of evaluative themes was easily sortable into three subgroups—Catalogues, Indexes, and Internet Tools—likely because these categories were included in the initial questionnaire, in the types of possible resources listed in DiaryClient Question 15, and in my follow-up interview questions posed after each subject searching demonstration. I did not identify any instances of advanced thinking pertaining to evaluating newspapers, which was the fourth resource type identified in step one of analysis of participants' thoughts spoken during subject searching.

Catalogues

During search demonstration sessions the first spoken evaluative thoughts were often about which resource to choose, and why. Advanced thinking referencing the theme *Catalogues - Background or General Information* suggested participants judged catalogues to be useful primarily for finding background information on a topic. For example, Carol said “*the first place I’m going is . . . the . . . library and see if I can’t find a quick little book to see . . . basic definitions and that kind of thing*” (Carol, demo1). Gail referenced the sole additional theme reflecting a positive evaluation of catalogues, *Catalogues - Links to Related Subject Terms*, when she said, “*The only thing that I do like*

about it . . . if you can choose yourself the topic, and I'm not too sure yet and I type it in, and then on the bottom it sometimes gives me some related topics, and sometimes . . . I start with something then I kind of roll into something else" (Gail, interview1). Here Gail referred to subject headings in catalogue records which may represent concepts that help the searcher "roll into" new, related topics.

That the catalogue was not always judged to be a useful tool was suggested by voiced thoughts referencing the themes *Catalogues - Recency of Content* and *Catalogues - Search Performance*. For example Gail expressed general discontent with the datedness of materials in her home library catalogue: *"I used to do it more [use the catalogue] when I was . . . in my first two years, because that's kind of what they teach you. But . . . the chapter is usually dated, maybe . . . the chapter is at least three years old even it was a . . . brand new chapter, then it still takes a year after writing to publish it"* (Gail, interview1). Search performance refers to the extent to which a search tool supported retrieval of useful information. This theme was present, for example, in the following voiced thought, *"I don't like the library catalogue very much because it doesn't have abstracts so I tend to not use it very often"* (Annette, demo1), which suggested the absence of abstracts hampered evaluation of catalogue search results.

Internet tools

Ambivalence was also present in thoughts evoking evaluative themes that referenced the utility of Internet tools. Some themes referenced ways in which they were useful—*Internet tools - Background or General Information*—and ways in which they were less than satisfactory—*Internet tools - Search Performance*—similar to those pertaining to catalogues. Other themes referencing positive evaluative thoughts were *Internet tools - Source Type*, and *Internet tools - Unfamiliar or Uncertain Topic*. Frances referenced the former theme when she wondered aloud about the possibility of finding a particular type of Internet resource, *"some kind of database based in [country] where [author is] sort of a hero and there would be more about her in their databases, instead of . . ."*

here in Canada where nobody really knows who she is and the [home university] doesn't even hold any of her books" (Frances, interview2). Bonnie referenced the latter theme in her voiced thought on Google being useful for initial searches on an uncertain topic or term: *"whenever . . . something like this happens and I've talked about it in class before, but I can't remember exactly who the reference was made to or what concept was referred to, I usually go and Google. Even if I can't quite spell something, I go and Google"* (Bonnie, interview1).

The theme *Internet tools - Content Quality* reflected mixed assessments of the quality of information located using open access Internet tools. Some views were positive: *"one of my profs told us in science class . . . Google Scholar is very neat . . . if you want full-text you have to go back to the library webpage to find actual articles and it takes a long time whereas Google Scholar right away gets you all abstracts"* (Gail, interview1), and *"I like this database because...well...I love Google. I Google everything, and this one's [Google Scholar's] supposed to be reliable"* (Carol, demo1). Other views were less positive: *"I'm skeptical normally of the Internet and . . . the reliability of its sources"* (Bonnie, interview2), and *"I am so wary about Internet sources . . . because so many of my profs are totally against them . . . I am less comfortable in that way, because to judge their authenticity might be more challenging"* (Isabel, interview2).

Indexes

While a mix of positive and negative themes were expressed in participants' evaluative thoughts about catalogues and Internet tools (especially in the case of Internet tools for which feelings ranged from love to skepticism, and professorial stances ranged from recommending to disallowing their use), the more numerous themes relating to the utility and quality of indexes and databases were primarily positive. Among the themes reflecting reasons for choosing an index or database as an aid to subject searching were the following: *Indexes - Subject Coverage*, *Indexes - Links to Related Articles*, *Indexes - Availability of Full-Text*, and *Indexes - Results Limitable by Subject Terms*.

Familiarity would not ordinarily constitute a studied rationale for making a choice, but I categorized one evaluative thought referencing the theme *Indexes - Familiarity or Preference* because a professor's recommendation to use a new database was weighed and then rejected in lieu of using a familiar database: "*thinking a little bit about a specific database that was suggested to me by this professor but I'm not sure if it's going to be completely applicable . . . so I'm gonna go to Academic Search Premier because I'm more familiar with it. I tend to fall back on that one*" (Ellen, demo3). Ellen's considered decision to disregard her professor's recommendation is noteworthy because all other participants tended to follow their professors' recommendations to use (or not use) particular sources and source types.

An instance of advanced thinking referencing the evaluative theme *Indexes - Search Performance* was spoken by Howard, "*I always seem to have the best luck with...that one [JSTOR]. Well maybe it's because I always use it*" (Howard, demo3). Howard's thought is notable not for the evaluation itself, which seemed rather ordinary—that the tool usually proved to be productive—but because of his afterthought that perhaps he found JSTOR to be the most productive because he always used it. This thought illustrated Howard's aptitude for counterbalancing decisions, evaluations, and observations with reflection on variant viewpoints, explanations, or opposing factors.

Two evaluative themes covered reasons to choose as well as reasons to avoid particular indexes: *Indexes - Content Quality*, and *Indexes - Ease of Use*. True to form, Howard was the only participant who voiced evaluative thinking about the content of an index that both favoured it—"I like JSTOR because . . . everything's scholarly and peer-reviewed . . . so it's a pretty reliable source" (Howard, demo1)—and pointed out a shortcoming of the results it produced—"And they're a bit older, I think that's the biggest drawback to JSTOR . . . you don't find a lot that is really contemporary" (Howard, interview3).

Ease of use was another reason for Howard's fondness for JSTOR: "*I get frustrated because [other databases] might have full text, where as JSTOR always has full text. And I love that. . . I don't*

want to be clicking on 15 different links, checking for a full text of a particular . . . article that I'm looking for" (Howard, demo3). Other participants judged index ease of use of to be wanting. For example Bonnie said she disliked recent changes in a favourite index, "*if I was going to continue this search, I would definitely go into . . . the MLA, although the format seems to be changing so I don't like it any more. But I used to use it . . . MLA was my favourite*" (Bonnie, interview1) and Gail noted dissatisfaction with Web of Science: "*I know everybody says it's really good, but I have a hard time working with it, Web of Science . . . sometimes you have to do little tricks to it, like minimizing things or using different . . . search words. But I can't myself*" (Gail, interview3).

6.5.2 Results

The Results theme group comprised 44 themes which fell into two subgroups: Actions taken to evaluate query results, and Criteria used to make those evaluations. The majority of these themes referenced aspects of a typical series of evaluations made in response to a query results set. If we regard this series of typical assessments as main themes of evaluating query results, the remainder can be viewed as variations of the main themes. In this subsection I explore themes in evaluative thinking roughly in the order in which one might typically conduct evaluations while assessing a set of query results (main themes), followed by less common evaluative actions and criteria (variations).

Main Themes of Evaluating Results

Rough and Fine Sorting

Instances of advanced thinking grouped under the theme *Actions - Evaluate in Stages* suggested that in general participants evaluated query results in a stepwise fashion. I observed the first two stages to involve rough sorting of query results, beginning with a very quick scan of the title and perhaps a brief description to determine whether an item had any possibility of being useful, accompanied by few spoken thoughts. In the second stage which unfolded less quickly and with

more voiced thoughts, items deemed in the first stage to be possibly useful were considered somewhat more carefully by reading document descriptions or surrogates to separate potentially relevant items from those that were not. The third stage of evaluating results usually occurred at a much reduced pace and involved fine sorting to judge the quality or usefulness of items thought to be potentially useful through closer first-hand examinations of their content. Only a few participants engaged in stage three evaluations during their subject searching demonstrations, with most participants preferring to do so at a later time “off-stage.”

Instances of advanced thinking referencing the theme *Actions - Evaluate in Stages* primarily involved preliminary assessments of potential relevance or usefulness, with closer evaluations of retrieved items planned for a later time. Examples of spoken thought referencing stage two evaluations were the following: “*the book is...about the goddess...I would assume something of her festival would be in there, then. I’ll write that down as useful...just writing the call number and brief title information to check about it later*” (Ellen, demo2), and “*when I save, it doesn’t mean I’m going to use it, it’s more I’m going to look at it . . . I don’t try to break up, I don’t like getting bogged down . . . in sources when I’m searching for them*” (Howard, interview2).

Browse titles, abstracts, and documents

Most participants commented aloud at least once that they evaluated their query results by browsing (scanning, skimming, or looking through) them. Despite the frequency of these thoughts, I was able to categorize only a few as instances of advanced thinking under the theme *Actions - Browse Results*, perhaps because they occurred so quickly. One of those few was Howard’s comment “*Just scanning through the titles here...I’m also . . . noticing a familiar name . . . so that’s a significant thing for me*” (Howard, demo1). More instances of advanced thinking were evident in thoughts referencing the theme *Criteria - Title Words - Topic Words*. These spoken thoughts indicated a focal point of query results evaluation was the title of documents, which participants scanned for the

presence of words representing their search topics. For example Isabel stated “*the title I find is usually fairly indicative, and they talk about the title in the abstracts where you usually have a good indication of whether the resource will be useful*” (Isabel, interview1).

More details of the processes of rough and fine sorting of query results surfaced in advanced thinking referencing the themes *Actions - Read or Skim Abstract or Introduction*, and *Actions - Read or Skim Document*. Participants often used document surrogates to determine an item’s potential usefulness. For example Gail said, “*I am not really familiar with looking for humanities papers, but in a science paper they always give you an abstract that kind of tells you . . . what it’s all about. And I don’t really find that with this. . . . So I’m just going to read through the introduction...quickly*” (Gail, demo1). Although the introduction Gail referred to was in fact part of a full-text article, I categorized her thought under the theme *Action - Read or Skim Abstract or Introduction*, as she used the introduction as a substitute for an abstract which was not available. Other participants mentioned the need to evaluate a source firsthand, which Isabel noted in this way, “*sometimes . . . [an item’s description] will look good on the screen and then I’ll go get the book and it will be totally not useful, just because you have to look. Sometimes it doesn’t give enough information*” (Isabel, interview2).

Determine relevance

Determining the usefulness and relevance⁴² of query results is an example of the learning outcome “assesses the usefulness and relevance of the information obtained” associated with the third ANZIIL information literacy standard three (Bundy, 2004, p. 16). In this study I use the term relevance to refer to the participant-determined usefulness or topical applicability of information sources encountered during subject searching. Instances of participants’ advanced thinking suggested

⁴² Relevance is a much discussed, complex concept relating to information retrieval, information seeking and subject searching (e.g., Barry, 1994; Barry & Schamber, 1998; Borlund, 2003; Budd, 2004; Cuadra & Katter, 1967; Green, 1995; Green & Bean, 1995; Greisdorf, 2000; Harter, 1992; Hjørland, 2000; Hjørland, 2010; Meadow, 1985; Park, 1993; Saracevic, 1975, 2007a, 2007b, 2008; Schamber, 1994; Schamber, Eisenberg, & Nilan, 1990; Wilson, 1973). An in-depth treatment of its meaning, historical underpinnings, and ways in which it has served as a focus in research related to subject searching, however, are beyond the scope of this study.

they used applicability to their search topic as the chief determinant of the usefulness of a search item, which in turn represents another learning outcome example of ANZIIL standard three, “defines and applies criteria for evaluating information” (Bundy, 2004, p. 16). Several evaluative themes about Results identified in participants’ advanced thinking collectively implied that relevance was relative: *Criteria - Relevance - Exactly on Topic, Criteria - Relevance - Generally on Topic, Criteria - Relevance - Different Topic but Potentially Applicable, and Criteria - Relevance - Not Relevant or Useful.*

In some instances participants’ voiced thoughts indicated the item under evaluation scored a bull’s eye (exactly on topic), such as Frances’ comment, *“Ah, so, this is good. This is perfect because what I’m hoping for here...is ...the title of her autobiography because I know she’s written one”* (Frances, demo2). In many other instances participants indicated items in their query results were in the general neighbourhood of what they were looking for (generally on topic), an example of which was the following voiced thought, *“Shakespeare's so big, that you can . . . write on many themes in this play, but I needed . . . a source that really just dealt specifically with [protagonist] and his characterization, or relevant scenes and texts that somehow related to him like the one that was on mourning”* (Isabel, interview1).

Participants sometimes appraised items in their query results addressing topics different from their stated search topic as being potentially relevant. Examples of thoughts judging items to be in separate but nearby neighbourhoods bordering the search topic (different topic but potentially applicable) included the following, *“That could be useful. I could see that as applying to my topic. Even though this article’s on dog sports, I think that some of the . . . issues that they’re mentioning in the abstract could be useful”* (Annette, demo1), and *“it says about gay men, and this [class assignment] is supposed to be a subject of women so I’m going to avoid that article . . . but I still feel . . . [it] might be useful. I’m going to look at it anyways . . . because . . . the rest of the title and subject matter seems to be applicable . . . Might be something worth considering even if . . . it’s*

maybe not exactly what . . . my professor is interested in" (Ellen, demo3). Annette's spoken thought was one of several revealing her facility for seeing possible applications of items addressing seemingly peripherally related topics (in this example her search topic had nothing to do with dogs or sports), and in Ellen's voiced thought we see another example of her propensity for independent thinking that was informed but unconstrained by her professors' recommendations and expectations.

Instances of participants' advanced thinking that judged some query results not to be worthy of further consideration (not relevant or useful) usually identified the absence of some desired topical aspects. One example was expressed in the following thought voiced by Carol, "*Environmental risks . . . doesn't seem like they have . . . so much to do with family, more to do with school . . . so, not really what I want*" (Carol, demo1).

Relevance basis: Key concepts and specificity

How did participants decide a query result was closely, generally, distantly, or not related to their search topic? Thoughts referencing the theme *Criteria - Key Concepts or Entities* suggested a common criterion was the presence of words representing central aspects of a search topic. For example, Frances said "*because I had in mind a specific part of [political figure's] life that I wanted more information on, what I was doing was scanning for . . . those kind of words for more about her life in [country] . . . it was pretty much a quick scan for key words that I thought I was looking for*" (Frances, interview1). Another basis for judging relevance was captured by the theme *Criteria - Specificity of Topic Treatment*. Advanced thinking referencing this theme indicated participants viewed items not to be useful when the topic treatment was overly specific, an example of which was this observation, "*these ones are more...specific to a really narrow theme that I wouldn't want to incorporate in my essay*" (Isabel, demo1). Besides key concepts or entities and specificity of topic treatment, additional themes in advanced thinking referenced other criteria used to judge the

relevance or usefulness of query results were sortable into five clusters: topic delimiters, distinctive content, quality, form of content/source, and pragmatic considerations. I consider these clusters next.

Relevance basis: Topic delimiters

Themes referencing search topic delimiters that served as the basis for relevance judgements included the following: *Criteria - Disciplinary Treatment of Topic*, *Criteria - Population or Geographic Area*, and *Criteria - Time Period Covered*. Participants' spoken thoughts suggested they viewed these delimiters as more or less objective boundaries of their search topics which they used to differentiate seemingly potentially useful items from those that did not seem useful. In one example Ellen referenced a particular disciplinary perspective she hoped to see addressed in her query results: *"I think that's going to be the biggest challenge . . . to find things that are kind of in the department I'm looking for, of more philosophical than anthropological"* (Ellen, demo1).

Relevance basis: Distinctive content

At times participants' advanced thinking suggested they judged their query results on the basis of distinctive content addressing unique aspects of a topic, uncommon topic treatments, or a specific information need within the research task. Distinctive content as a relevance basis was referenced in the themes *Criteria - Distinctive Ideas*, and *Criteria - Background Information*. Some participants mentioned looking for or recognizing in their query results a unique approach to or viewpoint about the search topic, a compelling or interesting argument, or useful background information, all of which represent distinctive information content relating to the topic. An instance of evaluative thinking referencing the theme *Criteria - Distinctive Ideas* was Howard's spoken thought, *"Some of these look like good places, general topics that I'll start with. What I'll often do is read the introduction of these monographs before I take them out of the library and see if there's anything compelling in the argument of the author"* (Howard, demo1).

Relevance basis: Quality

Themes referencing quality as a basis for judging the relevance of query results that occurred most often were about journals, websites, publication recency and the reputation or familiarity of authors. A voiced thought referencing the theme *Criteria - Journal or Website Quality* was Carol's comment, "*Hmm...[journal title] – I've never heard of it. Kind of makes me question it*" (Carol, demo2), which she later explained further, "*if I've never heard about a journal, I'm a little more skeptical of it, because generally if you hear about a journal and it's really, really well cited . . . it just tends to be reputable*" (Carol, interview2). Ellen articulated evaluative thoughts about how she determined the quality of websites in this way, "*I like to initially . . . look at the website . . . to see if I can decipher some level of accountability, whether it's a university based website, or a publisher's web site . . . as opposed to just some one single person's . . . information*" (Ellen, interview1).

Participants' instances of advanced thinking referencing the theme *Criteria - Recency of Content* implied an item's date of publication was a marker of quality. For example Howard noted "*some of these articles are getting a little bit on the old side here . . . and that's my only...concern . . . because history professors do not like to see old...sources in your bibliography especially with articles*" (Howard, demo1), and Gail stated "*I always make sure there are a certain number of papers that are not older than three years old*" (Gail, interview3). At other times participants knew enough about the literature surrounding their search topics to recognize prominent or familiar author names in query results. Participants regarded professor-recommended authors to be trustworthy, and their publications were therefore viewed to be of high quality. Annette referenced the theme *Criteria - Reputable or Familiar Authors* in the following spoken thought, "*the author of this one is . . . the researcher on [subject], at least in Canada . . . he's coming to teach my class so...I know that . . . he's a really good resource and I know that my prof really likes him so anything by him might be useful*" (Annette, demo1).

The preceding three themes about quality as a factor in evaluating relevance involved the identification or recognition of quality markers largely determined or created by external agents or processes. Another such theme that occurred less often was *Criteria - Citation Rate*. It is arguable, however, that a greater degree of effort and higher order thinking is involved in making relevance judgments on the basis of quality when personally constructed assessments are involved, rather than judgments principally involving recognition of quality factors determined by others. Instances of participants' evaluative thinking about relevance provided several examples of themes referencing independently judged quality.

In a voiced thought referencing the theme *Criteria - Potential Bias*, Howard expressed wariness of potential editorial bias within a book of collected essays, which revealed a sophisticated understanding of source quality and his characteristic desire to strive for balance while evaluating: *“one of those [edited works]. . . might be a good . . . source as well. The disadvantage . . . is that the very fact that they're included within a compilation is interpretation in and of itself, through the editor. So that is something when you're researching you have to be careful of, because you don't know what they've neglected or what they've included, if it's promoting some kind of a specific angle or something like that on the subject”* (Howard, interview2).

Carol referenced the theme *Criteria - Research Methods* when she voiced thoughts reflecting a sophisticated understanding of the rigour required to produce the desired level of quality in the research evidence she sought: *“I look at the way it's written . . . and whether the conclusions are actually supported by the research . . . it's a big problem, especially in behavioural psychology. People want to generalize more than they should with the research, because you can't generalize to the population from a sample of even two hundred people. You can support a theory but you can't generalize the results, a big mistake”* (Carol, interview2).

Gail referenced the theme *Criteria - Understandability* by judging a document to be relevant because she found it to be highly understandable, *“it looked like a paper for students . . . it was . . . to*

the point . . . actually like a student was telling me about it, rather than someone in college . . . [it had a] high level of understandability but it still had quality . . . it wasn't like philosophy for dummies . . . it was . . . kind of a cross between those two. It was short and I assume it was important" (Gail, interview1). Understandability may have been a particularly important criterion in this instance because Gail's demonstration was in a pre-focus phase on an unfamiliar topic in a humanities domain that was at a considerable distance from the area of her degree major in the life sciences.

Some of the preceding instances of participants' advanced thinking referencing indicators of quality echo evaluative criteria exemplifying those mentioned in the second learning outcome associated with the ANZIIL model's third standard, which include authority, timeliness, point or view or bias, and the logic of supporting arguments or methods (Bundy, 2004, p. 17). These criteria represent a mix of externally sourced and internally generated quality indicators and determinations. Some instances of participants' evaluative thinking about the quality of retrieved documents are suggestive of the kind of personal assessments Wilson (1991) argued students may position themselves to make as they gradually and tentatively acquire independent cognitive authority of a body of literature that interests them by reading samples of its works, and gaining an understanding of differing perspectives and varying levels of regard among practitioner experts of those works.

Relevance basis: Form of content/source

Participants' evaluative thoughts evidencing advanced thinking in some cases referenced themes pertaining to particular genres of writing as relevance criteria: *Criteria - Genre - Book Review, Criteria - Genre - Criticism or Interpretation, Criteria - Genre - Editorial, Criteria - Genre - Folk Literature, Criteria - Genre - Literature Review, Criteria - Genre - Personal Experience or Views, and Criteria - Genre - Theory*. I use the term genre loosely to encompass different forms of written composition and information content. In addition to genre, a specific type of information

source was referenced in the theme *Criteria - Primary Source* and represented another basis for relevance judgements.

In a few instances, participants appeared to have desired genres or types of information in mind before commencing their subject searching demonstrations, and at other times they reflected on the relevance of genres or types of information only upon encountering them in query results. Criticism and interpretation, folk literature, and theory were referenced in evaluative themes identified in spoken thoughts indicating that these genres were judged to be desirable or useful. Howard stated more than once that the use of primary sources was very important in history assignments, an instance of which was his comment, “*the library here is good, but it’s not as extensive as some, and so I want availability of primary sources*” (Howard, interview1).

In other cases, genre themes encompassed differing evaluations of the usefulness of particular forms of written information. Sometimes book reviews were viewed positively—for example, “*it does seem to be looking at some of the other topics that I’m interested in, so this potentially—just as a book review—might be useful, to see if the book would be useful*” (Ellen, demo3)—and at other times they were dismissed —“*Oh, it’s only a book review, I’m not interested in that. Never mind*” (Howard, demo2). Carol voiced a positive evaluative thought about literature reviews⁴³, “*a literature review will probably be really good just because . . . I’ll be able to figure out who’s actually written on these things*” (Carol, demo1) while Howard found reviews of any type to be disruptive to his subject searching, “*I just don’t want reviews . . . because there’s tons of reviews, and it just plugs up your search*” (Howard, demo1). Ellen judged a document describing personal experiences related to her topic to be potentially useful, “*so, personal...account in a way of – that might be very important*” (Ellen, demo3), whereas Gail viewed a document on her search topic that discussed personal beliefs not to be of interest because “*it [an article with high relevance ranking] doesn’t appeal to me . . . I guess that his position is more like a personal, like his religious belief*” (Gail, interview1). Gail’s

⁴³ Literature reviews were also referenced in the theme *Operations - Specify Publication Format* in the Seek Information group of strategy themes.

disinterest in items presenting primarily beliefs and opinions perhaps stemmed from a personal inclination as a science major toward empirically verifiable facts rather than personal views⁴⁴.

Relevance basis: Pragmatic considerations

Occasionally participants' evaluative thoughts about their query results referenced themes suggesting that practical matters such as the availability or quantity of information sources were bases for judging an item's usefulness: *Criteria - Local Availability of Source*, *Criteria - Full-Text Availability*, *Criteria - Number of Results*, and *Criteria - References Cited in Source*. The following thought voiced by Frances exemplified the theme *Criteria - Local Availability of Source* and revealed that local access to potentially relevant items was in this instance important: "*because we had already looked up several journal titles and discovered I couldn't get them . . . nearing the very end of the results, I was looking only at the journal title to see if it was one we had already looked at . . . I stopped looking as much at the title of the article so much as at the title of the journal*" (Frances, interview2). Similarly, instances of advanced thinking under the evaluative theme *Criteria - Full-Text Availability* referenced the importance or appeal of immediate access to full-text journal articles.

Query results were on more than one occasion judged on the basis of the size of the results set. In instances of participants' advanced thinking I found indications of sizes considered to be manageable—for example, "*All right, 28 sources, that's not too huge. I'll just scan through these here, looking at some of the years of publication and seeing what kind of things we come up here*" (Howard, demo1)—as well as those considered to be overly large—"Let's just see how many I get. Yeah, almost 4,000. That's...way too much . . . I'm not even gonna look at these. If there's 4,000 of them, most of them are going to be completely unrelated to what I need" (Annette, demo1). A sample learning outcome of the third ANZIIL standard says an information literate individual "assesses the

⁴⁴ This inclination was suggested in Gail's comment that she liked the inclusion of article abstracts in science journals because they allowed her "to right away say yes or no I want . . . this paper" (Gail, demo1), which I categorized as an instance of evaluative thinking (*Results- Actions - Read or Skim Abstract or Introduction*).

quantity” of search results (Bundy, 2004, p. 17) to determine whether the search tools or search approach should be modified. Spoken thoughts referencing the evaluative theme *Criteria - Number of Results* thus indicated that several participants handled the aspect of information literacy involving assessment of quantity of results adeptly.

Evaluative thoughts referencing the theme *Criteria - References Cited in Source* suggested participants sometimes regarded the presence of cited sources in a retrieved item as a relevance indicator in that the cited sources increased the item’s potential usefulness. Referring to cited references Isabel remarked “*this might be useful. It says ‘presents a bibliography of scholarship and criticism...’ So that might lead us to other . . . sources of authors*” (Isabel, demo1). A positive relevance judgement was therefore not always based solely on an item’s primary content, but at times hinged on the presence of supplementary material such as references to other possibly relevant items.

Variations on Main Themes of Evaluating Results

Beyond Browsing Titles and Abstracts

If the preceding main themes represent the most common actions and criteria participants used to evaluate their query results, we can view the following as variant themes that occurred less frequently but highlight unique instances of participants’ evaluative thinking. The theme *Actions - Obtain Evaluative Information in Another Source* is a variation on the theme *Actions - Read or Skim Abstract or Introduction*. For example Carol spoke of Google as a possible source of abstracts for journal articles she could use to evaluate the relevance of cited articles, “*Most of those ones I put down, I’ll probably go and Google them and get some abstracts and read that and stuff before I actually waste my interlibrary loan on them*” (Carol, interview2).

Another variation on reading or skimming abstracts was the theme *Actions - Skip Unknown or Uninformative Items or Terms*, which was present in the following comments by Ellen relating to a demonstrated search on an unfamiliar topic: “*there’s...some names and words in the titles I don’t*

really know so I'm kind of avoiding them" (Ellen, demo3), and in the follow-up interview, "sometimes I don't look at things that just have short titles because I . . . don't have enough time to look at every single thing. So if it just says book review, I sometimes skip over it just because I don't have enough information to go into it" (Ellen, interview3). In these examples Ellen referred to items in query results that did not make the first relevance cut. Gail chose to forego expending effort to evaluate query results when she felt it was not a good use of her time given her lack of sufficient discriminatory power: "since I don't really know if it's gonna be helpful, I'm not going to put my time in writing all the numbers down, go to the library and find them" (Gail, demo2).

Calibrate Evaluative Effort

Instances of evaluative thinking referencing the theme *Actions - Calibrate Effort to Avoid Information Overload* arose when participants were concerned about becoming overwhelmed by information. For instance Gail said "I did it [stopped retaining abstracts while saving references to relevant articles] because if it's too big and I print it off I kind of get lost . . . I have a tendency to have lots of information and then I have no clue on what's going on . . . in my first year, I think I printed all papers I thought was useful, so I kind of learned not to do that anymore" (Gail, interview3), and Carol noted "I already have a lot of stuff on alcohol [and therefore did not evaluate query results referencing alcohol] . . . I probably have like twenty articles, and I get a little overwhelmed if I add too much more" (Carol, interview3). Gail and Carol opted to reduce their evaluative effort to avoid being overwhelmed with too much information by minimizing the amount of data per saved item, and by capping the number of saved items on an aspect of the search topic.

Idiosyncratic and Nonverbal Relevance Criteria

Criteria used by participants to evaluate the usefulness of items in query results usually consisted in factual evidence discernible in the text of displayed results or in full-text documents (e.g.,

the presence of topic words in the document title, peer review statements, recent publication dates, recognized author names). Five themes referenced somewhat uncommon criteria for judging the relevance of query results, two of which related to unique content, *Criteria - Personal Interest*, and *Criteria - Title Words - Catchy Words*. An example of the former theme is evident in Ellen's musing, "oh, yeah, of course I'll be interested in something like that – talking about art and other things that are kind of interesting to me. . . . so now I'm not sure if I'm interested in it because it seems applicable or just because there's been some words in here that...have enticed me" (Ellen, demo3).

The evaluative theme referencing catchy words arose in Gail's voiced observation that "most people title their paper in a catchy way so . . . it kind of takes my attention, but I'd rather have something that exactly tells . . . what it's going to be about rather than like, for example, a paper about the prefrontal cortex. You can call it 'The prefrontal cortex in relation to brain plasticity and experience' or you can call it 'Can you teach a dog new tricks?' I guess most people would say the dog one was . . . kind of different, but I prefer this [the former]" (Gail, demo1). Here again, Gail's preference for unvarnished, immediately apprehendable facts was unmistakable.

Ellen voiced thoughts revealing she viewed retrieving the same item in the results of two or more different queries to be an indicator that the item was important and therefore likely to be relevant. An instance of this theme, *Criteria - Same Item Retrieved in Different Query Results*, was evident in her spoken thought, "it takes me back to that same...book with the other spelling, which...makes me [think] . . . that must be...a good source. So I'm gonna ...make a note of that to myself" (Ellen, demo2). Although this theme was not referenced during any other participant's demonstrated searching, noticing when the same items were retrieved in different searches was mentioned by Howard in his response to DiaryClient Question 13⁴⁵ about how participants would know when they had enough information on their search topic, "When I find that my sources start to repeat themselves, then I know I have enough information."

⁴⁵ See Appendix 10 for all DiaryClient questions.

Two themes referenced nonverbal criteria for judging relevance, *Criteria - Pictures and Picture Captions* and *Criteria - Intuition or Signals*. Bonnie voiced the only thought captured in the study that referenced an evaluative theme based on images rather than text. Referring to her search for newspaper articles treating any topic in a racist manner, she observed, “*when I was searching through the newspapers . . . things like pictures helped . . . sometimes, or . . . captions under pictures . . . There was one . . . that had two black men in the picture, and I was like oh, maybe that has something to do with racism, and it did*” (Bonnie, interview3). The following voiced thought referenced the theme *Criteria – Intuition or Signals* which focused on criteria that were seemingly intuitive rather than rational, “*I’m not looking for a specific . . . it’s really hard to pinpoint exactly what racism is and I’m not really looking for certain words*” (Bonnie, interview3).

6.5.3 Search Process

The Search Process theme group represented 10% of instances of advanced thinking referencing evaluative themes. I identified four evaluative themes on participants’ overall search process: *Amount of Needed Sources*, *Outcome*, *Ease*, and *Skills*. *Amount of Needed Sources* reflected evaluative thoughts about how much information was required for the underlying task, an example of which was Annette’s observation, “*Because it is quite a short paper . . . I don’t think I’ll have a lot of space to include a lot of sources . . . So a few really good sources would be better than a lot of sources*” (Annette, demo3). This theme is related to but distinct from the strategy theme *Decide How Much Information is Needed* which reflected thinking about how to determine how much information was needed, and the evaluative theme *Criteria - Results - Number of Results* which addressed the manageability or expectedness of the number of query results obtained.

Toward the end of their search demonstrations most participants spoke spontaneously⁴⁶ evaluative thoughts referencing the search process theme *Outcome*. One example was Annette’s

⁴⁶ In the interview portion of demonstration sessions I asked participants to rate the success of their searches.

comment suggesting she was somewhat surprised and happy to have found some relevant books on her topic, *“I think that’s probably...pretty good . . . I found a few . . . articles that may be useful, but I actually found three books which was...really...good news”* (Annette, demo1). The search process theme *Ease* arose, for example, in Gail’s observation that conducting her third search demonstration was much easier than her first two, *“I think I won’t have a problem finding papers... which is interesting because . . . I know this topic fairly well and it goes really easy, but if I have to do a search for something I’m not as familiar it looks like I can’t find anything”* (Gail, demo3). Evaluative thoughts referencing the theme *Skill* indicated some participants felt their subject searching abilities could be improved. In one example, Carol said she would like to improve a specific aspect of her subject searching: *“It’s frustrating sometimes. . . . I’d like to know how to limit my search more, cause a lot of the times I come up with . . . 40...50 papers and three quarters of them aren’t useful. . . . I get to the point where I just don’t know what else to do”* (Carol, interview3).

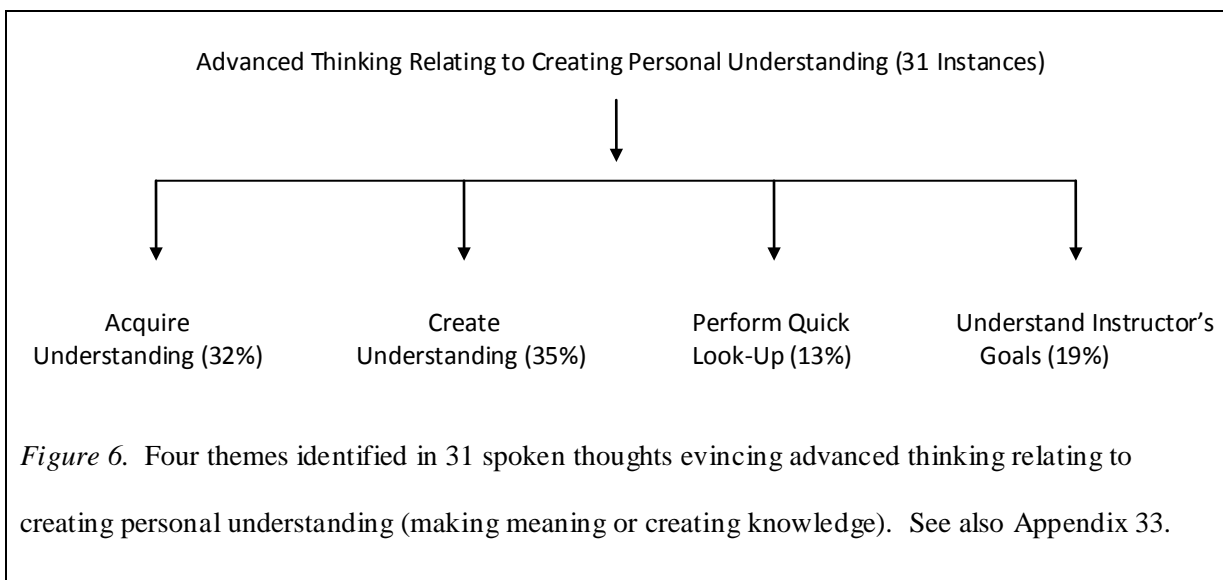
6.5.4 Terms for Querying

Terms for Querying was the smallest of the four groups of evaluative themes, comprising 4% of all advanced thinking referencing evaluation. The three themes comprising this group were about *Inadequate*, *Potentially Problematic*, and *Potentially Useful* terms for querying. Bonnie commented on the inadequacy of her query terms in this spoken thought, *“I’m still not really comfortable [searching this topic in the catalogue] because I don’t know a lot of the issues surrounding . . . [country] and World War I . . . I don’t really have an idea of any other . . . words that I can use to search the subject at the moment”* (Bonnie, interview2). Sometimes participants recognized potential problems when their query terms matched terms occurring in non-relevant results. For example Annette noticed an acronym she used as a query term retrieved off-topic items, *“I know that [acronym] . . . was an acronym for a whole bunch of different things, but . . . that wasn’t too much of a problem because there were only 10 . . . papers came back anyways. If it came back with 100, then*

I would make it more [specified]” (Annette, demo1). At other times participants recognized words in their query results to be potentially useful query terms. For example Howard said, “he’s calling it the theory of holy war . . . that’s a little bit of a different term than what I’ve used [just war] so maybe that could be another potential search . . . for me” (Howard, demo3). Howard then used “holy war” in a subsequent query in an attempt to retrieve additional relevant items.

6.6 Advanced Thinking in Creating Personal Understanding

Each of the 31 thoughts voiced by participants that broadly related to creating personal understanding also met the study’s criteria for advanced thinking. These spoken thoughts referenced one of four themes addressing a need or plan to acquire, create, or quickly address gaps in personal understanding relating to the subject searching topic or task, or they referenced comprehension of instructors’ goals for acquiring understanding that underlay assigned tasks or the design of enrolled courses. Spoken thoughts referencing these four themes are listed in Appendix 33 (see Figure 6 for a breakdown of the proportions of spoken thoughts categorized under these themes).



6.6.1 Understanding From Participants' Personal Perspectives

The themes *Acquire Understanding*, *Create Understanding*, and *Perform Quick Look-Up* encompassed participants' advanced thinking about their own personal understanding of aspects of their subject search or task. The commonality among spoken thoughts referencing the theme *Acquire Understanding* was awareness of a need to bone up on the search topic, which participants expressed in a variety of ways. In general these thoughts referenced a need to get the general lay of the land of their topic in order to search more productively and to complete the underlying task, and were most closely associated with the relational model's knowledge construction conception. For example Isabel said about a book on the historical and social context of her search topic, "*the background information will . . . be really important but it probably won't factor into the body of my essay as much as the specific quotes that I'll use . . . from the articles . . . But in order to understand the text properly, I think it is just as important*" (Isabel, interview3), and Ellen said "*I would call it like a knowledge building kind of stage . . . I'd probably have at least five or six solid things now, and I would probably get upwards of twelve or something like that to get kind of an idea of where I want to go*" (Ellen, demo3).

The theme *Create Understanding* reached beyond boning up on a topic. Instances of advanced thinking reflecting this theme referenced plans and processes to make meaning or extend knowledge by synthesizing new understanding. In general the understanding participants referred to was dependent on the use of informed personal knowledge to produce new insights or to present unique ways of viewing a topic. Annette said she was excited to find a gap in the knowledge base relating to her search topic, "*It doesn't look like there is anything about [topic] so I'm going to have to use theories of serious leisure to kind of forge my own path*" (Annette, interview1). Her excitement at the opportunity to forge her own path in a largely uncharted subject area suggests she felt capable of beginning to perform the kind of knowledge creation expected of domain experts such as university professors. Carol outlined a detailed plan to conduct a study that would provide her with

answers to a specific research question: “*I’m trying to explain why some [population group members] will commit and invest resources for long term relationships and other [population group members] . . . prefer short . . . term . . . strategies. . . it’s going to be a two by two group . . . we’ll end up . . . showing [subjects the treatment stimuli] . . . and then we give them risk taking tasks [in treatment and nontreatment domains]*” (Carol, interview2). Spoken thoughts referencing the theme *Create Understanding* had strong connections to the relational model’s knowledge extension conception.

Thoughts voiced by participants that referenced the *Perform Quick Look-Up* theme were accompanied by speedily executed search actions to address a gap in factual knowledge or understanding of the meaning of terms encountered during searching. I also found descriptions of seemingly similar quick look-ups in participants’ diarized subject searching. Bonnie provided an example when she said, “*I don’t know the dates of World War I, which is kind of sad, so I’m just going to go to Google real fast, and check that out*” (Bonnie, demo2). In another example Gail said, “*I would like to know a little bit more about exactly what [concept] means. I think it is somebody who thinks that . . . the mind is just a machine, or maybe just the opposite. So I’m just going to look to Dictionary.com*” (Gail, demo1). Both Bonnie and Gail launched a new browser window to perform their quick look-up, and then promptly returned to their subject searching in the original browser window. Spoken thoughts referencing this theme seemed most strongly aligned with the relational model’s information sources conception.

6.6.2 Understanding From Instructors’ Perspectives

The first three *Create Understanding* themes referenced spoken thoughts about understanding from a personal perspective whereas the fourth theme, *Understand Instructor’s Goals for Creating Understanding*, reflected thinking about creating personal understanding from a perspective other than their own, representing a “higher level of abstraction,” a central aspect of the concept of higher

order thinking skills in information literacy discussions (e.g., Association of College and Research Libraries, 2000, p. 7). Spoken thoughts referencing this theme suggested participants understood the pedagogical purposes of tasks and courses relating to their subject searches from the viewpoint of their instructors, which also exemplifies the advanced thinking criterion of considering multiple perspectives. In other words, instances of advanced thinking referencing this theme showed participants' capacity to think like their professors about assigned tasks and course content.

Annette's comment "*The prof is trying to make classical theory relevant. So . . . one of our articles has to be from . . . June of 2005 or more recent, but the rest of our articles can be from whenever*" (Annette, interview3) showed she understood the professor-imposed requirement to find at least one very recently published article on her research paper topic to be more than an arbitrary, unwieldy stipulation, as its purpose was to have students seek out or construct relevant connections between classical sociological theory and present-day situations and issues. Similarly Howard insightfully articulated the overall objective of his fourth-year history class to be an introduction to the practice of historians, but from the perspective of professional practitioners rather than the usual perspective of students: "*the purpose of this class really is to engage in . . . historical practice, because that's what historians do, is they submit works to be reviewed et cetera and that's really how this course has been kind of designed . . . it's an introduction into . . . more of the . . . loops of the discipline*" (Howard, interview2).

Most of the spoken thoughts referencing the theme *Understand Instructor's Goals for Creating Understanding* seem aligned with the relational model's knowledge extension conception, including the preceding examples. A few, however, seem more strongly representative of the knowledge construction conception. For instance Annette's comment, "*This professor . . . doesn't focus a lot on resources or using other people's . . . ideas. Mostly he just wants you to show that you understand the theorists, so I don't need a lot of research...a lot of citations*" (Annette, interview3) expressed awareness of her professor's desire that students build up and express coherently their

personal understanding of particular theorists, which evokes the idea of constructing a foundational store of knowledge on a topic.

All instances of spoken thoughts referencing the theme *Understand Instructor's Goals for Creating Understanding* reflected discerning appreciation of instructor expectations that students use their own personal knowledge, or create new knowledge to complete assigned research tasks. In these instances, the positive orientation of this study's participants toward fulfilling those pedagogical goals and tasks contrasts sharply with the approaches of undergraduates in other studies who have seemingly focused more strongly on circumventing situations demanding effortful new learning by using or adapting existing skills and applying least effort to accomplish assigned tasks and obtain desired grades (e.g., Head & Eisenberg, 2009; Valentine, 2001; Warwick, et al., 2009).

6.7 A Filtered View of Advanced Thinking

Taken as a whole, themes identified in advanced thinking provide substantiation of the suggestion arising from my broad portrayal of participants' subject searching contexts and characteristics in chapter 5 that their search processes and outcomes were in some respects similar to the kinds of abilities and practices of domain and search experts who we consider to be information literate individuals in their particular areas of expertise. Participants' voiced thoughts indicated they used a variety of strategies to plan and navigate their search process and wield their search tools, they evaluated their resources, query terms and results, search processes and their own thinking often and with insight, and they reflected on the need for personal understanding about their search topic and task. Perusal of themes and spoken thoughts referencing those themes discussed in the previous three sections, however, show the strength of similarities to the kinds of higher order thinking we understand information literate individuals to possess and use habitually to be variable. Along what lines might those variations be distinguishable?

While I pondered this question and reviewed the instances of participants' advanced thinking listed in Appendices 31, 32 and 33, three interrelated factors surfaced which seem to influence the proximity of those spoken thoughts to the kinds of higher order thinking understood to be part of the repertoire of information literate individuals. These three factors are the degree to which an advanced thinking theme, or a spoken thought referencing a theme, reflected matters relating to subject searching or its underlying tasks that tended to be i) pragmatic or principled, ii) technical or conceptual, and iii) externally or internally focused.

Pragmatic matters were practical, concrete, most often familiar procedural steps taken to try to advance the search that related to functional, nontechnical aspects of subject searching such as strategies for deciding how much information is needed, obtaining needed information, and for deriving the most benefit from research efforts. Principled matters involved decisions, considerations or plans based on scholarly criteria, authoritative domain expertise, good research practice, or instructor-imposed task requirements generally accepted to be markers of quality or relevance, such as the prominence of leading research specialists in a domain, whether an item was peer-reviewed or not, and whether information sources aligned well with requirements of the associated task.

Technical matters related to the mechanics of subject searching and often focused on query terms, or active manipulation of components of queries or search tool options such as using Boolean operators, customizing default search settings, and engaging in progressive query refinement. Conceptual matters involved contemplation of ideas, viewpoints, theory, the knowledge base, terminology, or concepts relevant to the domain of the search topic or task such as controversial issues, core concepts, relationships between concepts, potential for hidden biases, influential theory, and the lingo used by practitioners within a specialized domain.

Externally focused matters involved aspects of a subject search or its underlying task that were controlled or guided by other individuals or groups rather than by study participants themselves. Examples included professorial recommendations for, and warnings against, using particular search

tools and information sources, the pedagogical goals underlying an imposed research task, and participants' attempts to seek confirmation of their own research paper arguments in published sources. Internally focused matters were aspects of a subject search or its associated task that participants reflected upon, interpreted, or controlled independently such as recognizing certain search decisions and choices to be based on intuition, personal affinity or affect, and thinking about personal meaning making, understanding, or lack thereof.

Another look at participants' advanced thinking filtered by these three factors brought into focus a differently organized view of their subject searching processes. In this filtered view, participants' advanced thinking that reflected successful advancement or understanding of their subject search processes fell into three qualitatively different groupings that cut across the bounds of the three information literacy elements examined in this study. In the largest grouping were themes relating primarily to pragmatic matters such as the Obtain Information group of strategy themes, many themes in the Seek Information group of strategy themes not related to Query, many themes in the Results, Resources and Search Process groups of evaluating themes, and the *Perform Quick Look-Up* theme relating to creating personal understanding. The overall character of advanced thinking in this group brings to mind the SCONUL information literacy model's concept of "competent students" as spoken thoughts referencing these themes in general marked participants as "being able to use an institutional library and its resources to further one's studies [and] being able to perform 'literature searches' to whatever depth and complexity is required for a particular curriculum/discipline area" (Society of College National and University Libraries, 1999, p. 5).

In the second grouping of advanced thinking brought into relief by the three-factor filter were spoken thoughts referencing technical themes about querying, primarily in online resources. The applicable themes included all of the Query themes in the Seek Information group of strategy themes, the Terms for Querying group of evaluative themes, and several themes in the Resources group of evaluative themes. These themes tended to highlight resourceful, effective ways to find needed

information, and emphasized assessment and use of information less heavily. While indispensable to productive and efficient searching and at times involving advanced thinking, the role of technical matters in subject searching is typically to facilitate, but not to serve as the focus of, higher order thinking processes. Many of the themes in the second grouping evoked the abilities and searching emphases of individuals having specialized training and experience in information searching—“search experts”—who possess “knowledge about various sources of information, skills in defining search problems and in applying search strategies, and competence in using sophisticated electronic search tools” (Marchionini, et al., 1993, p. 36).

The third, smallest grouping of advanced thinking apprehended in my filtered view comprised themes referencing principled rather than pragmatic matters, emphasizing conceptual rather than technical aspects of subject searching, and most often involving internally focused thinking except for spoken thoughts about the pedagogical goals of imposed tasks which were externally controlled by course professors. Within the third grouping, all strategy themes fell into the Conduct Search theme group, all but one of the evaluative themes referenced criteria used in evaluating, and the two applicable themes of personal understanding were *Create Understanding* and *Understand Instructor’s Goals for Creating Understanding*. Advanced thinking represented in this grouping evoked the abilities of “domain experts” reminiscent of Leckie’s (1996, p. 202) “expert researcher” in a subject area or field who has acquired through extensive scholarly experience “an in-depth knowledge of the discipline, awareness of important scholars working in particular areas . . . [is] relatively independent, and has developed his or her own personal information-seeking strategies.”

The extent of higher order thinking is incrementally more pronounced from the first to the third groupings as the focus of the content shifts from pragmatic, to technical, and then to principled and conceptual matters. It is the quality of thinking represented in the third grouping that presents the greatest attainment challenge for undergraduate students (Appendix 34 lists the 43 instances of

participants' advanced thinking I identified as having domain expert qualities). While search expertise (comprising largely technical matters) and domain expertise (comprising principled, conceptual, often independently determined matters) are both important in subject searching, we usually consider the mechanics of an effortful intellectual process to be more easily mastered than the conceptual, theoretical or constructive aspects. Moreover it is logical to expect elements of pragmatism and search expertise at times to be present in subject searching by domain experts, but domain expertise may not necessarily be present or required in subject searching reflecting basic academic or technical search competence. As participants were not (yet) domain experts, the content of their advanced thinking not unexpectedly tended to be on a different level than that associated with subject experts within a defined domain. Carol's assertion that she knew more about the topic of her third search demonstration than did her professor, however, distinguished her as an exceptional case.

The finding of Meadow, Wang, and Yuan (1995) that search experts preferred to explore technical features of a search system whereas domain experts spent more time examining retrieved items to determine their relevance offers some support for the view that search experts exercise somewhat less independent higher order thinking than do domain experts during subject searching. These researchers (1995, p. 504) noted "the domain specialists mentally separated relevant from irrelevant records, thereby improving their effective precision [but] procedural [search] specialists did not tend to want to do this on their own." Another group of researchers described information seeking by domain experts within subject areas of their expertise in the following way:

Domain experts focused on answers to problems. They quickly understood the problem and had definite expectations about possible answers. They sometimes used technical terminology to formulate queries and devoted large amounts of time to examining results by scanning, reading, and assessing text. These experts also used results to reflect on the progress of searches and made relatively fast relevance judgments in which they expressed high levels of confidence. (Marchionini, et al., 1993, p. 64)

This profile references technical, conceptual and independently determined matters, and notably these domain expert qualities were apparent in instances of advanced thinking in the third grouping.

Carol, for example, described the problem of inconsistent research quality she encountered on occasion during subject searching, and articulated decisively how she dealt with it: *“I look at the way it’s written, I look at the conclusions they draw from the research and whether the conclusions are actually supported by the research . . . it’s a big problem, especially in behavioural psychology. People want to generalize more than they should with the research, because you can’t generalize to the population from a sample of even two hundred people. You can support a theory but you can’t generalize the results, a big mistake”* (Carol, interview2). The evaluation Annette made in following spoken thought indicated she had a definite expectation about the size of a potentially useful query results set on her search topic, which was much smaller than that retrieved by one of her queries: *“Let’s just see how many I get. Yeah, almost 4,000. That’s...way too much . . . I’m not even gonna look at these. If there’s 4,000 of them, most of them are going to be completely unrelated to what I need”* (Annette, demo1). Assessing the size of the results set alone was an unusual step in the present age of Internet search engine results often numbering in the millions, but deliberately foregoing a look at even the first results page, a common practice in casual online searching, was arguably a distinctive indicator of higher order, domain-knowledgeable thinking.

Examples of advanced thinking referencing technical matters comprised the entire second grouping that came to light in my filtered look at advanced thinking but there were also some examples in the third grouping. Technical (domain-specific) terminology was in evidence, for instance, in Annette’s comment, *“I looked for the word community a lot . . . And a lot of them did have community, or network . . . if it mentioned certain groups that . . . I know . . . And I know certain terms like social capital, virtual social capital is related to . . . community formation online, so I knew that that would be something useful as well”* (Annette, interview2). By performing the mechanics of “scanning, reading, and assessing text” Isabel was able to identify and assess as

potentially useful a particular argument being made in a retrieved full-text article which she articulated in this way, *“I think this article’s maybe playing upon...the notion of [heroine] as a pure woman because it was written in the Victorian times. . . . she’s not technically pure...so this might have something good...in terms of how women are perceived”* (Isabel, interview3).

As for using search results to reflect on the progress of searches, Howard indicated he monitored the progress of his subject searching in order to remain on topic and task, *“I try to find . . . subjects a) that are interesting to me, and b) something that potentially is contentious . . . I want availability of primary sources. . . . And I just kinda try to narrow it down as I go so . . . the subject and the material lines up as closely as possible with the requirements of the assignment”* (Howard, interview1). Although participants did not voice thoughts about judging relevance speedily that qualified as advanced thinking, I observed all participants to make relatively quick relevance judgments in demonstrations in post-focus phases or on familiar topics within their degree majors. And finally, I also noted a relatively high degree of confidence in participants’ evaluative voiced thoughts in post-focus phase search demonstrations. For example the following comment by Carol implied her confidence in her relevance judgements was founded on extensive domain knowledge, *“I don’t know how to explain why it’s good . . . it’s kind of an intuitive connection that I know of, it’s just...from all the reading that I’ve done”* (Carol, interview3).

Summary

In this chapter I explored the extent to which study participants’ subject searching thoughts and actions suggested they had acquired some of the skills and experiences recognizable as being aspects of information literate behaviour and thinking normally considered to be fully attained only by search and domain and experts. Spoken thoughts evincing advanced thinking identified through a two-step interpretive process revealed that participants as a group exercised all three higher order elements of information literacy most applicable to subject searching —using strategy, evaluating,

and creating personal understanding. Evaluating, which has often been mentioned by other studies as a particularly challenging aspect of subject searching for undergraduates, was by far referenced most frequently among all instances of advanced thinking.

While search and domain expert-like qualities were suggested in a number of themes and instances of advanced thinking, they were not consistently aligned with any of the theme groups that referenced using strategy, evaluating or creating personal understanding. Reviewing participants' advanced thinking with the goal of identifying possible factors associated with expert-like qualities surfaced three factors which I used as a filter to distil three levels of subject searching expertise encompassing progressively greater levels of higher order thinking: competent student, search expert, and domain expert. Competent student qualities were associated with pragmatic matters of search strategy, evaluation, and performing quick look-ups; search expert qualities were found in themes about querying and were primarily technical in nature; and domain expert qualities, while few, addressed primarily principled, conceptual, independently determined matters most often reflecting evaluating, and creating personal understanding.

I reflect on these findings in the following chapter in terms of answers they suggest to this study's research questions, and in light of related research on subject searching and information literacy involving or pertaining to undergraduates and other higher education students.

Chapter 7

Discussion and Conclusions

7.1 Chapter Overview

This study's multiple case study exploration of undergraduate subject searching was guided by two research questions:

- What are the characteristics and contexts of subject searching by academically successful, upper-level undergraduates that occurred over two successive academic semesters in response to genuine academic needs?
- To what extent did study participants' observed subject searching thoughts and actions suggest they had acquired some of the skills and experiences recognizable as being aspects of information literate behaviour and thinking, normally considered to be fully attainable only by search and domain experts?

In sections 7.2 and 7.3 I discuss answers to these questions arising from the findings presented in chapters 5 and 6 on participants' diarized and demonstrated subject searching relating to their academic studies. I reflect on this study's contributions to what we know about undergraduate subject searching, domain and search expertise, and information literacy in section 7.4, and in section 7.5 I note strengths and limitations of the methods and approaches applied. I identify areas for future research in section 7.6 that could further illuminate the many questions relating to undergraduate subject searching and information literacy that remain unanswered, and provide a concluding summation of the study in section 7.7.

7.2 Characteristics and Contexts of Subject Searching

What were the characteristics and contexts of participants' subject searching pursued during this study? In other words, what did their subject searching look like? In this section I address this research question by sketching a general picture of participants and the subject searching they

conducted over the eight-month period of this study using their search diaries, recordings of online search demonstration sessions, information literacy quiz results, and questionnaire responses. This broad portrayal is based on the detailed descriptions presented in chapter 5.

The eight participants in this study represented a distinctive, infrequently studied group of undergraduates due to their upper-level class standing, academic excellence, and ability to gauge their subject searching abilities accurately. All participants had GPAs of at least 3.75 and were in the last half of an arts and science undergraduate degree. Two groupings emerged from their average information literacy quiz scores based on three quiz completions, and their subject searching self-assessments at the end of the study: Annette, Frances and Howard had the highest average quiz scores (between 72% and 79%) and rated their general subject searching abilities as “very good,” whereas Bonnie, Carol, Ellen, Gail and Isabel all had lower average quiz scores (between 57% and 63%) and rated their general subject searching abilities as “moderately good.”

Five participants were humanities majors, one was a science major, and two were majoring in sociology plus a humanities or science. Participants were traditionally-aged upper-level undergraduates (i.e., early to mid-twenties) except for Howard who was about six years older than the other students and had roughly twice as much postsecondary education experience, as he had completed a four-year college degree prior to embarking on his university studies. All participants pursued lower-level and higher-level courses during the study, and for almost all participants those courses were within and outside of their degree majors. Annette was the sole participant to take only courses within her degree majors during the study. In addition, five of eight participants completed at least one independently-pursued course.

On the one hand, a number of broad contextual aspects of study participants’ subject searching were typical of undergraduate research processes in general. Almost all of the tasks underlying participants’ diarized and demonstrated searching were imposed by course instructors, and more than half of those tasks were traditional research papers of varying length. Besides research

papers, more frequently pursued instructor-imposed tasks included class presentations and written reviews of particular works. While participants were restricted to online resources in their subject searching demonstrations, it came as no surprise that about 85% of resources used in diarized searching were also online tools (e.g., library catalogues, indexes, databases, Internet search engines, Web resources) despite their freedom to use any searching aids desired. The use of printed and human resources was infrequent in diarized searching but each participant used one or both resource types at least once. Participants' subject searching topics were unremarkably scattered across a variety of arts and science subject areas. The majority of participants' subject searching during the study was for course-related tasks within their degree majors. Most often participants said they were familiar with their subject searching topics when their underlying tasks were for courses in their degree majors. About 70% of demonstrated subject searches addressed a topic and task also pursued at least once by the same participant in diarized searching, indicating diarized and demonstrated subject searching topics and tasks, on the whole, were similar.

On the other hand, broad contextual aspects of participants' subject searching were at times less ordinary. Notwithstanding the predominance of instructor-imposed tasks, several participants chose to pursue self-generated tasks in diarized or demonstrated searching that were most often motivated by personal interest in learning more about the search topic. A somewhat unexpected finding was the scholarly nature of the most frequently used resources. In both modes of searching, online resources used in subject searching fell into three similarly proportioned categories: library catalogues, and Internet search tools each accounted for about 25% to 30%, while indexes/databases accessible via the home library website accounted for about 50% to 60% of online tools used. Each participant used a general Internet search engine at least once and Google was used often by some, but the most frequently used resource in both modes of searching was the home library catalogue. In fact the top five most frequently used online resources in diarized and demonstrated searching were the same, only one of which was not a scholarly resource (Google). Isabel's inclusion of her course

professors as resources in 9 of 10 diary entries and her stated habit of consulting with them for all research papers was distinctive; no other participant reported using their professors regularly as subject searching resources. Also distinctive was the finding that the majority of Ellen's diarized searches on familiar topics were for tasks associated with courses outside of her degree major.

Participants' diary entries also yielded details on characteristics of the information they sought and of their search processes. Most often participants knew about how much information they needed, and were looking for only a modest amount of information—five or fewer items. At the same time, in about one-third of diarized searches the amount of information sought was moderate, ranging between 6 and 20 items, and six participants performed diarized searches for tasks requiring many (between 21 and 50 or more) information sources. While Gail reported needing to find no more than five sources in diarized searches, Howard most often indicated he was looking for 11 to 20 items. All participants diarized at least one subject search to find journal articles, brief information, and Internet sources. They most often looked for journal articles, books, brief information and definitions, however, which together constituted more than 70% of the types of information or sources sought in diarized searching, providing another indication that they were not overly dependent on non-scholarly Internet sources.

In diarized searching the time frames of information need were equally often immediate (today/tomorrow) and short-term (within the week). A notably substantial proportion of diarized searches (39%), however, were for longer-term needs—two weeks or more into the future—and all participants diarized at least one search for information needed in two weeks. This suggests participants may have been mindful of the importance of time management and planning needs surrounding academic research tasks. Isabel did not diarize any subject searches for immediately needed information, and Bonnie, Carol and Frances each diarized subject searches having time frames longer than four weeks.

Characteristics of participants' subject searching processes examined in this study included perceived search ease, the research stage associated with their subject searches, and the success of their searches. Looking at each participant's diarized searches as a whole, it was surprising to find every participant tended to underestimate the ease and overestimate the difficulty of his or her independently pursued subject searching. Participants' pre- and post-search ease ratings collectively indicated they most often expected and experienced their diarized searches to be easy, however. Participants' subject searching diaries thus indicated they found subject searching to be a relatively easy process to engage in most of the time, and rarely reported experiencing significant difficulties.

In response to DiaryClient question 11⁴⁷ which asked participants to choose from among six research stages adapted from Kuhlthau's (2004) information search process model, they indicated a research stage for about 70% of diarized subject searches. The stage identified most often was "Collecting," and the stages selected least often were "Beginning" and "Completing." Applying the concept of focus phase⁴⁸ revealed that the majority of diarized searches with a research stage occurred in a pre-focus phase of the search or underlying task. Using participants' thoughts voiced during subject searching demonstration sessions, I inferred the focus phase of their demonstrated searches when applicable, and found the percentages of searches in pre- and post-focus phases (about 64% and 36%, respectively) to be roughly the same as those pertaining to diarized searches associated with a research stage. That participants' diarized and demonstrated subject searching occurred most often in a pre-focus phase of their search or underlying task is notable, as establishing a focus for research tasks has been modeled (Kuhlthau, 2004; Vakkari, et al., 2003) and experienced by undergraduates (Fister, 1992; Kennedy, et al., 1999) as a pivotal, challenging aspect of the research process.

I regarded a subject search to be successful when a participant judged a diarized search to have found all or most of the needed information, and when a participant rated a demonstrated search

⁴⁷ See Appendix 10 for all DiaryClient questions.

⁴⁸ I adapted Vakkari, Pennanen and Serola's (2003) conceptualization of pre- and post-focus phase tasks to define subject searching in the first four research stages (beginning, generating, exploring, and formulating) as pre-focus phase searching, and the last two stages (collecting and completing) as post-focus phase searching.

to be entirely or mostly successful. By these success markers, successful searches were achieved roughly equally often in diarized and demonstrated subject searching (64% and 69%, respectively). Complete search failure was rare: only 7% of diarized searches located none of the needed information, and in demonstrated searching no search was rated entirely unsuccessful. Individual participants obtained differing levels of search success, however, ranging from 92% (Gail) to 45% (Bonnie) in diarized searching. Frances rated neither of her two demonstrated subject searches analyzed in this study to be entirely or mostly successful.

Viewing this broad portrayal of participants' subject searching contexts and characteristics against the larger canvas of the research literature on undergraduate information seeking processes and abilities reveals some areas of alignment. Similar to the findings of Head's (2008) examination of how upper-level humanities and social science undergraduates conduct academic research, the tasks underlying subject searching by this study's participants were almost always imposed by their professors in the form of research papers of varying length, most often short, and the resources they used to conduct subject searching included online as well as physical resources that were most often scholarly although this study's participants did not rely heavily on course textbooks.

Other aspects of the contexts and characteristics of participants' subject searching differed from those reported in other studies. Lee (2008, p. 214) found a small group of upper-level arts and science undergraduate students perceived their library's website resources "to be confusing and difficult to use" which led most of them to choose "the Internet either as the sole source or as their preferred first stop for information," whereas in the present study the home library catalogue was the resource used most frequently by participants, and only one Internet tool, Google, was among the top five most frequently used online resources. While almost all discussion group participants in Head's (2008) study were self-described research procrastinators and in the present study the time frame of participants' information needs was most often immediate or within one week, all of this study's participants also diarized at least one subject search having a longer time frame of two weeks, and

39% of all diarized searches had time frames between two weeks and one semester, suggesting they were not principally procrastinators. First- and second-year students in the longitudinal study of undergraduate information seeking by Warwick, Rimmer, Blandford, Gow and Buchanan (2009, p. 2409) “tended to avoid books, journals, and the physical library if possible, preferring to conduct a Web search,” whereas books and journals were the top two types of information sources sought by the present study’s participants in subject searching they diarized, and Internet sources were notably absent from the top four types of information or sources representing 70% of all types of information they sought.

Several subject searching characteristics noted in the present study are infrequently reported on in the research literature. Participants usually stated the amount of information they were seeking in diarized searching to be small, typically five or fewer sources, although in about one-third of their searching they said they were seeking up to 20 items. Each participant tended to underestimate the ease and overestimate the difficulty of subject searching described in diary entries, while as a group they most often expected and experienced their searches to be easy. In both diarized and demonstrated searching the majority of participants’ subject searches began in a pre-focus phase in which the topic or focus of the search or underlying task was not yet fully formulated. And finally, despite the preponderance of pre-focus phase searching, participants as a group judged about two-thirds of their collective subject searching to be successful.

The broad contexts of participants’ subject searching during this longitudinal case study were therefore in general seemingly typical of undergraduate research processes. At the same time this study’s participants represented a distinctive group of undergraduates, primarily due to their outstanding academic abilities. Several characteristics of their subject searching seemed singularly far-sighted, weighted toward strongly scholarly tools and information sources, and notably productive given that they assessed the majority of their subject searching to be successful despite most searches having taken place in a pre-focus phase. As well, the Kruger and Dunning (1999) effect noted among

undergraduates lacking abilities in a cognitive domain was not evident in study participants' assessments of their general subject searching abilities, possibly because they possessed top-quartile academic competence.

This broad portrayal thus tentatively suggests study participants had acquired and were exercising some of the subject searching abilities and experiences considered to be part of the repertoire of information literate individuals. Greater confidence in advancing this proposition, however, required a more in-depth, first-hand examination of their actual subject searching processes, which I address in the following section.

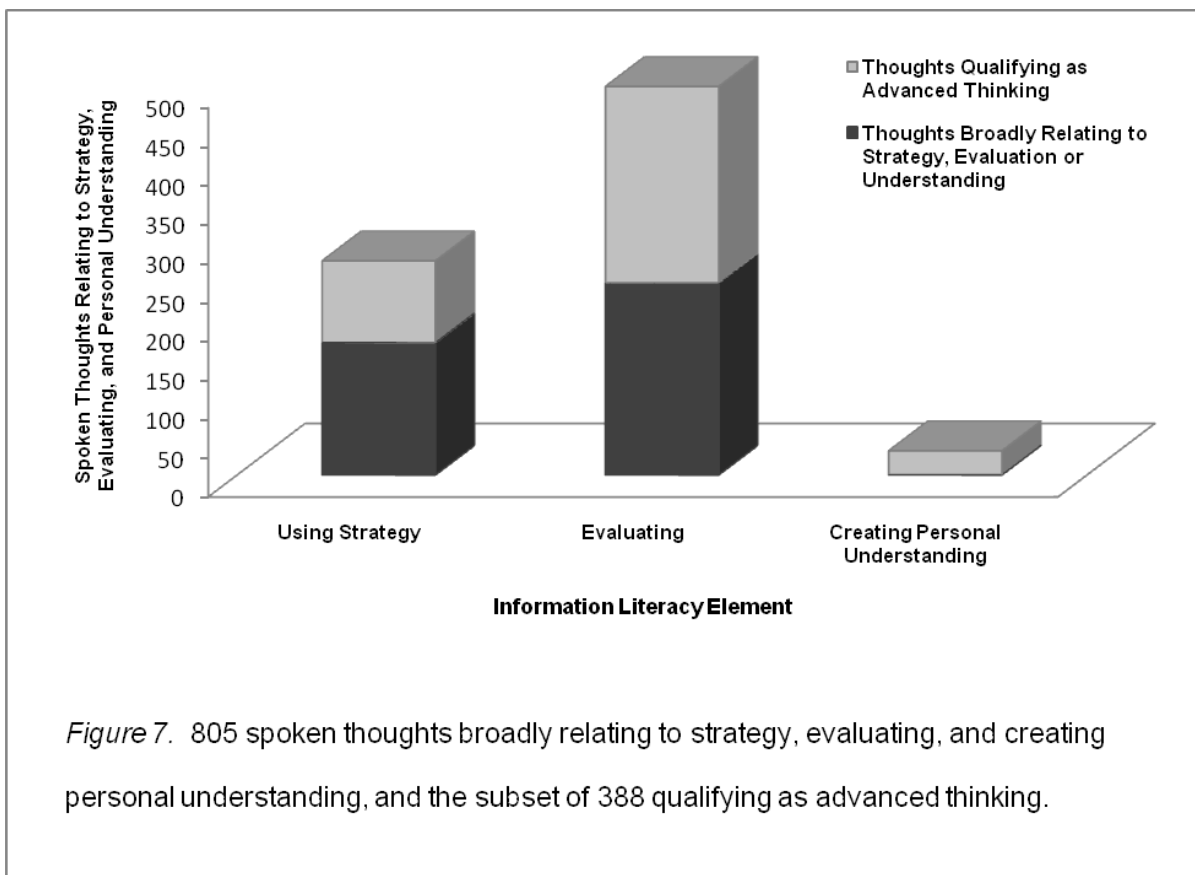
7.3 Advanced Information Literacy Skills and Experience

My second research question asked about the extent to which study participants' observed subject searching thoughts and actions suggested they had acquired some of the skills and experiences recognizable as being aspects of information literate behaviour and thinking normally considered to be fully attainable only by search and domain experts. I sought answers by exploring their spoken thoughts and actions that occurred during online subject searching demonstration sessions at the beginning, middle and end of the study. In particular I looked for voiced thoughts referencing three information literacy elements—using strategy, evaluating, and creating personal understanding—because we can reasonably expect these elements to be applicable at least occasionally in subject searching, and because they are understood to involve higher order thinking going beyond relatively simple, habitual, and largely non-deliberative thoughts associated with basic skills and experiences of information seeking and use (Maughan, 2001, p. 73).

Analysis of participants' thoughts voiced during their subject searching demonstration sessions revealed many instances of advanced thinking referencing strategy, evaluating, or creating personal understanding that exemplified standards or conceptions of the ANZIIL (Bundy, 2004) and relational (Bruce, 1997b) models of information literacy (see Appendices 31, 32, and 33). Some

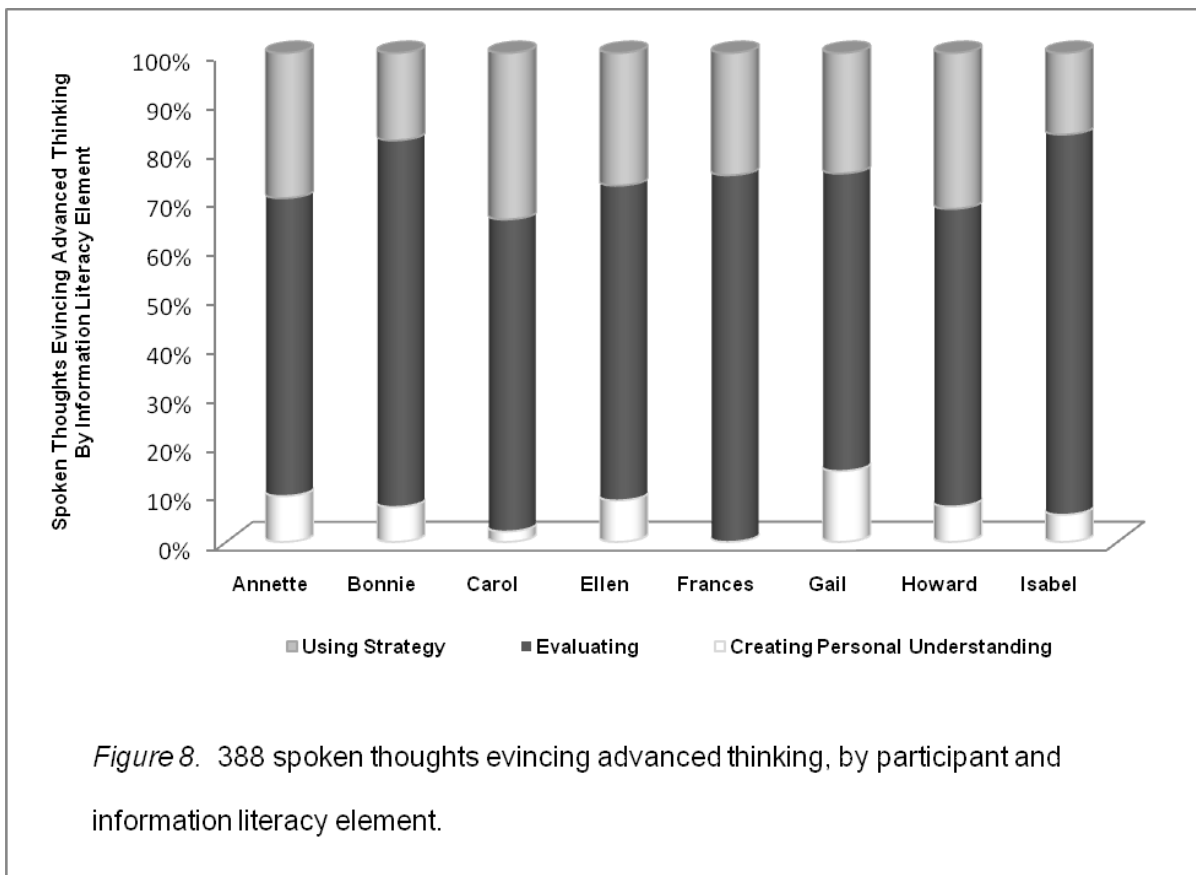
instances also evoked the quality of thinking we associated with information literate individuals such as search and domain experts as they pursue subject searching and other research activities within their domains of expertise.

I used a two-step interpretive process to analyze participants' thoughts voiced during their demonstration sessions, as I was interested in particular content relating to using strategy, evaluating or creating personal understanding, as well as quality that was suggestive of advanced thinking. Step one identified themes within spoken thoughts referencing the content of interest, while step two reduced the results of step one to those reflecting advanced thinking. Figure 7 presents proportions of the 805 thoughts spoken during participants' 23 subject searching demonstration sessions I identified as relating broadly to using strategy, evaluating and creating personal understanding, as well as the narrower subset of 388 thoughts meeting advanced thinking criteria listed in Table 29.



In both broad and narrow analyses, spoken thoughts referencing evaluating were identified most frequently.

All participants voiced thoughts during their demonstration sessions referencing the three information literacy elements of interest except for Frances who did not happen to voice any thoughts about creating personal understanding. Figure 8 indicates that spoken thoughts referencing evaluating constituted the largest portion of each participant's advanced thinking analyzed in the study. The largest proportions of individual participants' advanced thinking relating to strategy, evaluating, and creating personal understanding belonged, respectively, to Carol, Isabel, and Gail.



Although a surprising number of instances of participants' voiced thoughts referencing themes of strategy, evaluating, and creating personal understanding seemed qualitatively similar to

the kind of thinking we understand to be exercised by information literate search and domain experts, many others, while meeting the criteria specified in Table 29, did not seem to be of search or domain expert calibre. Further reflection on participants' advanced thinking brought to light three interrelated factors which influence the proximity of themes and instances of advanced thinking to the kinds of higher order thinking we understand to be part of the repertoire of information literate search and domain experts. These factors are the degree to which an advanced thinking theme, or a spoken thought referencing a theme, reflected matters relating to subject searching or its underlying tasks that tended to be i) pragmatic or principled, ii) technical or conceptual, and iii) externally or internally focused.

Filtered through these three factors, a different view of advanced thinking emerged that remained organized in three groupings but cut across the bounds of the three information literacy elements. I characterized these groupings as advanced thinking at the level of: the competent student (pragmatic matters of accomplishing assigned tasks efficiently and on time), the search expert (technical matters relevant to querying productively in online search tools), and the domain expert (principled, conceptual, and independently determined matters relating to evaluating and creating understanding of content retrieved through subject searching). In this view, higher order thinking about subject searching is incrementally more pronounced from the first to the third groupings as the focus shifts from pragmatic, to technical, and then to principled and conceptual matters.

Figure 9 shows proportions of advanced thinking represented by instances evoking domain expert qualities (see Appendix 34) which, in the context of the present study, represent the highest level possessed by information literate individuals. All three information literacy elements of interest in this study are represented in the domain expert grouping, but advanced thinking referencing evaluating and creating personal understanding were predominant. Figure 9 indicates that the relative proportions of advanced thinking containing domain expert-like qualities was highest (almost 50%) for voiced thoughts referencing creating understanding, and were much smaller for those relating to

using strategy, and evaluating (in each case 8%). Except for Frances⁴⁹, each participant spoke at least one thought about subject searching that was suggestive of domain expert qualities.

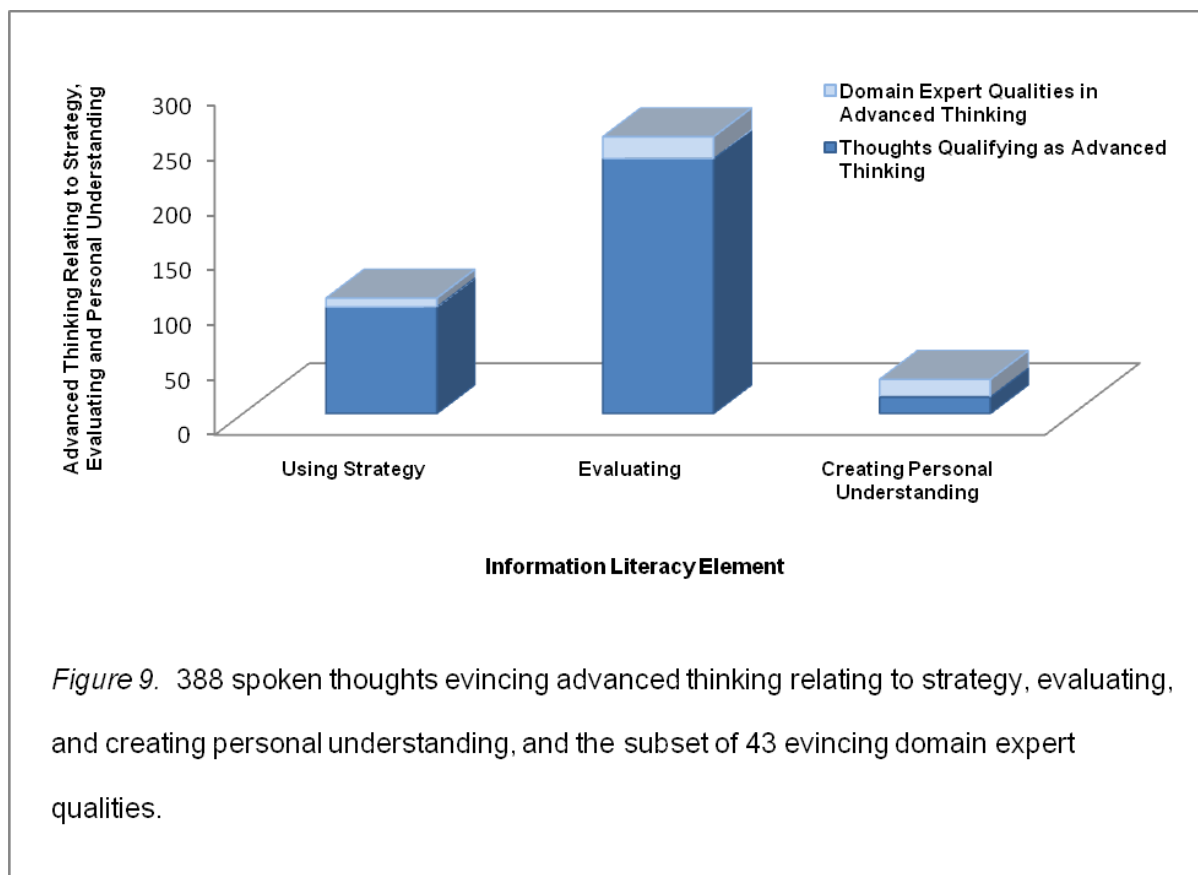
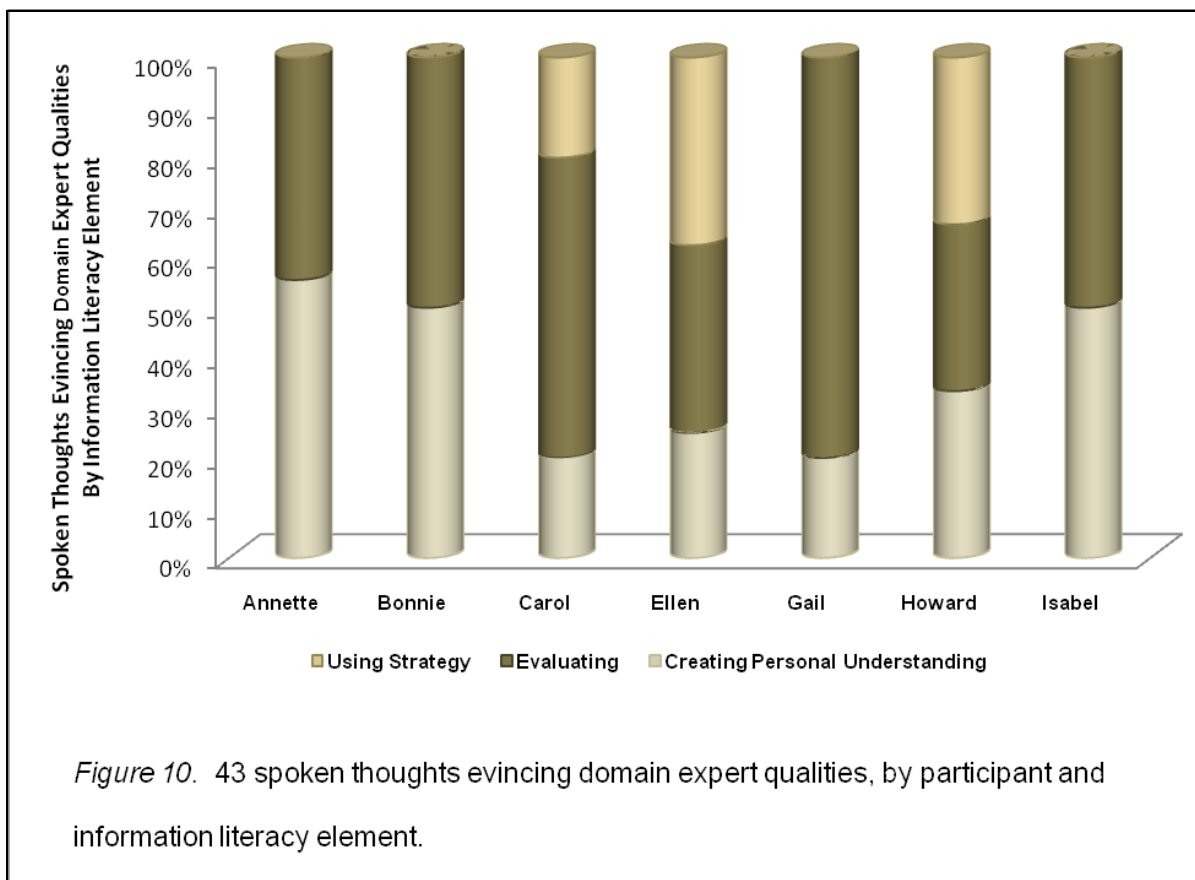


Figure 10 shows the proportions of seven participants' advanced thinking containing domain expert-like qualities that related to using strategy, evaluating, and creating personal understanding; only the latter two information literacy elements were present in each case. On an individual case basis, the largest proportions relating to using strategy, evaluating, and creating personal understanding belonged, respectively, to Ellen, Gail, and Annette.

⁴⁹ Had Frances chosen to demonstrate a subject search on her undergraduate thesis topic, she may well have voiced thoughts having domain expert qualities. In diarized subject searching for her undergraduate thesis Frances provided comments indicating she planned to create new personal understanding and knowledge by addressing a complex research question involving social and historical implications of a literary archetype.



The finding of the present study that its upper-level undergraduate participants evidenced some levels of search expertise and domain expertise in their demonstrated subject searching sessions offers a somewhat different view of undergraduate subject searching processes and abilities than those presented in other studies. In a survey of university and college undergraduates' information seeking practices for academic and everyday life needs, Head and Eisenberg (2009, p. 32, 33, 34) found "most students in our study favored a risk-averse and predictable information-seeking strategy . . . [apparently] learned by rote and reliant on using a small set of resources nearly each and every time," and that "today's students clearly favor brevity, consensus, and currency in the information sources they seek ," leading the researchers to worry that "the very important pedagogical goals of deep learning and critical thinking are at risk of being greatly impeded within the academy."

While this study's participants certainly had favourite or habitually used search resources, the breadth of the resources they employed in diarized and demonstrated searching (see Appendices 21 and 22, respectively) and their voiced thoughts during demonstrated searching for genuine academic tasks suggest they chose their resources thoughtfully (e.g., the strategy theme *Conduct Search-Choose Resources*) and did not restrict themselves perennially to only one or two tools. Instances of advanced thinking suggested participants valued and sometimes deliberately sought information sources presenting variant or unique viewpoints on a topic (e.g., the strategy theme *Conduct Search-Include Multiple Perspectives*), and comprehended their instructors' pedagogical goals (e.g., the personal understanding theme *Understand Instructor's Goals for Creating Understanding*).

The study by Warwick et al. (2009) provides another interesting comparator to the present study because both are longitudinal studies of undergraduate information seeking. Distinctive aspects of the study by Warwick et al. (2009) included its focus on a small group of undergraduates as they progressed through their first two years of a three-year information management degree program that involved specific training in information literacy concepts and skills, and its aim to explore how students' information seeking expertise developed. According to these researchers, their "results demonstrate that experience does not necessarily bring about expertise, especially if, as in this case, participants lack confidence in analyzing and evaluating the utility of search results," and that "for a given task, they estimated what the minimum literature requirements were and chose specific goals that they could fulfill easily and quickly . . . expertise was demonstrated, but typically through ingenuity in finding strategies that sustained existing skills" (Warwick, et al., 2009, p. 2411, 2412).

In the present study, the skilful nature of participants' online subject searching was in many instances reminiscent of search tactics and ideas identified with search experts (e.g., the Query themes in the Seek Information group of strategy themes), and participants seemed not at all reluctant to evaluate aspects of their demonstrated subject searches as their advanced thinking most frequently referenced evaluative themes. Moreover participants were not only undaunted by the prospect of

having to define or create meaning for themselves relating to their search topic or task, but in some cases were excited by the opportunity to forge their own path (Annette, interview1) and expressed passion about their research topic (Howard, interview3).

The character of undergraduate information seeking depicted in the studies by Head and Eisenberg (2009) and Warwick et al. (2009) seems closest to the competent student, focused primarily on pragmatic matters and using strategy to meet instructors' specifications of assigned tasks with minimal effort. In contrast the present study's participants showed themselves to function in different situations at the level of the competent student, the search expert, and the domain expert, and to use strategy, evaluate, and create or consider the need to create personal understanding about their search topic and task. Those differences were particularly evident in their demonstrated confidence and competence in evaluating search tools and query results. Several instances of participants' voiced thoughts reflected a higher order quality considerably beyond the seemingly non-evaluative approach to reviewing online search results by novice undergraduates which was characterized by one researcher as "I don't think, I click" (Novotny, 2004), and which another researcher noted was "not a particularly deliberate and thoughtful process, and the rapidity with which students viewed information and discarded it was startling" (Hofer, 2004, p. 53).

On the one hand advanced thinking evincing domain expert qualities represented a very small proportion of participants' thoughts voiced during subject searching demonstration sessions. On the other hand, the fact that some domain and search expert qualities were identified in almost all participants' spoken thoughts is noteworthy because this study's participants were not trained search intermediaries, nor did they have the extensive subject searching experience, or post-graduate or specialized education and training normally possessed by domain experts. The largest number of domain expert-like qualities in the voiced thoughts of Howard who referenced using strategy, evaluating, and creating personal understanding equally often, is perhaps due in part to his significantly greater accumulation of higher education experience in comparison to other participants.

In terms of the degree to which participants' spoken thoughts during their search demonstration sessions reflected standards or conceptions of the ANZIIL and relational models of information literacy, in general the strongest correspondences appeared to be with the ANZIIL standards for defining a need, and finding and evaluating information, and to the relational model's information sources and process conceptions. Table 30 summarizes correspondences I noted between advanced thinking themes, and elements of the ANZIIL and relational models of information literacy.

Table 30

ANZIIL and Relational Model Correspondences to Themes in Advanced Thinking

Themes in Advanced Thinking	ANZIIL Standards ⁵⁰	Relational Model Conceptions ⁵¹
<u>Using Strategy</u>		
Conduct Search	standards 1, 2, 3	information process
Obtain Information	standard 2	information sources
Seek Information	standard 2	information process
<u>Evaluating</u>		
Resources	standard 1, 2, 3	information sources and process
Results	standard 1, 2, 3, 4	information sources and process
Search Processes	standard 1, 2, 3	information sources and process
Terms for Querying	standard 2	information sources and process
<u>Creating Personal Understanding</u>		
Acquire	standard 5	knowledge construction
Create	standard 5	knowledge construction and extension
Perform Quick Look Up	standard 1	information sources
Understand Instructor's Goals		knowledge construction and extension

⁵⁰ ANZIIL standards:

standard 1: recognize information need, determine nature and extent of need

standard 2: find information effectively and efficiently

standard 3: critically evaluate information and the information seeking process

standard 4: manage information collected or generated

standard 5: apply prior and new information to construct new concepts or understanding (Bundy, 2004)

⁵¹ Bruce (1997b)

For themes of creating personal understanding only a rough correspondence seemed to be applicable between the *Acquire Understanding* and *Create Understanding* themes and the ANZIIL standard for constructing new understanding, although a reasonably good fit existed between these themes and the relational model's conceptions of knowledge construction and knowledge extension. I was unable to identify any correspondence between the theme *Understand Instructor's Goals for Creating Understanding* and the ANZIIL standards for information literacy. The ANZIIL and relational models of information literacy provide detailed coverage of pragmatic and technical aspects applicable to subject searching, but include fewer details addressing principled, conceptual, and internally determined matters applicable to subject searching which are the aspects of the three factors influencing the quality of thinking about subject searching processes that are weighted toward the realm of domain expert.

Participants' thoughts voiced during search demonstrations sessions thus provided greater substantiation of the suggestion gleaned through my broad portrayal of their subject searching contexts and characteristics that they had acquired some of the information literate behaviour and thinking abilities normally ascribed to search and domain experts. The results of this study suggest participants moved relatively easily across three different levels of advanced thinking. These levels were situation-dependent and focused on qualitatively different kinds of issues relating to subject searching processes which I characterized as the competent student (pragmatic), the search expert (technical), and the domain expert (principled, conceptual, independently determined).

This finding portrays the gap separating study participants and domain experts, such as their course professors, to be considerably smaller than the chasm between novice undergraduate and expert researcher depicted, for instance, by Leckie (1996), which is reassuring. It also provides some measure of hope that we can further our understanding of the subject searching abilities and experiences of other segments of the undergraduate student population having varying class standings and levels of academic achievement with an eye to finding meaningful ways to help students stuck in

the pragmatic trenches of subject searching move forward to engage in higher calibre thinking of the kind universities hope all undergraduates have acquired and practice by the time they graduate.

7.4 Contributions of the Study

This study makes a contribution to the research literature through its consideration of an infrequently studied segment of the undergraduate population, upper-level academically excellent students, using a longitudinal research design which attempted to capture all genuine academic subject searching needs pursued by participants over two consecutive semesters. As part of its research design this study paid particular attention to participants' subject searching contexts, and applied a custom-built information literacy theoretical lens to explore the quality of participants' thinking relating to subject searching. Its findings on the extent to which the quality of participants' thinking relating to subject searching was similar to that of search and domain experts also contributes new understandings to the knowledge base on undergraduate subject searching and information literacy.

Previous investigations of undergraduate subject searching and research processes have tended to lack differentiation of study participants by their class standing and academic abilities, and have often suggested that their subject searching abilities were not adequately developed. The present study's exploration of academic subject searching pursued by a small group of third- and fourth-year undergraduates on the Arts and Science Dean's Honour List throughout a normal school year provided a uniquely rich and broad portrayal of the contexts and characteristics of their subject searching. This portrayal included descriptions of contextual aspects such as their enrolled courses, the resources used, the topics and tasks pursued, the types and quantities of the information they sought, the research stage associated with the task motivating their subject search, and their perceptions of search ease and search success.

Against the backdrop of the broad contexts and characteristics of subject searching over an eight-month period, this study also contributed the first in-depth analysis of ways in which participants conducted subject searching that seemed in some respects similar to the higher order quality of thinking understood to be part of the repertoire of information literate individuals such as search and domain experts. The specific content examined in this study was participants' voiced thoughts evincing advanced thinking about subject searching that referenced the information literacy elements of using strategy, evaluating, and creating personal understanding. These elements are the most challenging aspects of information literacy that may arise in subject searching, and have been found to present difficulties to undergraduate researchers. I discovered many instances of participants' spoken thoughts referencing these information literacy elements to be similar to strategies used by search experts, and found some to reflect evaluative and constructive thinking characteristic of search and domain experts. Details of those instances represent unique contributions as they represent context-sensitive and situation-specific glimpses of undergraduate subject searching through an information literacy theoretical lens.

Because instances of advanced thinking identified in the study were not all uniformly representative of search and domain experts, further consideration surfaced a set of three factors which appeared to influence the proximity of participants' advanced thinking to qualities evocative of search and domain expertise. These factors represent another contribution as they provide a potentially useful analytical tool for other researchers or educators that can be used with and without an information literacy theoretical lens. The three factors are the extent to which successful advancement or understanding of participants' subject searching processes tended to be i) pragmatic or principled, ii) technical or conceptual, and iii) externally or internally focused.

Findings of this study make it clear that the research literature's general picture of undergraduate research and subject searching processes as geared primarily toward pragmatic matters of discovering and meeting professorial task requirements, obtaining the best grade for the least

effort, and using in a rote manner a small, familiar, simple set of strategies and tools (e.g., Head, 2008; Head & Eisenberg, 2009; Lee, 2008; Valentine, 2001; Warwick, et al., 2009; Whitmire, 2004) is not true of all undergraduates. While higher order information literacy skills may not be required when subject searching is approached by undergraduates as a primarily pragmatic matter, the findings of this study suggest higher order abilities and thinking are an integral part of the research process when principled and conceptual matters are recognized and appreciated by students as pedagogical goals or, even better, when they represent personally interesting issues to explore and understand.

7.5 Strengths and Limitations

As with any research effort, this study has both strengths and limitations. Its strengths include its multiple data collection methods, its longitudinal design, and the uniqueness of its participant group. Because my aim was to explore undergraduate subject searching broadly with no formal hypotheses in mind, I used a number of different data collection methods to try to accumulate as many richly variant details as possible and to triangulate findings. Participants' subject searching diaries and self-recorded online subject searches provided a breadth of details through their descriptions of subject searching they pursued privately throughout the study. Participants' subject searching demonstration sessions in which they conducted subject searches for genuine academic needs at three temporally spaced points during the study provided a tremendous depth of details captured through my direct observation of the demonstrations, audio and screen recordings of participants' thoughts spoken aloud as they conducted the searches, and audio recordings of post-demonstration interviews I conducted with each participant. Supplementing these two main data collection methods were initial and final questionnaires on subject searching experiences and abilities, and three information literacy quiz iterations completed by all participants.

Recognition of the complexity and variety of human information seeking processes has led some researchers to urge others to undertake more longitudinal studies of these processes to uncover

details and patterns of information seeking within natural contexts and in response to genuine information needs (e.g., Courtright, 2007, p. 293). This study represents one effort to respond to those calls for longitudinal studies which remain relatively scarce in the area of undergraduate subject searching and research processes due to the significant time and resource commitments required of both researchers and participants. This study's focus on a select, little-studied subgroup of higher education students—upper-level, academically excellent undergraduates—also represents a research strength in that it uncovered new knowledge about subject searching abilities of students near the end of their undergraduate degrees that was significantly different from other studies of upper-level undergraduates not identified as possessing superior academic abilities (Head, 2008; Maughan, 2001).

Among this study's limitations are its small number of participants, its use of talk-aloud protocols the validity of which is disputed by some, the dependence of its interpretive process on analyses and categorizations of a single interpreter and coder, the lack of participant validation of interpretations and coding, its capture of most, but not all, of participants' academic subject searching throughout the study, and variations in how participants diarized their privately pursued subject searching. Although I hoped to recruit 12 participants pursuing a variety of arts and science majors for the study, within the 8 participants who completed all study requirements and submitted useable diary entries and screen recordings there was a high proportion of humanities majors, and only three majors involving the social sciences and sciences. As a result the small number of participants in this study provided a glimpse of subject searching processes of upper-level, academically excellent arts and science undergraduates that is not necessarily representative of upper-level, academically successful undergraduates as a whole.

I acknowledged in chapter 4 the impossibility of gaining direct access to individuals' thought processes and the imperfect nature of using talk-aloud protocols as indicators of what those inner thought processes might be. I thus elected to analyze participants' voiced thoughts during subject searching demonstrations while striving to maintain an awareness of the essentially interpretive and

therefore fallible nature of this approach, and also of the likelihood that some of their thoughts were not verbalized during those demonstrations and therefore not captured in the study⁵². Had greater time and resources been available, it is possible that the interpretive process used to analyze participants' spoken thoughts could have been strengthened by the inclusion of research assistants in the analysis and coding processes to provide a measure of intercoder reliability, and/or by seeking participant validation of samplings of categorizations of their spoken thoughts under the various identified themes.

I set out to capture a picture that was as complete as possible of all participants' academic subject searching occurring during the eight months of the multiple case study, but in the end this goal was only partially realized. Factors contributing to a less-than complete capture included participants' decisions not to diarize/record selected subject searches when they were not comfortable doing so (this was an option I specified was available to them throughout the study), the need to do online subject searching when their laptops were not handy, and variant understandings of whether or not quick look-ups (e.g., dictionary definitions) were instances of subject searching. At one extreme, Gail said she did many quick look-ups of dictionary definitions throughout the study but diarized/recorded very few, not realizing they were searches I was interested in capturing. In her final interview Gail estimated her diarized subject searches to comprise about 30% of her total subject searches, but of the remaining 70% of undiarized subject searches almost all were of the quick look-up variety. In their final interviews the other participants estimated they had captured between 65% and 90% of their total subject searching during the case study inclusive of quick look-ups.

And finally, the unusual brevity of Bonnie's diarized subject searches, and Isabel's stated practice of making hand-written notes on privately pursued subject searching prior to creating one diary entry per academic research task suggest there was some variation in the way participants

⁵² I also noted in chapter 5 that there were a small number of occasions during Howard's first and second demonstrations when his spoken thoughts seemed to go beyond the subject search he was demonstrating to reference general subject searching tactics and research practices he liked to use in general, which he may have mentioned for my benefit as the study investigator.

viewed the bounds of subject searches. It is therefore important not to assume that participants' individual diary entries represented a shared understanding of the temporal and practical bounds of a subject searching episode.

7.6 Future Research

Due to its fundamentally exploratory nature, this study perhaps uncovered more questions than it answered about undergraduate subject searching. Among the many further areas of research suggested by this study's findings are the following, which I have organized into two groupings relating to information literacy, and higher order thinking in subject searching.

Information Literacy

The definition of information literacy I developed for this study in chapter 3 was based on four well-known models (Association of College and Research Libraries, 2000; Bruce, 1997b; Bundy, 2004; Society of College National and University Libraries, 1999). As I analyzed and reflected on participants' thoughts spoken during their subject searching demonstration sessions, it became clear to me that details of what is meant by information literacy presented in the four models pertain primarily to pragmatic and technical matters, while details of information literacy matters applicable once pragmatic and technical matters are largely mastered are relatively scarce. In other words, current information literacy models do not specify the "domain expert" area of abilities and experiences to the same degree as they do those of the "search expert" and "competent student." If we are to follow Wilder's (2005, para. 13) exhortation to academic librarians to teach undergraduates to "absorb and add to their disciplines in ways that make them more like their professors," however, further work is needed to refine these models or create new ones to understand and incorporate more fully what lies in the upper echelons of the information literate individual's repertoire.

Like Budd (2008) and Dunn (2002), I find the sufficiency of current information literacy models to guide development of information literate abilities and experiences in undergraduates to be lacking. One step toward alleviating this problem is to investigate effective ways of conceptualizing holistically the abilities and experiences encompassed in current models as meaningful processes students can reflect on, and increase their understanding about, through a range of subject searching experiences. This study's definition of information literacy served its purpose as a way of framing lower and higher order thinking relating to subject searching processes. Adequacy of the definition for additional work needed to further develop the concept of information literacy, however, bears scrutiny, given its lack of acknowledgement of factors influencing the proximity of instances of advanced thinking about subject searching to the kinds of higher order thinking understood to be part of the repertoire of information literate search and domain experts.

The information literacy element I refer to in this study as creating personal understanding seems to me to be fundamental to the kind of higher order learning, critical and creative thinking, and problem solving abilities which undergraduate degree programs aspire to instil in students. At the same time, creating personal understanding tends not to be emphasized as much as strategy and evaluation in information literacy instruction and research. Within the context of higher education, subject searching for academic tasks ideally involves or leads to new learning, and when learning occurs it necessarily results in changes in students' personal understandings of the subject matter or task. I suggest students and information literacy instructors could benefit from further research on ways to facilitate strategy use, evaluation, and creating personal understanding as integrated components of finding information⁵³ appropriate to one's subject searching task. This study's exploration of the quality of thoughts relating to higher order information literacy elements spoken during subject searching can be viewed as an example of research efforts seeking to explore and

⁵³ In this study I sifted out instances of participants' spoken thoughts illustrative of themes pertaining to the three elements individually, but in fact combinations of strategy, evaluation, and making personal meaning were identifiable in many instances.

understand information literacy within contexts representative of real-world learning situations rather than as generic skills to be mastered (Bruce & Hughes, 2010). Extending this research approach with its focus on thoughts and behaviours relating to genuine subject searching tasks to different categories of students having variant levels of academic experience or success, and to a greater range of subject searching contexts, could expand our understanding of information literate qualities evidenced in undergraduate subject searching even further.

Future research aiming to build more robust and relevant conceptions and models of information literacy would also usefully consider two additional aspects of higher order thinking—metacognition and imagination—identified by Budd (2008) and Ward (2006), respectively. Both aspects, along with creating personal understanding, are examples of the third factor I referred to as “internally focused” matters of subject searching that require independence, introspection and analysis of one’s own thinking, and thinking beyond pragmatic and technical matters. In Ward’s (2006, p. 402) terms, “information literacy requires more than an impassive and objective working with the world. . . . If we lack self-understanding and an ability to accept the conjuring of our inner life . . . we fail to become fully information literate.” How best to incorporate such elements into information literacy instruction and student experiences requires developing potentially useful strategies and content, and then testing and evaluating them as did Budd (2008), for instance, in an information literacy course conceived and delivered within a “phenomenological cognitive action” framework.

We would additionally benefit from future research seeking to evaluate the durability of information literacy after undergraduates have graduated and moved into the next phases of their lives. The report by Candy, Crebert and O’Leary (1994) asserted the goal of Australian undergraduate education was to create lifelong learners, an idea that is widely recognized elsewhere as well (Maehl, 2003), but to what extent and in what circumstances do graduates in fact go on to be lifelong learners who apply and use information literacy competencies and conceptions productively

in daily life? If evidence for long-term effects of information literacy and lifelong learning is low, what might be the main contributing factors? Longitudinal studies seeking evidence of lifelong learning among higher education graduates in different educational systems could help illuminate such questions and permit formal evaluation of the concepts of lifelong learning and information literacy in ways not currently prevalent.

Higher Order Thinking in Subject Searching

Human thought is impossible to place under a microscope and examine in detail to begin with, and so the challenge to distil and explore a certain quality of thinking in the particular context of subject searching is an even taller order. It is the higher order thinking elements of information literacy, however, that present the greatest learning and performance challenges during subject searching, which therefore mark them as useful foci for further research. Additional investigations of higher order thinking and epistemological development along the lines employed by Whitmire (2003, 2004) could provide deeper insights into undergraduates' higher order thinking processes during subject searching, and on how best to influence development in the direction of more independent, critical and creative thinking. Whitmire explored the relationship between senior undergraduates' beliefs about knowledge and their information seeking behaviour (Whitmire, 2003) as well as first-year undergraduates' (Whitmire, 2004) knowledge beliefs, reflective judgment, and information behaviours. Although she used different data collection methods in these two studies, the results of both showed first-year students to possess generally low developmental levels of epistemological beliefs whereas seniors generally possessed medium to high epistemological beliefs.

Swanson (2006, p. 107) noted several research questions naturally arising out of Whitmire's findings that are worthy of future investigation and could significantly extend our understanding of undergraduate higher order thinking during subject searching: "does the development of information literacy skills impact the user's view of knowledge? . . . [and] if these two areas are indeed

connected . . . how do information literacy skills impact the user's view of knowledge?" One way to approach such investigations might be to gather information about subject searching, information literacy and epistemological development pertaining to undergraduates majoring in different subject areas as they progress from their first to fourth years of undergraduate studies. Such a study could involve multiple ways to track levels of participants' higher order thinking used in subject searching as well as their epistemological development levels over time to see if these appear to covary, and also to explore broad contexts and specific situations in which the two may be connected. Findings could assist academic librarians and other educators to understand and recognize undergraduates' differing levels of epistemological development, and to shape the timing, content and presentation of information literacy instruction in ways that are most likely to influence positively students' development of lower and higher order information literacy abilities and experiences.

7.7 Conclusions

The impetus for this exploratory multiple case study was my desire to know more about the subject searching processes of undergraduate students and the extent to which they become information literate while pursuing their degree programs. This is an important matter because subject searching is a common but at times particularly challenging aspect of completing undergraduate academic tasks, and many studies have suggested that undergraduates generally do not attain the ideal competency levels and ability to exercise higher order thinking abilities during subject searching that are outlined in well-known models of information literacy. In this study I therefore explored academic subject searching conducted by eight upper-level, academically excellent undergraduates at a small Canadian university over an eight-month period.

Using completed questionnaires, diarized and demonstrated subject searches, and information literacy quiz results I assembled a general picture of participants' subject searching contexts and characteristics. This picture showed some aspects such as their subject searching tasks and topics to

be typical of undergraduates in general, but revealed other aspects such as the types of resources used and information sought, and the success of their searches to be more strongly associated with experienced and knowledgeable researchers. I applied several layers of analysis to participants' thoughts spoken during subject searching demonstration sessions referencing the information literacy elements of using strategy, evaluating, and creating personal understanding. This interpretive process yielded many themes of advanced thinking providing further substantiation of the suggestion that participants had acquired some of the abilities and experiences we associate with search and domain experts. In particular, advanced thinking themes that referenced domain expert qualities tended to address principled, conceptual, and independently determined matters, whereas those referencing search expert qualities focused on technical matters.

This study illuminated a portion of the upper end of the subject searching/domain expertise continuum we hope most undergraduates traverse successfully during their academic studies. Examining the continuum where the novice-expert gap was theoretically smallest was a useful place to focus on as it represents an infrequently investigated subgroup within the undergraduate population, and because much has been reported on the more obvious, sizable gap between first-year students and domain experts. To my knowledge no other studies have specifically focused on subject searching processes of high-achieving upper-level undergraduates.

I did find participants to use strategy and evaluate various aspects of their subject searches, and occasionally to reflect on or recognize the need to create personal understanding of their search topic or task in ways that were reminiscent of the quality of thinking we understand domain experts to possess. This finding suggests that further research into the subject searching processes of undergraduates situated at other points along the expertise and academic abilities continuums may assist librarians and faculty to facilitate intellectual development in the same direction for other undergraduates who have yet to experience subject searching as an satisfying academic process they can engage in with confidence and skill.

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Appendices

Appendix 1: Participant Recruitment Email to Faculty

[Date: March 11, 2005]

Dear Colleagues,

I am writing to ask for your help identifying academically successful students who might be willing to participate in a research project on 'subject searching' led by Rumi Graham, our colleague in the library. Rumi is looking for senior students, on campus for the fall/spring semesters, who will be engaged in their own research projects and who would be willing to participate in such a study. I would expect that students who are working on honours theses, independent studies or senior seminars would be ideal for this project. Ideally Rumi would like to develop a cohort of about twelve students. Please let me know if you can help with this matter.

Cheers, [Name of Associate Dean, Arts & Science]

--

Dr. [Name of Associate Dean, Arts & Science]
Associate Dean
Faculty of Arts & Science
Name of University]
[City, Province]
Canada [postal code]
Phone: [] Fax: []
E-mail: []

Appendix 2: Letter of Invitation to Potential Participants

[on Home Library departmental letterhead]

Date

Dear [*Student*],

I am a librarian at the [*Name of University*] and a doctoral student at the Faculty of Information Studies, University of Toronto. As part of my doctoral degree requirements, I am conducting a study entitled **A Multiple Case Study Exploration of Undergraduate Subject Searching** to explore how high-achieving, senior undergraduates search for information on particular subjects in order to complete academic assignments. Your name was forwarded to me by Arts & Science professors or the Arts & Science Dean's office because of your high level of academic achievement and your probable intention to enrol in courses over the fall 2005 and spring 2006 semesters requiring substantial subject searching/ independent research in chosen topics subject areas. I am inviting you to participate as a volunteer in this study, which I hope will generate a more in-depth understanding of the intellectual processes and contexts of successful subject searching by undergraduates.

Many undergraduates begin their university studies with limited in-depth knowledge of the subject areas in which they intend to study, and of how to conduct research effectively and efficiently to complete university-level academic assignments. Research suggests that new undergraduates often experience frustration and poor results when they conduct subject searching in library online catalogues and other research tools, but in general these initial difficulties seem to dissipate over subsequent years of study. I am interested in exploring what differences may exist between the subject searching processes, practices and experiences of academically successful senior undergraduates, as compared with those of novice undergraduates which have been well-studied by library and information science researchers.

My study will examine closely the subject searching processes of approximately 12 high-achieving senior undergraduate students in order to understand how and when successful subject searching develops, as well as factors that may be associated with subject searching difficulties. I hope that this knowledge, in turn, will inform efforts to enhance the effectiveness of library research tools, instruction, and the provision of information resources and services that facilitate the development of essential undergraduate academic competencies such as successful subject searching.

The study will begin in September 2005, and will run continuously to the end of April 2006. During this time, I will ask you to make brief diary entries describing each episode of subject searching that arises as part of the requirements of your enrolled courses at the [*name of university*], and to invoke screen recordings of all online subject searching activity for academic assignments that you wish to allow me to examine. In addition, at three different time points, I will ask you to demonstrate for me an instance of subject searching on a topic of your choosing, and to respond to follow-up questions on the observed subject searching demonstration.

What are the risks of participating? I believe the risks are minimal for the following reasons. Participation is strictly voluntary, and although a commitment of about eight months is required, you may at any time withdraw from the study without negative consequences by informing me of your desire to withdraw, and by returning any equipment or other materials loaned to you for the purposes of collecting data for the study. No evaluative judgements will be made about you if you choose to withdraw. You will be free to raise questions about this study with my dissertation supervisor, Professor Lynne Howarth, or me throughout the study, and you may decline to respond to questions in interviews, questionnaires, and other study-related tasks, or to complete any parts of the procedures involved in this study.

In addition, all data generated during this study will remain confidential. All references to you, your enrolled courses, and the [Name of University] will be anonymized in published and unpublished reports of this study. The data will not be used to evaluate your academic performance in any way. Only my dissertation supervisor, Professor Lynne Howarth, and I will have access to all primary data, and you will have access to raw data collected about yourself. All data, including observation notes, diaries, subject searching screen recordings, and audio recordings will be secured in locked files, and will be destroyed once all analyses have been completed, which I anticipate will occur within five years after the end of the data collection period.

Finally, I believe there are minimal risks if you choose to participate because the estimated effort required of you to collect or generate the data I wish to use in my study should not total, on average, more than a few minutes per day, while you are actively working on subject searching as it naturally occurs over the fall 2005 and spring 2006 semesters in course-related work for your degree program. In addition, I expect that the initial orientation session, concluding debriefing session, and the three subject-searching observation/interview sessions will each be approximately 30 to 90 minutes long, and will take place at well-separated time intervals during the eight-month study.

What are the benefits of participating in this study?

- You will have the use of a laptop computer for the duration of the study for recording data required for my study, and for other academic pursuits in accordance with the University's Computer Use Policy. The laptop will include standard applications commonly found in the University's PC computer labs, current anti-virus software, an internal CD read-writable drive, internal modem, and on-campus wireless Ethernet connection capabilities.
- You will have the opportunity to experience and consider graduate research from a study participant's perspective, which may inform the process of designing your own research projects in the future should you choose to pursue graduate studies.
- You will be paid \$200.00 upon completion of the study and return of the laptop in good working order.
- Your participation will help generate new knowledge about subject searching by today's undergraduates. This new knowledge, in turn, may inform efforts to enhance library instruction, services, and resources that will facilitate the development of successful subject searching for future undergraduates. On request, I will send you a summary of findings from this study, and you may choose to access the completed dissertation once it is published.

Thank you for considering your participation in this study. Please contact me or my dissertation supervisor, Professor Lynne Howarth by [date] if you have questions or concerns, or if you wish to find out more about participating.

Sincerely,

Rumi Graham

Principal Investigator:

Rumi Graham
 [Name of University]
 Phone Number: []
 Email: []

Dissertation Supervisor:

Professor Lynne Howarth
 Faculty of Information Studies, University of Toronto
 Phone Number: (416) 978-4666
 Email: lynne.howarth@utoronto.ca

Appendix 3: Recruitment Email to Dean's Honour List Students

[Date: May 13, 2005]

Dear Student,

I am writing on behalf of Rumi Graham, Professional Librarian at the [Name of University], who is seeking students to participate in a library study. As a student who is currently on the Dean's Honour Roll I thought that you might be interested in Rumi's project. I will attach a letter from Rumi that explains her goals and the expectations she has of students who participate in the study. If you would like more information please contact Rumi, who would be happy to discuss the project with you. If you have already been contacted about this study please excuse the duplication of contact material.

Sincerely,

[Name of Associate Dean, Arts & Science]

--

Dr. [Name of Associate Dean, Arts & Science]

Associate Dean

Faculty of Arts & Science

Name of University]

[City, Province]

Canada [postal code]

Phone: [] Fax: []

E-mail: []

Appendix 4: Initial Questionnaire For Potential Participants

Questionnaire For Potential Participants in

A Multiple Case Study Exploration of Undergraduate Subject Searching

1. Please provide the following information about your planned studies at [*Name of University*] over the fall 2005 and spring 2006 semesters:

a. **Degree program** in which you are enrolled (e.g., BA, BSc, BA/BSc): _____

b. Your chosen **major**: _____

c. Current **year of study** in your degree program (e.g., 3rd year, 4th year): _____

d. Names of the courses you intend to take in the fall 2005 and spring 2006 semesters, and your current level of knowledge of the subject matter of each course:

FALL 2005 COURSES:

COURSE NAME

KNOWLEDGE OF COURSE SUBJECT MATTER
(For each course you list, circle one number)

	No knowledge	Very little knowledge	Moderate knowledge	Good knowledge	Extensive knowledge
_____	1	2	3	4	5

	No knowledge	Very little knowledge	Moderate knowledge	Good knowledge	Extensive knowledge
_____	1	2	3	4	5

	No knowledge	Very little knowledge	Moderate knowledge	Good knowledge	Extensive knowledge
_____	1	2	3	4	5

	No knowledge	Very little knowledge	Moderate knowledge	Good knowledge	Extensive knowledge
_____	1	2	3	4	5

	No knowledge	Very little knowledge	Moderate knowledge	Good knowledge	Extensive knowledge
_____	1	2	3	4	5

SPRING 2006 COURSES:

COURSE NAME

KNOWLEDGE OF COURSE SUBJECT MATTER
(For each course you list, circle one number)

_____	No knowledge	Very little knowledge	Moderate knowledge	Good knowledge	Extensive knowledge
	1	2	3	4	5
_____	No knowledge	Very little knowledge	Moderate knowledge	Good knowledge	Extensive knowledge
	1	2	3	4	5
_____	No knowledge	Very little knowledge	Moderate knowledge	Good knowledge	Extensive knowledge
	1	2	3	4	5
_____	No knowledge	Very little knowledge	Moderate knowledge	Good knowledge	Extensive knowledge
	1	2	3	4	5
_____	No knowledge	Very little knowledge	Moderate knowledge	Good knowledge	Extensive knowledge
	1	2	3	4	5

2. Please circle the appropriate answers to the following questions about your previous experience using **library catalogues** over the past year:

a. How often did you use library catalogues over the past year? (Circle one number)	Did not use library catalogues	Infrequently (a few times over the year)	Somewhat frequently (monthly)	Frequently (weekly)	Extensively (daily)
	1	2	3	4	5

If you circled number 1, please go directly to question 3.

b. What types of library catalogues did you use over the past year? (Circle all that apply)	Public library catalogue	College library catalogue	University library catalogue	Other type of catalogue
	1	2	3	4

If you circled number 4, please explain: _____

- | | | | | | |
|---|---------------------------------|--|-----------------------------|---------------------------------|----------|
| c. Reasons for using library catalogues over the past year? (Circle all that apply) | Completing academic assignments | Finding health or consumer information | Recreation or entertainment | Helping others find information | Other |
| | 1 | 2 | 3 | 4 | 5 |

If you circled number 5, please explain: _____

3. Please circle the appropriate answer to the following questions about your previous experience using **library online indexes or databases** (e.g., PsycINFO) over the past year:

- | | | | | | |
|--|--|--|-------------------------------|---------------------|---------------------|
| a. How often did you use library online indexes or databases over the past year? (Circle one number) | Did not use library indexes or databases | Infrequently (a few times over the year) | Somewhat frequently (monthly) | Frequently (weekly) | Extensively (daily) |
| | 1 | 2 | 3 | 4 | 5 |

If you circled number 1, please go directly to question 4.

- | | | | | |
|---|--|--|---|---------------------------------|
| b. Types of library online indexes or databases you used over the past year? (Circle all that apply). | Periodical literature index (e.g., PsycINFO) | Journal article database (e.g., JSTOR) | Statistical or numeric database (eg., CANSIM) | Other type of index or database |
| | 1 | 2 | 3 | 4 |

If you circled number 4, please explain: _____

- | | | | | | |
|---|---------------------------------|--|-----------------------------|---------------------------------|----------|
| c. Reasons for using library online indexes or databases over the past year? (Circle all that apply). | Completing academic assignments | Finding health or consumer information | Recreation or entertainment | Helping others find information | Other |
| | 1 | 2 | 3 | 4 | 5 |

If you circled number 5, please explain: _____

4. Please circle the appropriate answers to the following questions about your previous experience using **Internet search tools** (e.g., Google) over the past year:

- | | | | | | |
|--|-----------------------------------|--|-------------------------------|---------------------|---------------------|
| a. How often did you use Internet search tools over the past year? (Circle one number) | Did not use Internet search tools | Infrequently (a few times over the year) | Somewhat frequently (monthly) | Frequently (weekly) | Extensively (daily) |
| | 1 | 2 | 3 | 4 | 5 |

If you circled number 1, please go directly to question 5.

- | | | | | | |
|---|--------|-------|-----|-----|-------|
| b. Internet search tools you used over the past year? (Circle all that apply) | Google | Yahoo | MSN | AOL | Other |
| | 1 | 2 | 3 | 4 | 5 |

If you circled number 5, please explain: _____

- | | | | | | |
|--|---------------------------------|--|-----------------------------|---------------------------------|-------|
| c. Reasons for using Internet search tools over the past year? (Circle all that apply) | Completing academic assignments | Finding health or consumer information | Recreation or entertainment | Helping others find information | Other |
| | 1 | 2 | 3 | 4 | 5 |

If you circled number 5, please explain: _____

5. Please circle the appropriate answers to the following questions about your experiences looking for information on particular subjects **over the last year**:

- | | | | | | |
|---|---------------------------|----------------------|-------------------------|---------------------|--------------------|
| a. How often did you look for information on particular subjects to complete class assignments? (Circle one number) | Less than once a semester | About once per month | Several times per month | About once per week | Once a day or more |
| | 1 | 2 | 3 | 4 | 5 |

- | | | | | | |
|---|--------------|------------------------|------------------------------|-------------------------|---------------|
| b. When you looked for information on unfamiliar subjects, how useful were library online catalogues compared to other sources you used? (Circle one number) | Never useful | Useful once in a while | Useful about 50% of the time | Useful most of the time | Always useful |
| | 1 | 2 | 3 | 4 | 5 |

c. When you looked for information on unfamiliar subjects, how useful were **library online indexes and databases** (e.g., PsycINFO) compared to other sources you used? (Circle one number)

	Never useful	Useful once in a while	Useful about 50% of the time	Useful most of the time	Always useful
	1	2	3	4	5

d. When you looked for information on unfamiliar subjects, how useful were **Internet search tools** (e.g., Google) compared to other sources you used? (Circle one number)

	Never useful	Useful once in a while	Useful about 50% of the time	Useful most of the time	Always useful
	1	2	3	4	5

6. How would you rate your current subject searching abilities? (Circle one number)

Poor	Not Very Good	Moderately Good	Very Good	Excellent
1	2	3	4	5

7. Is there anything else you wish to tell me about your current subject searching abilities or experiences?

Name: _____

Date: _____

Thank you for completing this questionnaire!

Please return to Rumi Graham

[Room Number, *Name of University*] Library

Appendix 5: Letter of Consent

[on Home Library departmental letterhead]

Subject: Letter Soliciting Informed Consent

From: Rumi Graham, Librarian, [*Name of University*] Library

Thank you for indicating an interest in participating in my study entitled **A Multiple Case Study Exploration of Undergraduate Subject Searching**, which I am carrying out as part of the requirements for completion of the Doctor of Philosophy degree at the Faculty of Information Studies, University of Toronto. This letter outlines my study and provides information about your participation. If you require additional information, please contact me at [*office telephone number*] or my dissertation supervisor, Professor Lynne Howarth, at (416) 978-4666, Faculty of Information Studies, University of Toronto.

Purpose of the Study: My study will examine closely the subject searching processes of approximately 12 high-achieving upper-level undergraduate students in order to understand how and when successful subject searching develops or occurs, as well as factors that may be associated with subject searching difficulties. I hope that this knowledge, in turn, will inform efforts to enhance the effectiveness of library research tools, instruction, and the provision of information resources and services that facilitate the development of essential undergraduate academic competencies such as successful subject searching.

Rationale for the Study: Many undergraduates begin their university studies with limited in-depth knowledge of the subject areas in which they intend to study, and of how to conduct research effectively and efficiently to complete their academic assignments. New undergraduates often experience frustration and poor results when they conduct subject searching in library online catalogues and other research tools, but in general these initial difficulties seem to dissipate over subsequent years of study. An in-depth understanding of how and when successful upper-level undergraduate subject searching occurs may provide new insights on how the transition from less successful to more successful undergraduate subject searching can be facilitated by academic libraries

Participant Involvement: The study will begin in September 2005, and will run continuously to approximately the end of April 2006. During this time, I will ask you to do the following:

- Complete an initial questionnaire (May-June 2005).
- Participate in an orientation session for participants (August/September 2005).
- At three different time points, complete an online information literacy quiz (approximately 60 minutes in length, occurring in September 2005, and January and April 2006).
- Using a specially designed electronic form, make a diary entry describing each episode of subject searching that arises as part of the requirements of your enrolled courses at the [*Name of University*] (September 2005 to April 2006).
- Using software loaded on your laptop or on a laptop loaned to you by the University, invoke screen recordings of all of your online subject searching activity for academic assignments that you wish to allow me to study (September 2005 to April 2006).
- At three different time points, demonstrate for me an instance of subject searching involving the library online catalogue on a topic of your choosing that will be screen-recorded and audio-recorded, and participate in a follow-up focused interview on the observed subject searching demonstration (3 sessions approximately 90 minutes in length, occurring in September 2005, and January and April 2006).
- Participate in a participant debriefing session (approximately 60 minutes, occurring in April/May 2006).

Participation Risks: Participation risks for this study are minimal. Participation is voluntary, and you may at any time withdraw from the study without negative consequences by informing me of your desire to withdraw, and by returning any equipment or other materials loaned to you for the purposes of collecting data for the study. No evaluative judgements will be made about you if you choose to withdraw. You will be free to raise questions about this study with me or my dissertation supervisor, Professor Lynne Howarth, throughout the study, and you may decline to respond to questions in interviews, questionnaires, and other study-related tasks, or to complete any parts of the procedures involved in this study.

In addition, all data generated during this study will remain confidential. All references to you, your enrolled courses, and the [Name of University] will be anonymized in all reports of this study. The data will not be used to evaluate your academic performance in any way. Only my dissertation supervisor, Professor Lynne Howarth, and I will have access to all primary data, and you will have access to raw data collected about yourself. All data, including observation notes, diaries, subject searching screen recordings, and audio recordings will be secured in locked files, and will be destroyed once all analyses have been completed, which I anticipate will occur within five years after the end of the data collection period.

Finally, although this study will take place over an eight-month period, your participation effort should not total, on average, more than 5 to 10 minutes per day, while you are actively working on subject searching as it naturally occurs over the fall 2005 and spring 2006 semesters in course-related work for your degree program. The initial orientation session, concluding debriefing session, and the three subject-searching observation/interview sessions will each be approximately 30 to 90 minutes long, and will take place at well-separated intervals during the eight-month study, at times that are convenient for you.

Participation Benefits: Unless you own your own laptop, you will be provided with exclusive use of a laptop with wireless access to the campus network loaned to you for the purposes of recording data required for my study, as well as for other academic purposes of your choosing. If you are planning to pursue graduate studies, another benefit of participating might be the acquisition of experience and insights about graduate research from a study participant's perspective, which may inform the process of designing your own graduate research projects in the future. Upon completion of the study and (if applicable) return of the loaned laptop in good working order, you will be paid \$200.00 for participating.

Responsibility For Loaned Equipment: Because the laptop loaned to you for the purposes of this study remains the property of the [Name of University], you will be required to sign a memorandum of agreement upon receipt of the equipment, attached, [Appendix 11] that identifies the laptop loaned to you, specifies that use of the loaned laptop must be in accordance with the [Name of University's] Computer Use Policy, and states your willingness to be responsible for the safekeeping of the laptop during the study and its return in good working order at the conclusion of, or upon your withdrawal from, this study.

Research Consent

I have read and understood the conditions under which I will participate in this study and give my consent to be a participant. I have received a copy of this consent form.

Name: _____ Date: _____

Appendix 6: Outline of Study Orientation Session for Participants

- thank students for agreeing to participate
- review the study requirements and timelines in the informed consent letter
- distribute researcher's and dissertation supervisor's business cards and encourage participants to contact either person if questions arise throughout the study
- reiterate each participant's right to withdraw at any time without negative consequences
- distribute laptops and obtain signed consent form agreeing to the conditions of use (one copy to each participant)
- demonstrate the use of the Camtasia Studio screen recording software for online subject searching episodes, including how to conduct subject searching without initiating the screen recording software when searching is conducted that the participant does not wish to communicate to the researcher
- demonstrate the use of an electronic diary program written by H. Otterdyks for making subject searching diary entries that will be forwarded to the researcher

Appendix 7: Summary of Study Requirements

[on Home Library departmental letterhead]

Date: September 6, 2005
To: Case study participants
From: Rumi Graham
Subject: Timeline of required activities

First of all, sincere thanks for agreeing to participate in my case study research project on subject searching by undergraduates. Summarized below is a timeline of required activities for the study:

<u>Date</u>	<u>Activity</u>
Sep 6 – Apr 28 (continuously)	Create new diary entries (using the <i>Diary Client</i> program on your laptop) for each unique, naturally occurring subject searching need pertaining to your currently-enrolled courses at the [home university].
Sep 6 – Apr 28 (continuously)	Record all <i>online</i> subject searching (using the <i>Camtasia Studio</i> program on your laptop); each online subject searching session should have a corresponding diary entry created in the <i>Diary Client</i> program.
Sep 6 – Apr 28 (at least monthly)	Submit copies of completed diary entries and online subject searching screen recordings to me at least monthly. You may do so by burning copies of your data to CDs (I will provide blank write-able CDs) and depositing the CDs in my Level 11 mail slot. Or, you may bring your laptop to my office and I will make copies. File sizes of screen recordings can be extremely large; 1 hour of recorded online subject searching can take up about 50% of the recording space on an 700MB blank CD.
Sep 6 – 16	Complete the Information Literacy Quiz in <i>WebCT</i> ([WebCt URL]) [~ 30 min.]
Sep 12 – 23	Demonstrate a naturally-occurring online subject search, and participate in a follow-up focused interview [~ 90 min.]
Jan 3 – 13	Complete the Information Literacy Quiz in <i>WebCT</i> ([WebCt URL]) [~ 30 min.]
Jan 9 – 20	Demonstrate a naturally-occurring online subject search, and participate in a follow-up focused interview [~ 90 min.]
Apr 10 – 21	Complete the Information Literacy Quiz in <i>WebCT</i> ([WebCt URL]) [~ 30 min.]
Apr 17 – 28	Demonstrate a naturally-occurring online subject search, and participate in a follow-up focused interview [~ 90 min.]
May 1 – 5	Attend debriefing session and return laptop.

For the purposes of this case study, “subject searching” refers to your process of finding information needed for an enrolled [home university] course when you have a subject or topic in mind. There are many different ways of looking for information on a topic, including asking other people, and consulting various printed and online tools and resources. I hope to acquire a detailed understanding of your subject searching experiences pertaining to *all of your enrolled courses* over the next eight months. I will strive to do so by examining your diary entries describing each of your subject searches, and by analyzing screen recordings of your online subject searches.

These data will be supplemented by your information literacy quiz results, as well as my observations and recordings of three different online subject searches you will demonstrate during the study. I will contact you by email to identify a mutually convenient time when you are able to come to my office (in September, January, and April) to demonstrate a naturally-occurring online subject search of your choice, and to participate in a focused interview immediately afterward.

Attached are notes on procedures for using the ***Diary Client***, ***Camtasia Studio***, and ***RecordNow! Plus*** programs on your laptop, which we will review during your orientation. If you encounter problems or questions while using these programs, especially at the beginning of the study, please let me know as soon as possible, to ensure that the data needed for this study is captured properly. To protect data integrity, please do not make any changes to the ***Diary Client*** or ***Camtasia Studio*** application files or settings unless I specifically request that you do so.

If you experience any technical difficulties with your loaned laptop, please contact me as soon as possible, or bring the laptop to my office. Your laptop is covered by a comprehensive warranty and maintenance package, so I should be able to arrange for quick servicing if needed.

If you have questions on any aspect of this case study research project, please do not hesitate to contact me or my dissertation supervisor, Prof. Lynne Howarth, at the University of Toronto. I look forward to working with you over the course of this study.

Rumi Graham
[home library]

Telephone (office):
Telephone (home):
Email:
Office:

Appendix 8: Loaned Equipment Memorandum of Agreement

[On Home Library department letterhead]

Date:

To: Rumi Graham, Library

CC: Office of the University Librarian, [*Name of University*]

Subject: Memorandum of Agreement for the Loan of a Laptop Computer

I, _____, am a participant in the study entitled **A Multiple Case Study Exploration of Undergraduate Subject Searching** being conducted by Rumi Graham at the [*Name of University*] from September 2005 to April 2006. I have received a laptop computer with the specifications listed in this memorandum, below, loaned to me by the [*Name of University*] for my personal use for the duration of my participation in this study.

I understand that this laptop computer is provided to me for the purposes of gathering and recording information for this study, and for other academic purposes associated with my degree program at the [*Name of University*] that are in accordance with the current [*Name of University*] Computer Use Policy which is viewable and downloadable at: [http://\[university website address\]/COMPUTER USE POLICY.pdf](http://[university website address]/COMPUTER USE POLICY.pdf). I agree to return this laptop to Rumi Graham at the [*Name of University*] when the study concludes in April 2006, or upon my withdrawal from the study. I agree to be responsible for the safekeeping of this laptop, and to report any technical difficulties, damage, or loss to Rumi Graham as soon as the problem occurs or is discovered.

Laptop Specifications:

- Manufacturer:
- Model:
- Serial Number:
- Components:
- Accessories:

Study Participant Date

Witness

Date

Laptop returned to the [*Name of University*] on:

Date

Returned laptop received by:

Appendix 9: Sample Information Literacy Quiz

Question 1

The best **first step** in finding an article on "Saddam Hussein's rise to power" is:

- 1. to look in the online catalogue
- 2. to browse journals and magazines covering world events
- 3. to consult a journal index
- 4. to consult a current political science textbook on the Middle East
- 5. unsure

Question 2

Journal articles could be important sources of information for which of the following situations?

- 1. Joe needs information about an event that happened two months ago
- 2. Susie wants current information on a highly specialized topic
- 3. Bob needs scholarly information on a Psychology topic
- 4. journal articles could help Joe and Susie, but not Bob
- 5. journal articles would be useful to all three students
- 6. unsure

Question 3

If you find **too much** information on the topic you are researching, a good way to **limit** your search results is by:

- 1. selecting information published only within the last few years
- 2. picking a specific problem, issue, or trend
- 3. choosing a viewpoint or group affected
- 4. using all of the above strategies
- 5. using *b* and *c*
- 6. unsure

Question 4

If your search strategy for a research paper on "intellectual freedom" is **first to look at general works, and next to examine more specific works**, in what **order** would you consult the following literature?

- 1. books, research articles, encyclopedias
- 2. encyclopedias, books, research articles
- 3. research articles, books, encyclopedias
- 4. research articles, encyclopedias, books
- 5. unsure

Question 5

Library catalogues **do not** contain records for:

- 1. books that are signed out
- 2. journals
- 3. resources found only on the Web
- 4. individual journal articles
- 5. official government documents
- 6. unsure

Question 6

When you perform an **author search** in a library catalogue, you are asking for:

- 1. all the books and articles ever written by a particular author
- 2. all the books and articles by a particular author that are held by the library
- 3. the library's holdings of all of the scholarly works an author has written or contributed to
- 4. all catalogued materials written by a particular author that are held by the library
- 5. unsure

Question 7

Most library catalogues allow you to search by:

- 1. author
- 2. ISBN
- 3. publisher
- 4. call number
- 5. *a* and *d*
- 6. *a*, *c*, and *d*
- 7. unsure

Question 8

When using an online database, **subject searching** is usually **more precise** than **keyword searching**.

- 1. true
- 2. false
- 3. unsure

Question 9

In the Library, **call numbers**:

- 1. are only assigned to books
- 2. are needed to place a book on hold
- 3. are library inventory numbers
- 4. tell you where items are located
- 5. unsure

Question 10

Since the purpose of classification systems is to organize materials so that similar materials are collected together, often the **most useful** arrangement classifies according to:

- 1. title
- 2. physical format
- 3. subject
- 4. author
- 5. all of the above
- 6. unsure

Question 11

Choose the best source for finding information about the most recent studies on "the effects of alcohol on fetuses."

- 1. encyclopedias
 - 2. newspapers
 - 3. journal articles
 - 4. government documents
 - 5. unsure
-

Question 12

Which of these kinds of information are **NOT** usually found in reference sources?

- 1. statistical tables
 - 2. lengthy biographical data
 - 3. lengthy analyses of historical events
 - 4. comprehensive bibliographies
 - 5. unsure
-

Question 13

What is the best source for finding statistical information related to "population demographics in Canada"?

- 1. encyclopedias
 - 2. newspapers
 - 3. journal articles
 - 4. government documents
 - 5. unsure
-

Question 14

Choose the best source for finding general information about Venezuela."

- 1. geographical atlases
 - 2. newspapers
 - 3. journal articles
 - 4. government documents
 - 5. encyclopedias
 - 6. all of the above
 - 7. unsure
-

Question 15

What is the best source for finding information about a "recent local issue in Quebec"?

- 1. the Internet
- 2. newspapers
- 3. journal articles
- 4. government documents
- 5. unsure

Question 16

Which type of reference tool gives names, addresses, and occasionally activities associated with **individuals and organizations**?

- 1. a diary
 - 2. a handbook
 - 3. a directory
 - 4. a catalogue
 - 5. unsure
-

Question 17

A **thesaurus** is a book that:

- 1. lists college and university theses
 - 2. lists words and their history
 - 3. lists words and their synonyms
 - 4. lists alternate spellings of words
 - 5. unsure
-

Question 18

A **biography** is:

- 1. a list of resources referenced in an article
 - 2. a written account of a biologist's life
 - 3. a genealogical term meaning "family tree"
 - 4. a written account of a person's life
 - 5. unsure
-

Question 19

When would you use an online index or database?

- 1. to find citations to announcements of upcoming conferences and published conference proceedings
 - 2. to find citations to submitted articles awaiting peer review
 - 3. to search for materials available at a specific library
 - 4. to find citations to articles and conference papers on a specific subject
 - 5. unsure
-

Question 20

What information does the abstract of an article provide?

- 1. the name of the journal, the author, and publication information
 - 2. a brief summary of the article's contents
 - 3. general information about the article and its author
 - 4. none of the above
 - 5. unsure
-

Question 21

Which of these factors is **least important** in selecting the best journal article index or database for your research?

- 1. your topic
 - 2. your preference for full-text databases
 - 3. the publication dates covered by the index or database
 - 4. whether you need scholarly information or information from the popular press
 - 5. unsure
-

Question 22

When searching an electronic database, **truncating** a search term means:

- 1. abbreviating the first part of a keyword and inserting a symbol (usually *) **to retrieve fewer hits**
- 2. abbreviating the first part of a keyword and inserting a symbol (usually *) **to get any variant spellings or word endings**
- 3. abbreviating the first part of a keyword and inserting a symbol (usually *) **to retrieve terms from a variant root**
- 4. abbreviating the first part of a keyword and inserting a symbol (usually *) **to retrieve only items that are singular or plural**
- 5. unsure

Question 23

When using a library online database, which of these searches will retrieve the **most** records?

- 1. cognition AND emotion
- 2. cognition OR emotion
- 3. cognition NOT emotion
- 4. cognition OR emotion OR feelings
- 5. cognition AND (emotion OR feelings)
- 6. unsure

Question 24

Searching the phrase **"tree OR frog"** in an online database retrieves a list of items containing **"tree"**, items containing **"frog"**, and items containing **both** terms.

- 1. true
- 2. false
- 3. unsure

Question 25

Searching for **"pollution AND water"** in an online database retrieves items that contain BOTH **"pollution"** and **"water"**, as well as items that contain ONLY **"pollution"** or ONLY **"water"**.

- 1. true
- 2. false
- 3. unsure

Question 26

What is **not true** about the following URL:

<http://www.youruniversity.ca/lib/guides/citation-styles.asp>

- 1. it refers to a file residing on a university website
- 2. it refers to a file that must be read using software called "ASP"
- 3. it refers to a website based in Canada
- 4. it refers to a file located in a subdirectory named "guides"
- 5. it refers to a file accessed with software called "HTTP"
- 6. unsure

Question 27

A software program that sends, receives, formats, and displays the data needed to view a Web document is:

- 1. a webviewer
 - 2. a browser
 - 3. an explorer
 - 4. an HTML script
 - 5. unsure
-

Question 28

In the Web environment, **cookies**:

- 1. allow unscrupulous types to obtain your social insurance number and other personal information without your knowledge
 - 2. can wipe out your hard disk
 - 3. can track what you browse at a particular site
 - 4. can identify your personal search preferences, thereby making your searches more efficient
 - 5. all of the above
 - 6. a and c
 - 7. unsure
-

Question 29

Which is the **correct definition** for FTP?

- 1. File Transfer Protocol -- a way to transfer files from one computer to another on the Internet
 - 2. File Transfer Profile -- a description of a common method for transferring files on the Internet
 - 3. File Transfer Password -- a security measure preventing unauthorized access to files transferred on the Internet
 - 4. Forward Text Protocol -- a method for setting up automatic forwarding of selected texts or messages on the Internet
 - 5. unsure
-

Question 30

Which of these statements best describes information on the Web?

- 1. information is organized by server location
 - 2. information is selected through an algorithmic review process
 - 3. information is in a constantly updated permanent collection
 - 4. all of the above
 - 5. none of the above
 - 6. unsure
-

Question 31

A Web directory:

- 1. categorizes webpages according to their subjects
- 2. is the Web equivalent of a printed telephone directory
- 3. provides a way for subject experts to search the Web efficiently
- 4. a and c
- 5. all of the above
- 6. unsure

Question 32

Please choose the source of the following citation:

Canada. Health Canada. Guidelines and Recommendations on the Prevention and Control of Hepatitis C. Ottawa: Health Canada, 1995.

- 1. a journal article
 - 2. a newspaper article
 - 3. a web page
 - 4. a government document
 - 5. a book
 - 6. a chapter in a book
 - 7. unsure
-

Question 33

Please choose the source of the following citation:

Taylor, Paul. "Keyboard Grief: Coping with Computer-Caused Injuries." Globe and Mail [Toronto] 27 Dec. 1993:A1+

- 1. a journal article
 - 2. a newspaper article
 - 3. a web page
 - 4. a government document
 - 5. a book
 - 6. a chapter in a book
 - 7. unsure
-

Question 34

How would you search the Library catalogue to see if the Library owns the article referenced in the following citation?

Albrecht, K. (2001). "The True Information Survival Skills." Training and Development, 55(2), 24-27.

- 1. by the title "The True Information Survival Skills"
 - 2. by the subjects "information" and "survival skills"
 - 3. by the author K. Albrecht
 - 4. by the title "Training and Development"
 - 5. unsure
-

Question 35

Please choose the source of the following citation:

Sundstrom, Liselotte. Ant sex ratios. Nature, 370: 6487 (1994): 257-259.

- 1. a journal article
- 2. a newspaper article
- 3. a web page
- 4. a government document
- 5. a book
- 6. a chapter in a book
- 7. unsure

Question 36

Which of these would help you best judge the **authority** or **validity** of a website?

- 1. the layout of the site
- 2. the date the site was last updated
- 3. the sponsor or author of the site
- 4. the quality of the graphics
- 5. *b* and *c*
- 6. *a* and *c*
- 7. unsure

Question 37

Which of these **does NOT** describe a popular magazine?

- 1. articles are written for the general public
- 2. articles contain in-depth discussions and list sources consulted
- 3. there are lots of photographs and advertisements
- 4. articles are written by journalists or freelance writers
- 5. unsure

Question 38

Which of these describes an article published in a scholarly periodical?

- 1. the article contains a list of works cited (or references)
- 2. the article is written by a professional writer who makes a living by publishing articles on a wide variety of current topics
- 3. the article is published in a journal with a narrow topic focus meant for a specific, knowledgeable audience
- 4. both *a* and *c*
- 5. both *b* and *c*
- 6. unsure

Question 39

Which of these is **NOT** a good strategy for avoiding plagiarism?

- 1. document sources in the text of your essay by putting quotation marks around the exact quote
- 2. cite your sources in a reference list at the end of your paper
- 3. paraphrase ideas rather than copying words directly
- 4. take accurate notes about where you found specific ideas
- 5. unsure

Question 40

An academic library's **interlibrary loan** service allows patrons to:

- 1. borrow books for recreational reading
- 2. borrow restricted materials from other libraries
- 3. borrow materials from other libraries when the home library's copy is out on loan
- 4. borrow materials required for study and research that are not owned by the home library
- 5. all of the above
- 6. *c* and *d*
- 7. unsure

Appendix 10: DiaryClient Questions

Question: 1 Please fill out a new diary entry each time you pursue a new subject search. For each of the following questions, please highlight the best answer(s) and/or provide your response in the Comments box as appropriate, then click on 'Next Question' to continue.

Question: 2 What is the topic of your subject search?

Comments

Question: 3 What specific question(s) are you trying to address?

Comments

Question: 4 How much knowledge of the topic of your subject search do you presently have? Please select only one answer.

Comments

Pick List

- 1 Extensive knowledge
- 2 Good knowledge
- 3 Moderate knowledge
- 4 Very little knowledge
- 5 No knowledge

Question: 5 Before starting your subject search, how easy or difficult do you expect your subject searching will be? Please select only one answer.

Comments

Pick List

- 1 Extremely easy
- 2 Somewhat easy
- 3 Neither easy nor difficult
- 4 Somewhat difficult
- 5 Extremely difficult

Question: 6 How soon do you need this information? Please select only one answer.

Comments

Pick List

- 1 Today
- 2 Tomorrow
- 3 This week
- 4 Within 2 weeks
- 5 Within 3 weeks
- 6 Within 4 weeks
- 7 Within the next 2 months
- 8 Sometime this semester
- 9 Sometime this year
- 10 Other (In the Comments box please explain)**

Question: 7 For which course(s) do you need this information?

Comments

Question: 8 Do you need this information for a specific class assignment? (Please highlight 'Yes' or 'No')

Comments

Pick List

1 Yes (Please describe the assignment briefly in the Comments box. Your next question will be 10.)

2 No

Question: 9 You answered 'No' to the previous question (information needed for specific assignment?). In the Comments box please explain briefly why you need this information. Your next question will be 12.

Comments

Question: 10 For what type of assignment do you need to complete your subject search? Please select one answer that best describes the type of assignment you are working on.

Comments

Pick List

- 1 Class presentation
- 2 Class discussion
- 3 Course exam
- 4 Research paper proposal
- 5 Short research paper (fewer than 10 pages)
- 6 Medium-length research paper (between 11 and 20 pages)
- 7 Long research paper (more than 20 pages)
- 8 Annotated bibliography
- 9 Selected literature review
- 10 Comprehensive literature review
- 11 Other (In the Comments box please explain)

Question: 11 If your subject search is for a research paper, please select one of the following that best indicates your present stage of preparing a research paper:

Comments

Pick List

- 1 Just beginning to think about my research paper and what it will entail
- 2 Generating and selecting some possible topics for my paper
- 3 Exploring the types and amount of information available on the topics I'm considering for my paper
- 4 Formulating a thesis statement describing precisely the topic I've chosen for my paper
- 5 Collecting information I need to support the thesis statement I've developed for my paper
- 6 Using the information I've gathered to write my paper
- 7 Other (In the Comments box please explain)

Question: 12 What type of information are you seeking? Please select all that apply (hold <CTRL> while you make multiple selections), and provide comments if you wish.

Comments

Pick List

- 1 Basic definition(s)
- 2 Brief information
- 3 Advice or guidance on how to go about obtaining the information I'm seeking
- 4 Books
- 5 Journal articles
- 6 Internet sources
- 7 Sources that index or could lead to information on my topic
- 8 Information provided by a person or persons via interviews
- 9 Names of people or researchers known to be experts in the area of my subject search
- 10 Other (In the Comments box please explain)

Question: 13 How much information (e.g., facts, definitions, books and articles on your topic, citations to books and articles on your topic) do you think you will need? Please select only one answer, and indicate in the Comments box how you will know when you have enough information.

Comments

Pick List

- 1 Just one piece of information
- 2 Between 2 and 5 pieces of information
- 3 Between 6 and 10 pieces of information
- 4 Between 11 and 20 pieces of information
- 5 Between 21 and 50 pieces of information
- 6 More than 50 pieces of information
- 7 I don't know how much information I will need
- 8 Other (In the Comments box please explain)

Question: 14 Questions 14a to 14h ask about the 1st source you consulted or used while conducting your subject search.

Question: 14a What type of source did you first consult or use? Please select only one answer.

Comments

Pick List

- 1 [home university] course/lab/tutorial instructor
- 2 Another [home university] student
- 3 A [home university] Library staff member
- 4 Someone other than a [home university] instructor, student or Library staff member (In the Comments box please state why you chose this person)
- 5 Library online catalogue (In the Comments box please indicate the institution to which this catalogue belongs)
- 6 Online index to journal or research literature (In the Comments box please provide the name of this index)
- 7 Full-text database (In the Comments box please provide the name of this database)
- 8 Internet search engine (In the Comments box please provide the name of this search engine)
- 9 Printed resource (In the Comments box please provide the title and briefly describe this resource)
- 10 Other (In the Comments box please explain)

Question: 14b Why did you choose this source?

Comments

Question: 14c What questions did you ask, or, what are some search terms or search approaches you used?

Comments

Question: 14d To what extent was this source useful in finding information relevant to your subject search? Please select only one answer, and indicate reasons for your selection in the Comments box.

Comments

Pick List

- 1 Completely useful
- 2 Mostly useful
- 3 Moderately useful
- 4 Mostly useless
- 5 Completely useless (Your next question will be 14f)
- 6 Other (In the Comments box please explain)

Question: 14e If this source was at least somewhat helpful, in what ways was it helpful? Please select all that apply (hold <CTRL> while you make multiple selections).

Comments

Pick List

- 1 It answered a question
- 2 It suggested other new sources to check
- 3 It provided details needed to locate relevant documents or information
- 4 It provided full-text information relevant to my topic
- 5 It provided information about relevant sources I had already identified
- 6 It suggested to me that the information I am seeking may not be available
- 7 Other (In the Comments box please explain)

Question: 14f How easy or difficult was this source to consult or use? Please select only one answer. What made this source easy or difficult to use? (Please indicate your thoughts in the Comments box).

Comments

Pick List

- 1 Extremely easy
- 2 Moderately easy
- 3 Neither easy nor difficult
- 4 Moderately difficult
- 5 Extremely difficult

Question: 14g How important is this source to the success of your subject search? Please select only one answer.

Comments

Pick List

- 1 Critically important
- 2 Mostly important
- 3 Moderately important
- 4 Only slightly important
- 5 Unimportant

Question: 14h Did you consult or use another source while conducting this subject search?

Comments

Pick List

- 1 Yes
- 2 No (Your next question will be 24)

Question: 15 Questions 15a to 15h ask about the 2nd source you consulted or used while conducting your subject search.

Question: 15a What type of source did you first consult or use? Please select only one answer.

Comments

Pick List

- 1 [home university] course/lab/tutorial instructor
- 2 Another [home university] student
- 3 A [home university] Library staff member
- 4 Someone other than a [home university] instructor, student or Library staff member (In the Comments box please state why you chose this person)
- 5 Library online catalogue (In the Comments box please indicate the institution to which this catalogue belongs)
- 6 Online index to journal or research literature (In the Comments box please provide the name of this index)

7 Full-text database (In the Comments box please provide the name of this database)

8 Internet search engine (In the Comments box please provide the name of this search engine)

9 Printed resource (In the Comments box please provide the title and briefly describe this resource)

10 Other (In the Comments box please explain)

Question: 15b Why did you choose this source?

Comments

Question: 15c What questions did you ask, or, what are some search terms or search approaches you used?

Comments

Question: 15d To what extent was this source useful in finding information relevant to your subject search?

Please select only one answer, and indicate reasons for your selection in the Comments box.

Comments

Pick List

1 Completely useful

2 Mostly useful

3 Moderately useful

4 Mostly useless

5 Completely useless (Your next question will be 15f)

6 Other (In the Comments box please explain)

Question: 15e If this source was at least somewhat helpful, in what ways was it helpful? Please select all that apply (hold <CTRL> while you make multiple selections).

Comments

Pick List

1 It answered a question

2 It suggested other new sources to check

3 It provided details needed to locate relevant documents or information

4 It provided full-text information relevant to my topic

5 It provided information about relevant sources I had already identified

6 It suggested to me that the information I am seeking may not be available

7 Other (In the Comments box please explain)

Question: 15f How easy or difficult was this source to consult or use? Please select only one answer. What made this source easy or difficult to use? (Please indicate your thoughts in the Comments box).

Comments

Pick List

1 Extremely easy

2 Moderately easy

3 Neither easy nor difficult

4 Moderately difficult

5 Extremely difficult

Question: 15g How important is this source to the success of your subject search? Please select only one answer.

Comments

Pick List

1 Critically important

2 Mostly important

3 Moderately important

- 4 Only slightly important
- 5 Unimportant

Question: 15h Did you consult or use another source while conducting this subject search?

Comments

Pick List

- 1 Yes
- 2 No (Your next question will be 24)

Question: 16 Questions 16a to 16h ask about the 3rd source you consulted or used while conducting your subject search.

Question: 16a What type of source did you first consult or use? Please select only one answer.

Comments

Pick List

- 1 [home university] course/lab/tutorial instructor
- 2 Another [home university] student
- 3 A [home university] Library staff member
- 4 Someone other than a [home university] instructor, student or Library staff member (In the Comments box please state why you chose this person)
- 5 Library online catalogue (In the Comments box please indicate the institution to which this catalogue belongs)
- 6 Online index to journal or research literature (In the Comments box please provide the name of this index)
- 7 Full-text database (In the Comments box please provide the name of this database)
- 8 Internet search engine (In the Comments box please provide the name of this search engine)
- 9 Printed resource (In the Comments box please provide the title and briefly describe this resource)
- 10 Other (In the Comments box please explain)

Question: 16b Why did you choose this source?

Comments

Question: 16c What questions did you ask, or, what are some search terms or search approaches you used?

Comments

Question: 16d To what extent was this source useful in finding information relevant to your subject search? Please select only one answer, and indicate reasons for your selection in the Comments box.

Comments

Pick List

- 1 Completely useful
- 2 Mostly useful
- 3 Moderately useful
- 4 Mostly useless
- 5 Completely useless (Your next question will be 16f)
- 6 Other (In the Comments box please explain)

Question: 16e If this source was at least somewhat helpful, in what ways was it helpful? Please select all that apply.

Comments

Pick List

- 1 It answered a question
- 2 It suggested other new sources to check

- 3 It provided details needed to locate relevant documents or information
- 4 It provided full-text information relevant to my topic
- 5 It provided information about relevant sources I had already identified
- 6 It suggested to me that the information I am seeking may not be available
- 7 Other (In the Comments box please explain)

Question: 16f How easy or difficult was this source to consult or use? Please select only one answer. What made this source easy or difficult to use? (Please indicate your thoughts in the Comments box).

Comments

Pick List

- 1 Extremely easy
- 2 Moderately easy
- 3 Neither easy nor difficult
- 4 Moderately difficult
- 5 Extremely difficult

Question: 16g How important is this source to the success of your subject search? Please select only one answer.

Comments

Pick List

- 1 Critically important
- 2 Mostly important
- 3 Moderately important
- 4 Only slightly important
- 5 Unimportant

Question: 16h Did you consult or use another source while conducting this subject search?

Comments

Pick List

- 1 Yes
- 2 No (Your next question will be 24)

Question: 17 Questions 17a to 17h ask about the 4th source you consulted or used while conducting your subject search.

Question: 17a What type of source did you first consult or use? Please select only one answer.

Comments

Pick List

- 1 [home university] course/lab/tutorial instructor
- 2 Another [home university] student
- 3 A [home university] Library staff member
- 4 Someone other than a [home university] instructor, student or Library staff member (In the Comments box please state why you chose this person)
- 5 Library online catalogue (In the Comments box please indicate the institution to which this catalogue belongs)
- 6 Online index to journal or research literature (In the Comments box please provide the name of this index)
- 7 Full-text database (In the Comments box please provide the name of this database)
- 8 Internet search engine (In the Comments box please provide the name of this search engine)
- 9 Printed resource (In the Comments box please provide the title and briefly describe this resource)
- 10 Other (In the Comments box please explain)

Question: 17b Why did you choose this source?

Comments

Question: 17c What questions did you ask, or, what are some search terms or search approaches you used?

Comments

Question: 17d To what extent was this source useful in finding information relevant to your subject search? Please select only one answer, and indicate reasons for your selection in the Comments box.

Comments

Pick List

- 1 Completely useful
- 2 Mostly useful
- 3 Moderately useful
- 4 Mostly useless
- 5 Completely useless (Your next question will be 17f)
- 6 Other (In the Comments box please explain)

Question: 17e If this source was at least somewhat helpful, in what ways was it helpful? Please select all that apply (hold <CTRL> while you make multiple selections).

Comments

Pick List

- 1 It answered a question
- 2 It suggested other new sources to check
- 3 It provided details needed to locate relevant documents or information
- 4 It provided full-text information relevant to my topic
- 5 It provided information about relevant sources I had already identified
- 6 It suggested to me that the information I am seeking may not be available
- 7 Other (In the Comments box please explain)

Question: 17f How easy or difficult was this source to consult or use? Please select only one answer. What made this source easy or difficult to use? (Please indicate your thoughts in the Comments box).

Comments

Pick List

- 1 Extremely easy
- 2 Moderately easy
- 3 Neither easy nor difficult
- 4 Moderately difficult
- 5 Extremely difficult

Question: 17g How important is this source to the success of your subject search? Please select only one answer.

Comments

Pick List

- 1 Critically important
- 2 Mostly important
- 3 Moderately important
- 4 Only slightly important
- 5 Unimportant

Question: 17h Did you consult or use another source while conducting this subject search?

Comments

Pick List

Question: 18 Questions 18a to 18h ask about the 5th source you consulted or used while conducting your subject search.

Comments

Pick List

Question: 18a What type of source did you first consult or use? Please select only one answer.

Question: 18b Why did you choose this source?

*Comments**Pick List*

- 1 [home university] course/lab/tutorial instructor
- 2 Another [home university] student
- 3 A [home university] Library staff member
- 4 Someone other than a [home university] instructor, student or Library staff member (In the Comments box please state why you chose this person)
- 5 Library online catalogue (In the Comments box please indicate the institution to which this catalogue belongs)
- 6 Online index to journal or research literature (In the Comments box please provide the name of this index)
- 7 Full-text database (In the Comments box please provide the name of this database)
- 8 Internet search engine (In the Comments box please provide the name of this search engine)
- 9 Printed resource (In the Comments box please provide the title and briefly describe this resource)
- 10 Other (In the Comments box please explain)

Question: 18c What questions did you ask, or, what are some search terms or search approaches you used?

Comments

Question: 18d To what extent was this source useful in finding information relevant to your subject search? Please select only one answer, and indicate reasons for your selection in the Comments box.

*Comments**Pick List*

- 1 Completely useful
- 2 Mostly useful
- 3 Moderately useful
- 4 Mostly useless
- 5 Completely useless (Your next question will be 18f)
- 6 Other (In the Comments box please explain)

Question: 18e If this source was at least somewhat helpful, in what ways was it helpful? Please select all that apply (hold <CTRL> while you make multiple selections).

*Comments**Pick List*

- 1 It answered a question
- 2 It suggested other new sources to check
- 3 It provided details needed to locate relevant documents or information
- 4 It provided full-text information relevant to my topic
- 5 It provided information about relevant sources I had already identified
- 6 It suggested to me that the information I am seeking may not be available
- 7 Other (In the Comments box please explain)

Question: 18f How easy or difficult was this source to consult or use? Please select only one answer. What made this source easy or difficult to use? (Please indicate your thoughts in the Comments box).

Comments

Pick List

- 1 Extremely easy
- 2 Moderately easy
- 3 Neither easy nor difficult
- 4 Moderately difficult
- 5 Extremely difficult

Question: 18g How important is this source to the success of your subject search? Please select only one answer.

*Comments**Pick List*

- 1 Critically important
- 2 Mostly important
- 3 Moderately important
- 4 Only slightly important
- 5 Unimportant

Question: 18h Did you consult or use another source while conducting this subject search?

*Comments**Pick List*

- 1 Yes
- 2 No (Your next question will be 24)

Question: 19 Questions 19a to 19h ask about the 6th source you consulted or used while conducting your subject search.

Question: 19a What type of source did you first consult or use? Please select only one answer.

*Comments**Pick List*

- 1 [home university] course/lab/tutorial instructor
- 2 Another [home university] student
- 3 A [home university] Library staff member
- 4 Someone other than a [home university] instructor, student or Library staff member (In the Comments box please state why you chose this person)
- 5 Library online catalogue (In the Comments box please indicate the institution to which this catalogue belongs)
- 6 Online index to journal or research literature (In the Comments box please provide the name of this index)
- 7 Full-text database (In the Comments box please provide the name of this database)
- 8 Internet search engine (In the Comments box please provide the name of this search engine)
- 9 Printed resource (In the Comments box please provide the title and briefly describe this resource)
- 10 Other (In the Comments box please explain)

Question: 19b Why did you choose this source?

Comments

Question: 19c What questions did you ask, or, what are some search terms or search approaches you used?

Comments

Question: 19d To what extent was this source useful in finding information relevant to your subject search? Please select only one answer, and indicate reasons for your selection in the Comments box.

Comments

Pick List

- 1 Completely useful
- 2 Mostly useful
- 3 Moderately useful
- 4 Mostly useless
- 5 Completely useless (Your next question will be 19f)
- 6 Other (In the Comments box please explain)

Question: 19e If this source was at least somewhat helpful, in what ways was it helpful? Please select all that apply (hold <CTRL> while you make multiple selections).

*Comments**Pick List*

- 1 It answered a question
- 2 It suggested other new sources to check
- 3 It provided details needed to locate relevant documents or information
- 4 It provided full-text information relevant to my topic
- 5 It provided information about relevant sources I had already identified
- 6 It suggested to me that the information I am seeking may not be available
- 7 Other (In the Comments box please explain)

Question: 19f How easy or difficult was this source to consult or use? Please select only one answer. What made this source easy or difficult to use? (Please indicate your thoughts in the Comments box).

*Comments**Pick List*

- 1 Extremely easy
- 2 Moderately easy
- 3 Neither easy nor difficult
- 4 Moderately difficult
- 5 Extremely difficult

Question: 19g How important is this source to the success of your subject search? Please select only one answer.

*Comments**Pick List*

- 1 Critically important
- 2 Mostly important
- 3 Moderately important
- 4 Only slightly important
- 5 Unimportant

Question: 19h Did you consult or use another source while conducting this subject search?

*Comments**Pick List*

- 1 Yes
- 2 No (Your next question will be 24)

Question: 20 Questions 20a to 20h ask about the 7th source you consulted or used while conducting your subject search.

Question: 20a What type of source did you first consult or use? Please select only one answer.

*Comments**Pick List*

- 1 [home university] course/lab/tutorial instructor
- 2 Another [home university] student

- 3 A [home university] Library staff member
- 4 Someone other than a [home university] instructor, student or Library staff member (In the Comments box please state why you chose this person)
- 5 Library online catalogue (In the Comments box please indicate the institution to which this catalogue belongs)
- 6 Online index to journal or research literature (In the Comments box please provide the name of this index)
- 7 Full-text database (In the Comments box please provide the name of this database)
- 8 Internet search engine (In the Comments box please provide the name of this search engine)
- 9 Printed resource (In the Comments box please provide the title and briefly describe this resource)
- 10 Other (In the Comments box please explain)

Question: 20b Why did you choose this source?

Comments

Question: 20c What questions did you ask, or, what are some search terms or search approaches you used?

Comments

Question: 20d To what extent was this source useful in finding information relevant to your subject search? Please select only one answer, and indicate reasons for your selection in the Comments box.

Comments

Pick List

- 1 Completely useful
- 2 Mostly useful
- 3 Moderately useful
- 4 Mostly useless
- 5 Completely useless (Your next question will be 20f)
- 6 Other (In the Comments box please explain)

Question: 20e If this source was at least somewhat helpful, in what ways was it helpful? Please select all that apply (hold <CTRL> while you make multiple selections).

Comments

Pick List

- 1 It answered a question
- 2 It suggested other new sources to check
- 3 It provided details needed to locate relevant documents or information
- 4 It provided full-text information relevant to my topic
- 5 It provided information about relevant sources I had already identified
- 6 It suggested to me that the information I am seeking may not be available
- 7 Other (In the Comments box please explain)

Question: 20f How easy or difficult was this source to consult or use? Please select only one answer. What made this source easy or difficult to use? (Please indicate your thoughts in the Comments box).

Comments

Pick List

- 1 Extremely easy
- 2 Moderately easy
- 3 Neither easy nor difficult
- 4 Moderately difficult
- 5 Extremely difficult

Question: 20g How important is this source to the success of your subject search? Please select only one answer.

Comments

Pick List

- 1 Critically important
- 2 Mostly important
- 3 Moderately important
- 4 Only slightly important
- 5 Unimportant

Question: 20h Did you consult or use another source while conducting this subject search?

Comments

Pick List

- 1 Yes
- 2 No (Your next question will be 24)

Question: 21 Questions 21a to 21h ask about the 8th source you consulted or used while conducting your subject search.

Question: 21a What type of source did you first consult or use? Please select only one answer.

Comments

Pick List

- 1 [home university] course/lab/tutorial instructor
- 2 Another [home university] student
- 3 A [home university] Library staff member
- 4 Someone other than a [home university] instructor, student or Library staff member (In the Comments box please state why you chose this person)
- 5 Library online catalogue (In the Comments box please indicate the institution to which this catalogue belongs)
- 6 Online index to journal or research literature (In the Comments box please provide the name of this index)
- 7 Full-text database (In the Comments box please provide the name of this database)
- 8 Internet search engine (In the Comments box please provide the name of this search engine)
- 9 Printed resource (In the Comments box please provide the title and briefly describe this resource)
- 10 Other (In the Comments box please explain)

Question: 21b Why did you choose this source?

Comments

Question: 21c What questions did you ask, or, what are some search terms or search approaches you used?

Comments

Question: 21d To what extent was this source useful in finding information relevant to your subject search? Please select only one answer, and indicate reasons for your selection in the Comments box.

Comments

Pick List

- 1 Completely useful
- 2 Mostly useful
- 3 Moderately useful
- 4 Mostly useless
- 5 Completely useless (Your next question will be 21f)
- 6 Other (In the Comments box please explain)

Question: 21e If this source was at least somewhat helpful, in what ways was it helpful? Please select all that apply (hold <CTRL> while you make multiple selections).

Comments

Pick List

- 1 It answered a question
- 2 It suggested other new sources to check
- 3 It provided details needed to locate relevant documents or information
- 4 It provided full-text information relevant to my topic
- 5 It provided information about relevant sources I had already identified
- 6 It suggested to me that the information I am seeking may not be available
- 7 Other (In the Comments box please explain)

Question: 21f How easy or difficult was this source to consult or use? Please select only one answer. What made this source easy or difficult to use? (Please indicate your thoughts in the Comments box).

Comments

Pick List

- 1 Extremely easy
- 2 Moderately easy
- 3 Neither easy nor difficult
- 4 Moderately difficult
- 5 Extremely difficult

Question: 21g How important is this source to the success of your subject search? Please select only one answer.

Comments

Pick List

- 1 Critically important
- 2 Mostly important
- 3 Moderately important
- 4 Only slightly important
- 5 Unimportant

Question: 21h Did you consult or use another source while conducting this subject search?

Comments

Pick List

- 1 Yes
- 2 No (Your next question will be 24)

Question: 22 Questions 22a to 22h ask about the 9th source you consulted or used while conducting your subject search.

Question: 22a What type of source did you first consult or use? Please select only one answer.

Comments

Pick List

- 1 [home university] course/lab/tutorial instructor
- 2 Another [home university] student
- 3 A [home university] Library staff member
- 4 Someone other than a [home university] instructor, student or Library staff member (In the Comments box please state why you chose this person)
- 5 Library online catalogue (In the Comments box please indicate the institution to which this catalogue belongs)
- 6 Online index to journal or research literature (In the Comments box please provide the name of this index)

7 Full-text database (In the Comments box please provide the name of this database)

8 Internet search engine (In the Comments box please provide the name of this search engine)

9 Printed resource (In the Comments box please provide the title and briefly describe this resource)

10 Other (In the Comments box please explain)

Question: 22b Why did you choose this source?

Comments

Question: 22c What questions did you ask, or, what are some search terms or search approaches you used?

Comments

Question: 22d To what extent was this source useful in finding information relevant to your subject search? Please select only one answer, and indicate reasons for your selection in the Comments box.

Comments

Pick List

1 Completely useful

2 Mostly useful

3 Moderately useful

4 Mostly useless

5 Completely useless (Your next question will be 22f)

6 Other (In the Comments box please explain)

Question: 22e If this source was at least somewhat helpful, in what ways was it helpful? Please select all that apply (hold <CTRL> while you make multiple selections).

Comments

Pick List

1 It answered a question

2 It suggested other new sources to check

3 It provided details needed to locate relevant documents or information

4 It provided full-text information relevant to my topic

5 It provided information about relevant sources I had already identified

6 It suggested to me that the information I am seeking may not be available

7 Other (In the Comments box please explain)

Question: 22f How easy or difficult was this source to consult or use? Please select only one answer. What made this source easy or difficult to use? (Please indicate your thoughts in the Comments box).

Comments

Pick List

1 Extremely easy

2 Moderately easy

3 Neither easy nor difficult

4 Moderately difficult

5 Extremely difficult

Question: 22g How important is this source to the success of your subject search? Please select only one answer.

Comments

Pick List

1 Critically important

2 Mostly important

3 Moderately important

- 4 Only slightly important
- 5 Unimportant

Question: 22h Did you consult or use another source while conducting this subject search?

Comments

Pick List

- 1 Yes
- 2 No (Your next question will be 24)

Question: 23 Questions 23a to 23h ask about the 10th source you consulted or used while conducting your subject search.

Question: 23a What type of source did you first consult or use? Please select only one answer.

Comments

Pick List

- 1 [home university] course/lab/tutorial instructor
- 2 Another [home university] student
- 3 A [home university] Library staff member
- 4 Someone other than a [home university] instructor, student or Library staff member (In the Comments box please state why you chose this person)
- 5 Library online catalogue (In the Comments box please indicate the institution to which this catalogue belongs)
- 6 Online index to journal or research literature (In the Comments box please provide the name of this index)
- 7 Full-text database (In the Comments box please provide the name of this database)
- 8 Internet search engine (In the Comments box please provide the name of this search engine)
- 9 Printed resource (In the Comments box please provide the title and briefly describe this resource)
- 10 Other (In the Comments box please explain)

Question: 23b Why did you choose this source?

Comments

Question: 23c What questions did you ask, or, what are some search terms or search approaches you used?

Comments

Question: 23d To what extent was this source useful in finding information relevant to your subject search? Please select only one answer, and indicate reasons for your selection in the Comments box.

Comments

Pick List

- 1 Completely useful
- 2 Mostly useful
- 3 Moderately useful
- 4 Mostly useless
- 5 Completely useless (Your next question will be 23f)
- 6 Other (In the Comments box please explain)

Question: 23e If this source was at least somewhat helpful, in what ways was it helpful? Please select all that apply (hold <CTRL> while you make multiple selections).

Comments

Pick List

- 1 It answered a question
- 2 It suggested other new sources to check
- 3 It provided details needed to locate relevant documents or information
- 4 It provided full-text information relevant to my topic
- 5 It provided information about relevant sources I had already identified
- 6 It suggested to me that the information I am seeking may not be available
- 7 Other (In the Comments box please explain)

Question: 23f How easy or difficult was this source to consult or use? Please select only one answer. What made this source easy or difficult to use? (Please indicate your thoughts in the Comments box).

Comments

Pick List

- 1 Extremely easy
- 2 Moderately easy
- 3 Neither easy nor difficult
- 4 Moderately difficult
- 5 Extremely difficult

Question: 23g How important is this source to the success of your subject search? Please select only one answer.

Comments

Pick List

- 1 Critically important
- 2 Mostly important
- 3 Moderately important
- 4 Only slightly important
- 5 Unimportant

Question: 23h Did you consult or use additional sources while conducting this subject search? If you select 'Yes', in the Comments box please indicate the approximate number and types of additional sources you used.

Comments

Pick List

- 1 Yes
- 2 No (Your next question will be 24)

Question: 24 Considering all resources you tried, in total about how much time did you spend on this subject search? Please select only one answer.

Comments

Pick List

- 1 A few minutes
- 2 Between 5 and 15 minutes
- 3 Between 15 and 30 minutes
- 4 Between 30 and 45 minutes
- 5 Between 45 and 60 minutes
- 6 1 to 2 hours
- 7 2 to 4 hours
- 8 4 to 6 hours
- 9 1/2 day
- 10 1 day
- 11 2 days
- 12 3 to 4 days
- 13 5 to 6 days
- 14 1 week

- 15 1 to 2 weeks
- 16 More than 2 weeks

Question: 25 Having completed your subject search, how easy or difficult was your overall subject searching process? Please select only one answer. Were there any particular challenges posed by this subject search?

Comments

Pick List

- 1 Extremely easy
- 2 Somewhat easy
- 3 Neither easy nor difficult
- 4 Somewhat difficult
- 5 Extremely difficult

Question: 26 Considering your entire subject searching process and all resources you tried, to what extent was your subject search successful? Please select only one answer and provide Comments.

Comments

Pick List

- 1 I found everything I needed
- 2 I found most of what I needed
- 3 I found some of what I needed
- 4 I only found a little bit of needed information
- 5 I didn't find anything I needed

Question: 27 Do you have any further thoughts, feelings, or observations about this subject search you wish to share?

Comments

Appendix 11: Subject Searching Demonstrations Part 1. Talk-Aloud Protocol⁵⁴

Today's session will be in two parts. In the first part which will be underway shortly, I'm going to ask you to choose a research topic from one of the courses you are taking this semester⁵⁵, and then I'll ask you to search for information on this topic using online sources of your choice while you say aloud what you are thinking to yourself during the search. After completing your demonstration of subject searching, in the second part of today's session, I will interview you briefly to further understand your subject searching processes that I observed in the first part, as well as your views on what aspects were successful and unsuccessful, and why.

Do you have any questions? Is it ok to start part 1 now? Good.

Do you have a topic in mind already that you would like to demonstrate for me as a subject search?

If not, I'd like you to choose a specific topic that a) you think you may have to conduct research on this semester, or b) a topic you had to research for a previous course that you found particularly challenging to research.

Do you have some topics in mind?

What topic would you like to use?

Now that you have chosen a topic, I would like you to search for relevant information using any online resources you can access right now, and talk aloud while you are doing this. We will use Camtasia Studio to record your entire online search activity as well as your verbal commentary. There is no right or wrong way to conduct your search, so please search in any way that feels comfortable to you, and talk aloud constantly as you go.

Let me explain in a bit more detail what I mean by "talk aloud." I'm interested in what you say to yourself as you search online for information relevant to your topic, "[]". I would like you to say aloud everything that you would otherwise say to yourself silently as you search. If you are silent for any length of time I will ask you to keep talking. Is what I would like you to do fairly clear?

Good. Before we start your subject searching task, we'll start with some warm up exercises to get you used to talking aloud. I want you to talk aloud constantly while you do these problems.

The first problem is to add two numbers in your head. Are you ok with that? Good.

Now, talk aloud constantly while you add 35 and 76 in your head.

⁵⁴ The talk aloud protocol described in Appendix 11 is an adaptation of examples provided by Ericsson and Simon (1993).

⁵⁵ Participants were asked to choose a topic which they were currently researching, or for which they had recently conducted subject searching.

Good. Let's try another one. Talk aloud constantly while you subtract 83 from 147.

Good. Now I'd like you to talk aloud constantly as you think of words that rhyme with "steep".

Good. Now we're ready for you to search online for information on your topic, "[]" while talking aloud constantly. As you conduct your searching, I want you to say aloud anything you say to yourself as you type in words and commands, move the mouse, read information on the screen, ask yourself questions, and so on.

Do you understand what I want you to do? Good. If you are silent for any length of time, I will ask you to keep talking. When you have done the best you can, let me know when you are finished.

I'll turn on the screen and audio recording program now.

Please begin.

.....

Well done. I'm going to stop the screen recording program now, because we're now finished part 1 of today's session.

Is it ok to move on to part 2 of today's session? Good. For part 2, I will use this tape recorder to record our conversation.

Appendix 12: Subject Searching Demonstrations Part 2. Focused Interview Questions

Participant: _____

Demonstration/Interview #: _____

Date: _____

1. In part 1 of today's session, the topic you selected to search for was: _____

At the end of your search, would you say your topic had changed at all, or was it still the same as the one you chose at the beginning?

2. [For 2nd and 3rd subject searching demonstration sessions only]. Describe the course assignment and subject area to which your topic in 1, above, pertains.

3. How much did you know about your topic when you began searching for information about it?
(Circle one number)

No knowledge	Very little knowledge	Moderate knowledge	Good knowledge	Extensive knowledge
1	2	3	4	5

4. At present how comfortable are you when conducting subject searching in **library catalogues**?
(Circle one number)

Extremely uncomfortable	Mostly uncomfortable	Moderately comfortable	Mostly comfortable	Extremely comfortable
1	2	3	4	5

5. At present how comfortable are you when conducting subject searching in **library online indexes and databases** (e.g., PsycINFO)? (Circle one number)

Extremely uncomfortable	Mostly uncomfortable	Moderately comfortable	Mostly comfortable	Extremely comfortable
1	2	3	4	5

6. At present how comfortable are you when conducting subject searching using **Internet search tools** (e.g., Google)? (Circle one number)

Extremely uncomfortable	Mostly uncomfortable	Moderately comfortable	Mostly comfortable	Extremely comfortable
1	2	3	4	5

7. How did you decide which documents were relevant or potentially relevant to your search topic, and which ones were not?

8. How would you rate the results of your subject searching session? (Circle one number)

Entirely unsuccessful	Mostly unsuccessful	Moderately successful	Mostly successful	Entirely successful
1	2	3	4	5

9. Of all of the sources of information you have used or would like to use to find good information on the topic you chose for today's session, what is the relative importance of **library catalogues**, compared to those other sources? (Circle one number)

Not at all important	Not very important	Moderately important	Quite important	Extremely important
1	2	3	4	5

10. Of all of the sources of information you have used or would like to use to find good information on the topic you chose for today's session, what is the relative importance of **library online indexes and databases**, compared to those other sources? (Circle one number)

Not at all important	Not very important	Moderately important	Quite important	Extremely important
1	2	3	4	5

11. Of all of the sources of information you have used or would like to use to find good information on the topic you chose for today's session, what is the relative importance of **Internet search tools**, compared to those other sources? (Circle one number)

Not at all important	Not very important	Moderately important	Quite important	Extremely important
1	2	3	4	5

12. What additional sources of information have you used or would you like to use to find good information on the topic you chose for today's session? (Please indicate *source name* and *relative importance* of each additional source, compared to other sources you used or may use)

a. Name of additional source: _____

Not at all important	Not very important	Moderately important	Quite important	Extremely important
1	2	3	4	5

b. Name of additional source: _____

Not at all important	Not very important	Moderately important	Quite important	Extremely important
1	2	3	4	5

c. Name of additional source: _____

Not at all important	Not very important	Moderately important	Quite important	Extremely important
1	2	3	4	5

13. Is there anything else you wish to say about the subject search you demonstrated today?

**Thank you for demonstrating and discussing
your subject search today!**

Appendix 13: Outline of Participants' Debriefing Session

- thank students for participating in study
- request completion of final questionnaire (see Appendix 12)
- review privacy/confidentiality of participants' identities and data, as well as data disposition when analyses are completed
- receive laptops from each participant and indicate that all personal data will be erased from the hard drives before the laptops are used again

Appendix 14: Final Questionnaire For Study Participants

1. Considering the study as a whole, approximately how much effort did you have to exert to participate in this study? (Circle one number)

almost no effort	little effort	moderate effort	major effort	overwhelming effort
1	2	3	4	5

2. To what extent did your approach to subject searching change over the course of this study? (Circle one number)

no change	little change	moderate change	major change	complete change
1	2	3	4	5

3. If you circled *1 (no change)* in response to question 2, please go to question 4. Otherwise, please explain how your approach to subject searching changed.

4. Did your understanding of subject searching in **library catalogues** change over the course of the study? (Circle one number)

no change	little change	moderate change	major change	complete change
1	2	3	4	5

5. If you circled *1 (no change)* in response to question 4, please go to question 6. Otherwise, please explain how your understanding of subject searching in library catalogues changed.

6. Did your understanding of subject searching in **library online indexes and databases** change over the course of the study? (Circle one number)

no change	little change	moderate change	major change	complete change
1	2	3	4	5

7. If you circled *1 (no change)* in response to question 6, please go to question 8. Otherwise, please explain how your understanding of subject searching in online indexes and databases changed.

8. Did your understanding of subject searching using **Internet search tools** change over the course of the study?

no change	little change	moderate change	major change	complete change
1	2	3	4	5

9. If you circled *1 (no change)* in response to question 8, please go to question 10. Otherwise, please explain how your understanding of subject searching using Internet search tools changed.

10. How would you rate your subject searching abilities in general?

Poor	Not Very Good	Moderately Good	Very Good	Excellent
1	2	3	4	5

11. How would you rate your subject searching abilities in subject areas associated with your degree major(s)?

Poor	Not Very Good	Moderately Good	Very Good	Excellent
1	2	3	4	5

Subject areas associated with your degree major(s) are:

12. Would you like to receive a summary of the results of this study when they become available? (Circle *no* or *yes*)

No

Yes

If you circled "Yes", please provide an email or mailing address to which the summary can be sent:

Name: _____ Date: _____

Thank you for completing this questionnaire!

**Please return to Rumi Graham
[Room Number]
[Name of University] Library**

Appendix 15: Final Interview Questions

1. Now that your Spring 2006 courses are finished, how close are you to completing your degree program?
2. Has participating in this case study changed how you now do subject searching? If it did, can you explain what changed?
3. How would you describe the amount of effort you needed to make to meet the various requirements of participating in this study?
4. To what extent did diarizing all of your course-related subject searching, and recording those that happened to be online searches, become fairly routine over the course of the study?
5. Although I was interested in capturing each participant's entire course-related subject searching activity over the past two semesters, I realize that is not a realistic goal. Can you estimate what percentage of your entire school studies-related subject searching you were actually able to diarize and record?
6. Over the course of the study, were there any surprises or difficulties you encountered? Was there anything you found you needed to do for the study that I hadn't explained fully at the beginning, or any study-related activity you found took more time or effort than you expected, or remained difficult to do?
7. What kinds of recommendations might you suggest for anyone who wished to conduct a study like this in the future in terms of improving the experience for participants?
8. I'm wondering if you can reflect back to a time when you did not feel particularly competent at subject searching, and then think about your current subject searching comfort level, and how that evolution occurred. Are there things you can think of that you, or the University or the Library could have done to help make that learning process easier or smoother or more effective?
9. How would you describe your overall experience as a participant in this study?

Appendix 16: Memorandum Acknowledging Receipt of Payment

I, _____, acknowledge receipt of \$200.00 paid to me for my participation in the research project entitled A Multiple Case Study Exploration of Undergraduate Subject Searching conducted by Rumi Graham, [*Name of University*] Library over the Fall 2005 and Spring 2006 semesters.

Study Participant

Date

Appendix 17: Summary of Responses to Questionnaire Items on Subject Searching

Initial Questionnaire Responses (N = 8)

<u>Question</u>	Extensive (Daily)	Frequent (Weekly)	Frequent (Monthly)		
Online catalogue use	1	6	1		
Library online index/database use	1	5	2		
Internet search tool use	4	3	1		
Subject searching for class assignments	3	5			
	Public	College	University	Other	
Catalogue types used in past year	4		8	1	
	Periodical Literature	Journal Articles	Statistics	Other	
Index/database types used in past year	8	7	1		
	Google	Yahoo	MSN	Yahoo	Other
Internet tools used in past year	8	3	5	1	4
	Academic assignments	Health/ Consumer info	Recreation/ Entertainment	Helping Others	Other
Reasons for catalogue use	8	1	6	7	
Reasons for index/database use	8	1	2	7	1
Reasons for Internet tool use	8	7	8	5	4
	Never	Once in a While	Half of the Time	Most of the Time	Always
Catalogue usefulness for searching unfamiliar topics		1	2	3	2
Index/database usefulness for searching unfamiliar topics		2	1	2	3
Internet tool usefulness for searching unfamiliar topics		2	1	5	

Final Questionnaire Responses (N = 8)

<u>Question</u>	None/Very Little	Little	Moderate	Major
Effort required to participate in study		3	5	
Change in subject searching approach	1	4	2	1
Change in understanding of subject searching in library catalogues	3	5		
Change in understanding of subject searching in library online indexes/databases	5		2	1
Change in understanding of subject searching using Internet search tools	4	2	2	

Appendix 19: Tasks Relating to Diarized Subject Searching

	Annette	Bonnie	Carol	Ellen	Frances	Gail	Howard	Isabel	TOTALS
<u>Class Assignment (Imposed Tasks)</u>									
Annotated bibliography		10		7	2				19
Class discussion					1				1
Class presentation	1		2	4	1		1	1	10
Classmate's paper							1		1
Community presentation				2					2
Course exam	2	1	3	1			1		8
Literature review								1	1
Log sheet				1					1
Portfolio assignment		3							3
Research paper proposal	2	1	6						9
Research paper (short)		16	2	7	2	8	12	3	50
Research paper (medium)	6	8	10	7			4	4	39
Research paper (long)	3		3		4				10
Research paper (unspecified length)			2	3					5
Research report		3							3
Review of a work			4				9		13
Short answer assignment						3		1	4
<u>Not Class Assignment (Self-Generated Tasks)</u>									
Class preparation			1		1				2
Conference preparation						2			2
Personal interest	5	7	2		3				17
Search demo preparation			1						1
TOTALS	19	49	36	32	14	13	28	10	201

Definitions of class assignment types not listed in DiaryClient Question 10:

Classmate's paper: subject search conducted to aid a classmate in completing a research task

Community presentation: group project to prepare a public library presentation on an advocacy topic

Log sheet: "hypothetical routine planning" for a weight-training course

Paper/unspecified length: research paper of unknown length

Portfolio assignment: selection and summation of newspaper articles reflecting racism in some way

Research report: description of information gathered for other written research assignments

Review of a work: written review, evaluation, or summation of a single work

Short answer assignment: preparation of short written answers to specific questions

Appendix 20: Tasks Relating to Demonstrated Subject Searching

	Annette	Bonnie	Carol	Ellen	Frances	Gail	Howard	Isabel	TOTALS
<u>Class Assignment (Imposed Tasks)</u>									
Class discussion		1							1
Class presentation				2					2
Film treatment ⁵⁶					1				1
Literature review			1						1
Research paper + annotated bibliography					1				1
Research paper (short)	1					2	2	2	7
Research paper (medium)	1		1			1	1	1	5
Research paper (long)			1						1
Research paper (unspecified length)				1					1
Portfolio assignment		1							1
Research report		1							1
<u>Not a class assignment (Self-Generated Task)</u>									
Personal interest	1								1
TOTALS	3	3	3	3	2	3	3	3	23

⁵⁶ Film treatment: written description of an idea for a film suitable for presentation to a movie production company.

Appendix 21: Resources Used In Diarized Subject Searching

Online Resources: Indexes/Databases (24)

Abbreviation	Resource Name/Type	Data Provider	Resource Content/Access
AHL	America History & Life	ABC-CLIO	Licensed index + some full-text
ASP	Academic Search Premier	Ebsco	Licensed index + some full-text
ATLAREl	ATLA Religion Database with ATLASerials	Ebsco	Licensed index + some full-text
BAS	Bibliography of Asian Studies	Assoc. for Asian Studies	Licensed index
CanLit	Canadian Literary Centre	Ebsco	Licensed index + some full-text
CdnNews	Canadian Newsstand	ProQuest	Licensed full-text database
CINAHL	CINAHL	Ovid	Licensed index + some full-text
ContAuth	Contemporary Authors	Gale	Licensed full-text database
CPIQ	CPI.Q	ProQuest	Licensed index + some full-text
Ebrary	Ebrary	Ebrary	Subscription-based e-book database
ExpAcad	Expanded Academic ASAP	Gale	Licensed index + some full-text
GaleLit	Gale Literary Index	Gale	Free index to Gale print sources
Gender	Gender Studies	Ebsco	Licensed index + some full-text
JSTOR	JSTOR	JSTOR	Licensed full-text database
MLA	MLA International Bibliography	Ebsco	Licensed index
Philos	Philosophers Index	Cambridge Scientific Abstracts	Licensed index
PsycART	PsycArticles	Ovid	Licensed index
PsycINFO	PsycINFO	Ovid	Licensed index
PubMed	PubMed	National Library of Medicine	Free index + some free full-text
SciDir	ScienceDirect	Elsevier	Licensed full-text database
SocAbs	Sociological Abstracts	Cambridge Scientific Abstracts	Licensed index + some full-text
Unnamed	[unnamed index or database]	[unnamed provider]	Licensed index or database
Wiley	Wiley Interscience	Wiley	Licensed full-text database
WOS	ISI Web of Science	Thomson Scientific	Licensed index

Online Resources: Library Catalogues (5)

Abbreviation	Resource Name/Type	Data Provider	Resource Content/Access
CatExt	Catalogue	External institutions ⁵⁷	Library catalogue
CatHome	Catalogue	Home institution	Library catalogue

Online Resources: Internet Resources (17)

Abbreviation	Resource Name/Type	Data Provider	Resource Content/Access
AskJeeves	Ask Jeeves	Ask.com	Internet search engine
Britannica	Encyclopedia Britannica Online	Encyclopedia Britannica	Online encyclopedia
Chapters	Chapters Indigo website	Indigo	Commercial website
Dict.Com	Dictionary.Com	Dictionary.Com	Online dictionary
Encarta	Encarta	Microsoft	Online encyclopedia
Google	Google	Google, Inc.	Internet search engine
GoogleP	Google Print	Google, Inc.	Book index + some full-text
GoogleS	Google Scholar	Google, Inc.	Internet search engine (scholarly)
Merriam	Merriam-Webster Online Dictionary	Merriam-Webster	Online dictionary
OnlineEnc	[unnamed resource]	[unspecified]	Online encyclopedia
RhymeZone	RhymeZone	RhymeZone	Online dictionary
StatsCan	Statistics Canada website	Statistics Canada	Government website
Synonym	Synonym Dictionary	Vancouver Webpages	Online synonym dictionary
WebHome	home library website	home university	Organization website
Wikipedia	Wikipedia	Wikipedia	Online encyclopedia
WTO	WTO website	World Trade Organization	Organization website
Yahoo	Yahoo.com	Yahoo	Internet search engine

Physical Resources: Human (6)

Abbreviation	Resource Type	Location
Professor	Course professor	home university
LibStaff	Library staff member	home university
Student	Fellow student	home university
Other:ProfHome	Other professor	home university

⁵⁷ Four external catalogues were used, three belonging to other Canadian universities, and the fourth to a Canadian public library.

Physical Resources: Human (cont.)

Abbreviation	Resource Type	Location
Other:ProfExt	External professor	external university
Other:Expert	Nonacademic expert	local community

Physical Resources: Print (7)

Abbreviation	Resource Type	Location/Format
Bibliography	Bibliography or index	home university library
Dictionary	Dictionary	
RefList	Reference list in article/book	
ClassNotes	Class lecture notes	participant's notes
Essay	Essay	chapter in published literary work
Newspaper	Newspaper	Canadian daily newspaper
Text	Text of a literary work	

Physical Resources: Activity (1)

Abbreviation	Resource Type	Location/Format
Browsing	Browsing library shelves	university or public library

Appendix 22: Resources Used In Demonstrated Subject Searching

Abbreviation	Resource Name/Type	Data Provider	Resource Content/Access
AHL	America History & Life	ABC-CLIO	Licensed index + some full-text
Amazon	Amazon.com	Amazon	Commercial website
ASP	Academic Search Premier	Ebsco	Licensed index + some full-text
ATLAREl	ATLA Religion Database with ATLASerials	Ebsco	Licensed index + some full-text
BAS	Bibliography of Asian Studies	Association for Asian Studies	Licensed index
CatExt	Catalogue	External institutions ⁵⁸	Library catalogue
CatHome	Catalogue	Home institution	Library catalogue
CBC	CBC	Canadian Broadcasting Corporation	Corporate website
CdnNews	Canadian Newsstand	ProQuest	Licensed full-text newspapers
ContAuth	Contemporary Authors	Gale	Licensed full-text database
DemWar	Democracy at War website	Canadian War Museum	Free full-text newspaper articles
Dict.Com	Dictionary.Com	Dictionary.Com	Free online dictionary
DocAmS	Documenting the American South website	U of North Carolina at Chapel Hill Library	Free full-text, image and data files
ExpAcad	Expanded Academic ASAP	Gale	Licensed index + some full-text
Google	Google	Google	Internet search engine
GoogleS	Google Scholar	Google	Internet search engine (scholarly)
JSTOR	JSTOR	JSTOR	Licensed full-text articles
MLA	MLA International Bibliography	Ebsco	Licensed index
MSN	MSN	Microsoft	Internet search engine
PsycArt	PsycArticles	Ovid	Licensed index
PsycINFO	PsycINFO	Ovid	Licensed index
PubMed	PubMed	National Library of Medicine	Free index + some free full-text
SageFTPsy	Psychology	Sage	Licensed full-text articles

⁵⁸ Two external catalogues were used, one belonging to another Canadian university, and the other to a Canadian library consortium comprising primarily public and academic libraries.

Abbreviation	Resource Name/Type	Data Provider	Resource Content/Access
SocAbs	Sociological Abstracts	Cambridge Scientific Abstracts (CSA)	Licensed index + some full-text
WOS	ISI Web of Science	Thomson Scientific	Licensed index

Appendix 23: Overview of Subject Searching Demonstrations

	Search Demonstration Topic	Task Within Major	Initial Topic Knowledge*	Change In Topic	Task Type	Search Outcome Rating**	Importance: Catalogues*	Importance: Indexes-Databases*	Importance: Internet Resources*
<u>Annette</u>									
Demo1	sociology of a leisure activity	Yes	2. Very little	No change	Paper (medium-length)	3. Moderately successful	2. Not very	4. Quite	2. Not very
Demo2	religion on the Internet	Yes	4. Good	Some change	Personal interest	5. Entirely successful	4. Quite	3. Moderately	2. Not very
Demo3	2 classical social theorists' views on a contemporary issue	Yes	3. Moderate	No change	Paper (short)	4. Mostly successful	1. Not at all	4. Quite	2. Not very
<u>Bonnie</u>									
Demo1	the idea of an imperfect copy of the world	Yes***	3. Moderate	No change	Class discussion	5. Entirely successful	2. Not very	2. Not very	5. Extremely
Demo2	A Middle Eastern country in World War I	Yes***	2. Very little	No change	Report	3. Moderately successful	5. Extremely	2. Not very	2. Not very
Demo3	implied racism	No	2. Very little	No change	Portfolio	5. Entirely successful	1. Not at all	3. Moderately	1. Not at all
<u>Carol</u>									
Demo1	family dynamics of young offenders and a type of crime	Yes	2. Very little	Some change	Paper (medium-length)	4. Mostly successful	1. Not at all	4. Quite	4. Quite
Demo2	situational factors of a crime committed by a population group	Yes	3. Moderate	No change	Literature review	3. Moderately successful	1. Not at all	5. Extremely	3. Moderately
Demo3	a visceral cue and risky decision making	Yes	5. Extensive	No change	Paper (medium-length)	4. Mostly successful	1. Not at all	4. Quite	4. Quite

* Possible responses ranged from 1 (none/not at all) to 5 (extensive/extremely).

** Possible responses ranged from 1 (entirely unsuccessful) to 5 (entirely successful)

*** Reasons for interpreting the subject domain to be other than as categorized in this overview are discussed in section 5.6.3 of chapter 5.

Appendix 23: Overview of Subject Searching Demonstrations

Search Demonstration Topic	Task Within Major	Initial Topic Knowledge*	Change In Topic	Task Type	Search Outcome Rating**	Importance: Catalogues*	Importance: Indexes-Databases*	Importance: Internet Resources*	
<u>Ellen</u>									
Demo1	ethics and a type of folk literature	Yes	3. Moderate	Some change	Paper (unspecified length)	5. Entirely successful	4. Quite	3. Moderately	3. Moderately
Demo2	a Hindu goddess and associated festival	No***	1. None	No change	Class presentation	5. Entirely successful	5. Extremely	3. Moderately	5. Extremely
Demo3	women and a disease and activism	No	3. Moderate	Some change	Class presentation	4. Mostly successful	4. Quite	5. Extremely	3. Moderately
<u>Frances</u>									
Demo1	biographical info on a Canadian political figure	No	2. Very little	Some change	Film treatment	3. Moderately successful	1. Not at all	2. Not very	4. Quite
Demo2	autobiographical information on a woman writer	No***	2. Very little	Some change	Paper + annotated bibliography	2. Mostly unsuccessful	4. Quite	4. Quite	4. Quite
Demo3	[non-academic topic; not analyzed]								
<u>Gail</u>									
Demo1	a philosopher's thought experiment	No	2. Very little	No change	Paper (short)	4. Mostly successful	1. Not at all	5. Extremely	3. Moderately
Demo2	the scientific revolution	No	2. Very little	No change	Paper (short)	2. Mostly unsuccessful	3. Moderately	4. Quite	3. Moderately
Demo3	environmental factors of CNS development in rats	Yes	5. Extensive	No change	Paper (medium-length)	5. Entirely successful	4. Quite	4. Quite	1. Not at all

Appendix 23: Overview of Subject Searching Demonstrations

	Search Demonstration Topic	Task Within Major	Initial Topic Knowledge*	Change In Topic	Task Type	Search Outcome Rating**	Importance: Catalogues*	Importance: Indexes-Databases*	Importance: Internet Resources*
<u>Howard</u>									
Demo1	causes of the American Revolution	Yes	3. Moderate	Some change	Paper (short)	4. Mostly successful	5. Extremely	4. Quite	2. Not very
Demo2	a post-American Civil War secret society	Yes	4. Good	Some change	Paper (medium-length)	5. Entirely successful	5. Extremely	5. Extremely	5. Extremely
Demo3	a medieval theologian's theory of just war	Yes	4. Good	No change	Paper (short)	3. Moderately successful	5. Extremely	4. Quite	3. Moderately
<u>Isabel</u>									
Demo1	characterization of a Shakespearean dramatic hero	Yes	4. Good	No change	Paper (short)	3. Moderately successful	5. Extremely	5. Extremely	4. Quite
Demo2	a Canadian population group and WW II	Yes	3. Moderate	No change	Paper (medium-length)	4. Mostly successful	4. Quite	4. Quite	4. Quite
Demo3	victimization of women in two Victorian novels	Yes	4. Good	No change	Paper (short)	4. Mostly successful	4. Quite	5. Extremely	2. Not very

Appendix 24: Inferred Focus Phase of Subject Searching Demonstrations

Participant/ Demo	Excerpts From Participants' Spoken Thoughts During Demonstration Sessions Illustrating Focus Phase	Focus Phase	Topic Knowledge
<u>Annette</u>			
Demo 1	"it's not directly related to my topic, but I don't really know very much about sociology of leisure at all so any kind of theoretical or background stuff is definitely useful" (demo) "I think I'm going to be going back to the library catalogue and to . . . the databases, but I'll have to wait until I have a bit more focus in my topic before I go back again to . . . search terms" (interview)	Pre-focus	Very little
Demo 2	"could definitely be a journal that I would look into more, once I've narrowed down my topic" (demo) "we don't actually have an assignment specifically where I think I'm going to use this, but it is . . . what I want to do my Masters on, so I'm trying to . . . do some research on this so I can talk to my sociology of religions prof about how else I can, I don't know, incorporate this, or . . . how I can use this in the future" (interview)	Pre-focus	Good
Demo 3	"as soon as I thought of the topic, I was pretty married to it" (interview) "It's for a 4th year course in classical social theory, and we have to compare two of the theorists . . . what we think their views would be on a current event. And so the current event that I've chosen is the [current event] controversy, and I'm going to argue that from [theorist 1's] view we can look at it using disenchantment or from [theorist 2's] view we can look at it . . . from contrasting views of what is sacred"	Post-focus	Moderate
<u>Bonnie</u>			
Demo 1	"I decided it was a subject search I needed to do just because . . . the way this class works is we read a play and then we discuss it in class. . . . I read this play before and I remember there was this one part that I didn't quite understand, so I wanted to look it up, then bring it up in class, so that's really my reason" (interview)	Not applicable	Moderate
Demo 2	"it's an English course and basically I just need to write three pages on . . . [Middle Eastern country] in World War I . . . I'm still not really comfortable, because I don't know a lot of the issues . . . I don't really have an idea of any other . . . words that I can use to search the subject at the moment" (interview)	Pre-focus	Very little
Demo 3	"I was just looking for a case possibly where maybe a minority group was being somehow wronged in some way, but it wasn't necessarily being chalked up to racism, whereas, you know, being chalked up to terrorism . . . being the United States against . . . Eastern nations type thing" (interview)	Post-focus	Very little

Appendix 24: Inferred Focus Phase of Subject Searching Demonstrations

Participant/ Demo	Excerpts From Participants' Spoken Thoughts During Demonstration Sessions Illustrating Focus Phase	Focus Phase	Topic Knowledge
<u>Carol</u>			
Demo 1	<p>"[topic and] family dynamics and you know, just the differences between them. Kinda, I think it'll evolve a little bit" (interview)</p> <p>"I think I have to read [retrieved documents] just to kinda get a little bit better . . . it's kinda all a little bit vague in my head right now" (interview)</p>	Pre-focus	Very little
Demo 2	<p>"I'm just trying to find information to do my literature review before I do my proposal . . . doing background research on [a crime] . . . what are the characteristics of [a crime], what usually happens, what kind of risk taking is associated with [a crime] . . . it's evolutionary psych . . . I'm trying to explain why some [members of a population] will commit and invest resources for long term relationships and other [members of a population] . . . prefer short term . . . strategies" (interview)</p>	Post-focus	Moderate
Demo 3	<p>"I want specifically [physiological response] as a visceral cue" (demo)</p> <p>"anything I do now is pretty much just extra fluff and to add extra depth to the paper you know, find more support for what I say . . . I guess the meat of it's done" (interview)</p>	Post-focus	Extensive
<u>Ellen</u>			
Demo 1	<p>"I also need to find things that are a little more ethical based as opposed to the anthropological, so . . . I have to sort some things out that way . . . eliminate some of the options here because there's too many" (demo)</p> <p>"there is still . . . a lot to determine . . . to narrow the spectrum of resources that I use" (interview)</p>	Pre-focus	Moderate
Demo 2	<p>"the assignment is to do a presentation um...something I've chose ahead of time . . . so I'm basically bringing information to the class about the goddess and the festival of something I don't know anything about" (interview)</p> <p>"because I was looking for . . . such basic information, it seemed like everything would have been relevant, but I tried to pick things that were still kind of broad in . . . in potentially what it could be covering" (interview)</p>	Pre-focus	None
Demo 3	<p>"today the search will be . . . activism and [disease] for my activism and advocacy class. . . what I'm looking for are . . . just the things that have been done, or . . . ideas or things like that" (demo)</p> <p>"I'm just thinking a little bit in relation to my assignment now, about . . . what . . . my professor is looking for . . . in the project and I'm—have to say I'm not entirely sure" (demo)</p>	Pre-focus	Moderate

Appendix 24: Inferred Focus Phase of Subject Searching Demonstrations

Participant/ Demo	Excerpts From Participants' Spoken Thoughts During Demonstration Sessions Illustrating Focus Phase	Focus Phase	Topic Knowledge
<u>Frances</u>			
Demo 1	"the project is to construct a film treatment which is basically what you would pitch to a movie production company. So you don't have to film the film, but you have to have the entire film in your head and on paper . . . and it . . . has to be based on an actual event. . . . so I figured it would be easy to just do a biography of somebody. It also has to relate to women or...or issues with women. . . . So [political figure] being the female [government official], it seemed appropriate for a biography for it" (interview)	Post-focus	Very little
Demo 2	"I was looking for autobiographical information on [woman writer], but because I need fifteen sources for my project, also looking for articles on her autobiography and other things like that related" (interview) "The topic of the [undergraduate honours] thesis is the [ill] woman in contemporary literature. . . . [woman writer] is among, what I think I've boiled down to about five . . . women authors of the twentieth century who've been treated for . . . illness and have written autobiographical fiction on the topic" (interview) "I already sort of know what happened in the novels . . . but for just this assignment, what I want is just the true autobiographical facts, and so that they can eventually be compared" (interview)	Post-focus	Very little
<u>Gail</u>			
Demo 1	"I think I have now enough information to kind of . . . get some initial ideas of this. And . . . now I don't think there's any point going any further for me right now, rather just read it and have it in . . . my head . . . then I'll probably have a little bit better . . . idea of what I'm looking for" (demo) "I kind of was looking for arguments . . . why he's right or wrong, or why . . . he makes sense, his claim . . . I'm looking . . . to get some more insight in this argument" (interview)	Pre-focus	Very little
Demo 2	"It might also be that I'm just a little bit too early in the game to start already searching for . . . scholarly paper[s]. And maybe I should . . . Google or something just to kind of get more a feel for, or my textbook, preferably, what's going on, that I know more specifics" (demo) "I think I need to have a more specific aspect of the scientific revolution" (interview) "Not really knowing exactly what I want to write about, but also I think even mostly that I don't know in the history area how to get to the right area" (interview)	Pre-focus	Very little
Demo 3	"I decided to . . . write a paper about the early influences of different factors, for example nicotine or . . . stress or [antidepressants] in . . . [laboratory animals] and how it . . . affects their . . . offsprings . . . something . . . along those lines, it's not . . . written in stone because I can just pick my own topic" (demo) "It's maybe my first thing I have to decide, which factors I really want to do" (demo)	Pre-focus	Extensive

Appendix 24: Inferred Focus Phase of Subject Searching Demonstrations

Participant/ Demo	Excerpts From Participants' Spoken Thoughts During Demonstration Sessions Illustrating Focus Phase	Focus Phase	Topic Knowledge
<u>Howard</u>			
Demo 1	<p>"I haven't done very much research yet, and I'm doing a general search at this time so I'm able to narrow the topic from some of the information I find from this initial search" (demo)</p> <p>"at this point I'm not even sure what kind of argument I want to make or where I'm going to be coming from, so that [reading the introductions of potentially relevant books] might jump start some ideas for me and see what some of the critical issues are, especially with some of the more contemporary writers" (demo)</p> <p>"it's only 7 to 10 pages . . . so I'm needing to take a look at a few of these monographs and narrow it down quite substantially" (demo)</p>	Pre-focus	Moderate
Demo 2	<p>"my subject is either gonna be the [secret society] in the period just following the American Civil War, or, I was also possibly interested in the ethic of [illegal activity] in the American South during that same Reconstruction period. So those are the two general . . . ideas that I want to look at, and they're related, I just want to see what kind of information I can come up with" (demo)</p> <p>"I still don't have a specific topic as of yet. I want to just take a look at some of those monographs and see if anything jumps . . . out at me. . . . I need to have a fairly specific topic because it's a . . . a higher level class and I need to write a 20 page paper" (demo)</p>	Pre-focus	Good
Demo 3	<p>"My thesis, my topic I think is . . . pretty focused, but I don't have an argument yet about this" (interview)</p> <p>"I didn't find a lot in this particular search, but at the same time I feel that I already have . . . honestly more than enough material to go with . . . for my particular project" (interview)</p> <p>"I'm going to look at the writings of [early Church Father], specifically [treatise], and how it influenced the later development of the theory of just war and how . . . the notion of Christian thought went from turn the other cheek to kill the infidel, basically, and . . . how his writings influenced that kind of thought" (demo)</p> <p>"[early Church Father's] really on the boundary between the . . . Roman period and the Middle Ages. And I would make the argument that even if you don't consider him to be a medieval writer, his writing was enormously influential in the Middle Ages" (interview)</p>	Pre- and post-focus primarily Post-focus	Good

Appendix 24: Inferred Focus Phase of Subject Searching Demonstrations

Participant/ Demo	Excerpts From Participants' Spoken Thoughts During Demonstration Sessions Illustrating Focus Phase	Focus Phase	Topic Knowledge
<u>Isabel</u>			
Demo 1	<p>“So those could be important for a paper dealing with ... religious symbolism or things like that” (demo)</p> <p>“This would be useful ... Here it says that '[Shakespearean hero] has struck many from H.B. Shaw to Jan Kott as puppet-like or mechanical'...so that could either be refuted or supported in the body of the essay, depending on how you read [Shakespearean hero's] character” (demo)</p> <p>“I like that kind of research. Shakespeare is so ambiguous in his language that it's good, because . . . if you find a resource, there's so many different interpretations of things that are possible . . . [it's] more easy to find something that kind of suits what you're thinking about the play” (interview)</p>	Pre-focus	Good
Demo 2	<p>“That seems like an interesting site. I'm going to just copy and paste it, and . . . once I've got more information and I know what kinds of primary sources I'm looking for, it might be helpful to go back and try and look through those . . . newspapers” (demo)</p> <p>“It's been kind of I think in the preliminary stages of the search . . . so once I narrow it down, then maybe some of the resources won't be as useful as some others that I find later” (interview)</p> <p>“I haven't narrowed down a thesis or a direct question that I'm answering, so . . . I'm just kind of looking . . . at the subject itself and trying to find some things in that, that I'm interested in writing” (interview)</p>	Pre-focus	Moderate
Demo 3	<p>“<i>Beauty and Belief</i> – might be useful just because in the papers that I'm writing I'm looking specifically as, beauty as one of the causes of their victimization” (demo)</p> <p>“I tend to disagree with this one, so I might use this article just as a counterargument to my own” (demo)</p> <p>“for this assignment . . . I'll be relying on the texts themselves for most of the assignment. So the sources, the secondary sources that I was gathering . . . were just to kind of bolster my own arguments” (interview)</p>	Post-focus	Good

Appendix 25: Coding Chart For Analyses of Spoken Thoughts About Subject Searching

Definition	Examples: Bundy (2004)	Examples: Bruce (1997a, 1997b)
Using Strategy		
Applying a specified or demonstrated approach, plan or process for accomplishing an aspect of a subject search or its associated task	<p>Standard 2, Learning outcome 2. constructs and implements effective search strategies (p. 15)</p> <p><i>Examples:</i></p> <ul style="list-style-type: none"> • develops a search plan appropriate to the investigative method • identifies keywords, synonyms and related terms for the information needed • selects appropriate controlled vocabulary or a classification specific to the discipline or information access tools • constructs and implements a search strategy using appropriate commands • implements the search using investigative methodology appropriate to the discipline 	<p>Information process conception (1997a, p. 12-13)</p> <ul style="list-style-type: none"> • information literacy is seen as executing a process • information literacy is seen as the ability to confront novel situations, and to deal with those situations on the basis of being equipped with a strategy for finding and using information • effective action, problem-solving or decision-making is the outcome of the experience <p>“information literacy is experienced in terms of the ability to implement information processes. Information literate people are seen as those who can recognise a need for ‘information’, and who can use the information they access to meet the original need. This need is usually stated in terms of problem solving or decision making. . . . there is variation amongst individuals in terms of how the process is experienced.” (1997b, p. 132)</p>
Evaluating		
Judging the usefulness, relevance, quality, or appropriateness of aspects of a search process, strategy, resource, result of a search action, overall search outcome, or one's own thinking about the search	<p>Standard 1, Learning outcome 3. re-evaluates the nature and extent of the information need (p. 13)</p> <p><i>Examples:</i></p> <ul style="list-style-type: none"> • reviews the initial information need to clarify, revise, or refine the question • articulates and uses criteria to make information decisions and choices <p>Standard 3, Learning outcome 1. assesses the usefulness and relevance of the information obtained (p. 17)</p> <p><i>Examples:</i></p> <ul style="list-style-type: none"> • assesses the quantity, quality, and relevance of the search results to determine whether alternative information access tools or investigative methods should be utilized • identifies gaps in the information retrieved and determines if the search strategy should be revised 	<p>Knowledge construction conception (1997a, p. 14-15)</p> <ul style="list-style-type: none"> • information literacy is seen as building up a personal knowledge base in a new area • the idea of a knowledge base . . . goes beyond that of an information store; it involves the adoption of personal perspectives . . . achieved through critical analysis of what is read • the knowledge base of the discipline is not changed or added to in any way • the information user is involved in evaluation and analysis, whilst the information presents itself uniquely to the user <p>“in this category [information] becomes an object of reflection and it appears to each individual user in a unique way. . . the relation between the user and information is constituted in terms of meaning construction and interpretation.” (1997b, p. 137-138)</p>

Appendix 25: Coding Chart For Analyses of Spoken Thoughts About Subject Searching

Definition	Examples: Bundy (2004)	Examples: Bruce (1997a, 1997b)
	<p>Standard 3, Learning outcome 2. defines and applies criteria for evaluating information (p. 17)</p> <p>Examples:</p> <ul style="list-style-type: none"> • examines and compares information from various sources to evaluate reliability, validity, accuracy, authority, timeliness, and point of view or bias • analyses the structure and logic of supporting arguments or methods • recognises and questions prejudice, deception, or manipulation • recognises the cultural, physical, or other context within which the information was created and understands the impact of context on interpreting the information • recognises and understands own biases and cultural context 	<p>“Critical analysis . . . is an essential part of the character of this conception. [which involves] the ability to weigh and analyse the relative worth of information” (1997b, 138)</p> <p>“information seeking + critical analysis = personal knowledge base” (1997b, 138)</p> <p>“Although the respondents describe different sources of information, precisely where the information comes from is irrelevant. What is important is that the information comes from an appropriate source (a feature consistent with the emphasis on evaluation in the category).” (1997b, p. 139)</p> <p>“[A] distinctive feature of this category is the emphasis on a critical, analytical approach to information. This critical stance is qualitatively different from being able to identify information relevant to particular interests. . . . An outcome of critical analysis . . . is the adoption of personal perspectives on the area of interest.” (1997b, 141)</p> <p>“respondents describe experiences of critical analysis when they discuss the importance of being able to assess the scholarly value of documents.” (1997b, 142)</p>
	<p>Standard 3, Learning outcome 3. reflects on the information seeking process and revises search strategies as necessary (p. 17)</p> <p>Examples:</p> <ul style="list-style-type: none"> • determines if original information need has been satisfied or if additional information is needed • reviews the search strategy • reviews information access tools used and expands to include others as needed 	
Creating Personal Understanding		
Working out a personal understanding of a search topic or task, or recognizing that a search topic or task requires synthesizing new or unique personal understandings, conclusions, or solutions	<p>Standard 5, Learning outcome 1. compares and integrates new understandings with prior knowledge to determine the value added, contradictions, or other unique characteristics of the information (p. 21)</p> <p><i>Examples</i></p> <ul style="list-style-type: none"> • determines whether information satisfies the research or other information need and whether the information contradicts or verifies information used from other sources • recognises interrelationships between concepts and draws conclusions based upon information gathered • selects information that provides evidence for the topic and summarises the main ideas extracted from the information gathered 	<p>Knowledge construction conception (1997a, p. 14-15)</p> <ul style="list-style-type: none"> • information literacy is seen as building up a personal knowledge base in a new area <p>“[A] distinctive feature of this category is the emphasis on a critical, analytical approach to information. This critical stance is qualitatively different from being able to identify information relevant to particular interests. . . . An outcome of critical analysis . . . is the adoption of personal perspectives on the area of interest.” (1997b, 141)</p> <p>Knowledge extension conception (p. 15-16)</p>

Appendix 25: Coding Chart For Analyses of Spoken Thoughts About Subject Searching

Definition	Examples: Bundy (2004)	Examples: Bruce (1997a, 1997b)
	<ul style="list-style-type: none"> • understands that information and knowledge in any discipline is in part a social construction and is subject to change as a result of ongoing dialogue and research • extends initial synthesis at a higher level of abstraction to construct new hypotheses 	<ul style="list-style-type: none"> • information literacy is seen as working with knowledge and personal perspectives adopted in such a way that novel insights are gained • information use, involving a capacity for intuition, or creative insight, is the distinguishing feature of this experience . . . [which] usually results in the development of novel ideas or creative solutions • the knowledge base differs from that in the previous [knowledge construction] category in that it includes knowledge gained through personal experience • creativity, or intuition, is about how novel insights are gained . . . [and] 'new knowledge or information' is recognised as the outcome <p>“Overall the experience seems to be closely related to the process of research and writing. Although elements of the other categories may be present, the qualitatively different element of creativity is the foundation of the conception.” (1997b, 144)</p> <p>“Enhanced knowledge base + creative insight = novel ideas or solutions [knowledge extension]” (1997b, 144)</p> <p>“information literacy is experienced as knowledge extension. The information literate person relies heavily on personal knowledge, experience, and insight in order to use information creatively. . . . As information is used creatively it is ‘transformed’ or new knowledge is produced.” (1997b, 147)</p>

Appendix 26: Themes in Spoken Thoughts Referencing Strategy

Theme Groups	Annette	Bonnie	Carol	Ellen	Frances	Gail	Howard	Isabel	TOTALS
Conduct Search									
Approach a Search	3	3	2	3	0	1	3	2	17
Chart Next Steps	2	1	1	3	0	5	2	1	15
Choose Topic or Focus	0	1	0	0	0	2	3	1	7
Decide How Much Information is Needed	1	0	0	2	0	0	1	0	4
Handle Search Impasse	1	0	3	1	2	1	0	0	8
Include Multiple Perspectives	1	0	0	1	0	1	2	1	6
Totals: Conduct Search (6 themes)	8	5	6	10	2	10	11	5	57
Obtain Information									
Check Elsewhere	2	0	2	0	0	1	0	0	5
Check Index or Database	1	0	1	0	0	0	0	0	2
Check or Request Via Home Library Catalogue	0	0	2	5	1	2	1	1	12
Check Other Library Catalogues	0	0	0	0	1	0	0	1	2
Click Find Full Text in Index or Database	0	0	2	2	1	0	0	2	7
Use Interlibrary Loan	0	1	4	1	2	0	2	2	12
Totals: Obtain Information (6 themes)	3	1	11	8	5	3	3	6	40
Seek Information									
Consult Others									
Library Staff	0	0	0	0	0	0	1	1	2
Professors and Subject Experts	5	1	4	4	0	2	1	2	19
Students	0	0	2	0	0	2	0	0	4
Subtotals: Seek Information-Consult Others (3 themes)	5	1	6	4	0	4	2	3	25

Appendix 26: Themes in Spoken Thoughts Referencing Strategy

Theme Groups	Annette	Bonnie	Carol	Ellen	Frances	Gail	Howard	Isabel	TOTALS
Seek Information									
Query-Operations									
Combine Results Sets	0	0	3	0	0	0	0	0	3
Exclude Specific Publication Format	1	0	0	0	0	0	2	0	3
Limit to Full-Text Availability	1	0	0	0	0	1	0	0	2
Limit to Peer-Reviewed/Scholarly/Academic	2	0	0	2	0	1	0	0	5
Limit to Specific Date Range	1	0	0	0	0	1	1	0	3
Modify Catalogue Scope	1	0	0	0	0	0	0	0	1
Search Within Relevant Source or Results	1	1	1	2	0	0	1	0	6
Sort Results in Reverse Chronological Order	0	0	0	0	0	0	2	0	2
Switch to Advanced Search Mode	0	0	3	0	0	0	1	0	4
Specify Fields to Search or Limit By	3	1	1	1	0	0	2	2	10
Specify Publication Format	1	0	0	1	0	2	1	0	5
Specify Type of Term Matching to use	0	0	2	0	0	0	2	0	4
Use 'Find Similar' or 'Find Related'	0	0	1	0	0	1	0	0	2
Use or Modify Boolean Operators	1	0	1	0	2	0	0	0	4
Use Truncation	0	0	1	0	1	0	0	0	2
Subtotals: Seek Information-Query-Operations (15 themes)	12	2	13	6	3	6	12	2	56
Query-Terms									
Omit Terms	2	0	0	1	0	0	0	0	3
Reuse Previously Successful Terms	0	0	1	0	0	0	1	0	2
Search by Author Name	2	0	0	2	0	1	1	1	7
Select From Query Results or Full-Text Items	1	0	2	1	0	1	3	0	8
Use Broad Terms	4	1	3	1	0	0	0	0	9
Use Narrow Terms	2	0	1	0	0	1	0	0	4

Appendix 26: Themes in Spoken Thoughts Referencing Strategy

Theme Groups	Annette	Bonnie	Carol	Ellen	Frances	Gail	Howard	Isabel	TOTALS
Seek Information-Query-Terms (continued)									
Use Subject Terms Assigned to Relevant Items	2	0	1	2	0	2	2	1	10
Use Subject Terms Index or Thesaurus	0	0	0	1	0	1	0	0	2
Use Term or Spelling Variants	2	0	2	1	0	0	3	1	9
Use Terms Known to be Relevant	2	1	4	2	1	2	3	3	18
Subtotals: Seek Information-Query-Terms (10 themes)	17	2	14	11	1	8	13	6	72
Other									
Browse Library Shelves	0	1	1	0	0	0	2	0	4
Determine Who Cited Relevant Source	0	0	1	0	0	1	0	0	2
Examine References in Relevant Source	2	0	6	2	1	2	5	1	19
Subtotals: Seek Information-Other (3 themes)	2	1	8	2	1	3	7	1	25
Totals: Seek Information (31 themes)	36	6	41	23	5	21	34	12	178
GRAND TOTALS (43 Themes)	47	12	58	41	12	34	48	23	275
% of GRAND TOTALS by Theme Group ⁵⁹									
Conduct Search	17%	42%	10%	24%	17%	29%	23%	22%	21%
Obtain Needed Information	6%	8%	19%	20%	42%	9%	6%	26%	15%
Seek Information	77%	50%	71%	56%	42%	62%	71%	52%	65%
	100%	100%	100%	100%	100%	100%	100%	100%	100%
% of GRAND TOTALS by Data Source									
Demonstrations	85%	58%	66%	76%	76%	71%	67%	48%	69%
Follow-up Interviews	15%	42%	34%	24%	24%	29%	33%	52%	31%
	100%	100%	100%	100%	100%	100%	100%	100%	100%

⁵⁹ Percentages may not total 100% due to rounding.

Appendix 27: Themes in Spoken Thoughts Referencing Evaluating

Theme Groups	Annette	Bonnie	Carol	Ellen	Frances	Gail	Howard	Isabel	TOTALS
Resources-Catalogues									
Background or General Information	0	1	1	0	0	1	1	1	5
Indexes Books	2	1	1	1	0	1	2	2	10
Links to Related Subject Terms	0	0	0	0	0	1	0	0	1
Recency of Content	0	0	0	0	0	2	0	0	2
Search Performance	2	0	2	0	0	0	0	0	4
Subtotals: Resources-Catalogues (5 themes)	4	2	4	1	0	5	3	3	22
Resources-Indexes									
Availability of Full-Text	0	1	1	1	0	3	2	0	8
Content Quality	0	1	0	0	0	1	2	0	4
Ease of Use	0	1	1	1	1	1	0	0	5
Familiarity or Preference	1	1	2	2	3	5	4	0	18
Indexes Articles	0	2	1	0	0	2	3	3	11
Links to Related Subject Terms	0	0	0	0	0	1	0	0	1
Random Choice	0	0	1	0	0	2	0	0	3
Recency of Content	1	1	0	0	0	0	1	0	3
Recommended Resource	0	0	0	2	0	0	0	0	2
Results Limitable by Subject Terms	1	0	0	1	0	0	0	0	2
Search Performance	0	1	1	0	0	0	1	1	4
Subject Coverage	3	0	2	2	2	2	1	0	12
Subtotals: Resources-Indexes (12 themes)	6	8	9	9	6	17	14	4	73

Appendix 27: Themes in Spoken Thoughts Referencing Evaluating

Theme Groups	Annette	Bonnie	Carol	Ellen	Frances	Gail	Howard	Isabel	TOTALS
Resources-Internet tools									
Background or General Information	0	1	1	1	2	4	0	0	9
Content Quality	1	1	1	0	0	3	0	3	9
Familiarity or Preference	0	0	1	1	0	0	0	0	2
Recommended Resource	0	0	0	0	0	2	1	1	4
Search Performance	1	0	0	0	0	1	0	0	2
Source Genre	0	0	0	0	1	0	1	0	2
Unfamiliar or Uncertain Topic	0	3	0	0	1	0	0	0	4
Subtotals: Resources-Internet tools (7 themes)	2	5	3	2	4	10	2	4	32
Subtotal: Resources-Newspapers (1 theme)	0	1	0	0	0	0	0	1	2
Totals: Resources (25 themes)	12	16	16	12	10	32	19	12	129
Results-Actions									
Browse Results	4	1	1	2	0	2	1	1	12
Calibrate Effort to Avoid Information Overload	0	0	1	0	0	2	0	0	3
Evaluate in Stages	1	2	3	1	0	4	3	1	15
Identify Field Containing Indexed Keywords	0	2	0	0	0	0	0	0	2
Obtain Evaluative Information in Another Source	0	0	1	1	0	0	0	0	2
Read or Skim Abstract or Introduction	4	2	1	1	0	5	1	2	16
Read or Skim Document	1	3	4	1	1	3	2	2	17
Skip Unknown or Uninformative Items or Terms	1	0	0	3	0	1	0	0	5
Subtotals: Results-Actions (8 themes)	11	10	11	9	1	17	7	6	72

Appendix 27: Themes in Spoken Thoughts Referencing Evaluating

Theme Groups	Annette	Bonnie	Carol	Ellen	Frances	Gail	Howard	Isabel	TOTALS
Results-Criteria									
Background or General Information	0	0	0	0	0	2	1	0	3
Citation Rate	0	0	1	0	0	0	0	0	1
Disciplinary Treatment of Topic	0	0	1	3	0	0	1	0	5
Distinctive Ideas	0	3	0	1	0	0	4	0	8
Document Quality	2	0	0	2	0	2	0	0	6
Full-Text Availability	2	0	0	1	0	0	1	3	7
Genre-Book Review	2	0	0	1	0	1	1	0	5
Genre-Criticism or Interpretation	0	1	0	0	0	2	1	2	6
Genre-Editorial	0	0	0	0	0	1	0	0	1
Genre-Folk Literature	0	0	0	1	0	0	0	0	1
Genre-Literature Review	0	0	2	0	0	3	1	0	6
Genre-Personal Experience or View	0	0	0	1	0	1	0	0	2
Genre-Theory	2	0	0	0	0	0	0	0	2
Interesting	0	0	0	0	0	1	1	1	3
Intuition or Signals	0	1	1	0	0	0	0	0	2
Journal or Website Quality	0	0	3	1	0	1	2	0	7
Key Concepts or Entities	2	0	1	1	1	1	0	3	9
Number of Results	3	1	2	2	0	1	3	2	14
Personal Interest	0	0	0	1	0	1	0	0	2
Pictures and Picture Captions	0	1	0	0	0	0	0	0	1
Population or Geographic Area	1	1	4	4	0	2	0	1	13
Potential Bias	0	1	0	0	0	0	1	0	2
Primary Source	0	0	0	0	0	0	3	2	5
Recency of Content	0	0	2	2	0	5	5	3	17

Appendix 27: Themes in Spoken Thoughts Referencing Evaluating

Theme Groups	Annette	Bonnie	Carol	Ellen	Frances	Gail	Howard	Isabel	TOTALS
Results-Criteria (continued)									
References Cited in Source	1	0	2	0	0	1	1	2	7
Relevance-Different Topic But Potentially Applicable	3	0	1	2	0	0	1	1	8
Relevance-Exactly on Topic	3	1	3	2	1	0	0	0	10
Relevance-Generally on Topic	2	0	0	3	0	0	3	3	11
Relevance-Not Relevant or Useful	4	2	2	1	0	2	0	3	14
Reputable or Familiar Authors	1	0	3	0	0	0	3	0	7
Research Methods	0	0	1	0	0	0	0	0	1
Same Item Retrieved in Different Query Results	0	0	0	2	0	0	0	0	2
Specificity of Topic Treatment	0	0	0	2	0	3	0	2	7
Time Period Covered	0	0	0	0	1	1	1	0	3
Title words-Catchy Words	0	0	0	0	0	1	0	0	1
Title words-Topic Words	0	3	2	3	1	5	1	1	16
Understandability	0	0	0	0	0	2	0	0	2
Subtotals: Results-Criteria (37 themes)	30	17	35	37	6	40	37	34	236
Totals: Results (45 themes)	41	27	46	46	7	57	44	40	308
Search Process									
Amount of Needed Sources	1	0	0	3	0	0	2	3	9
Ease	1	0	0	0	0	1	0	0	2
Outcome	5	3	4	6	4	5	6	5	38
Skills	0	1	1	0	0	1	0	1	4
Totals: Search Process (4 themes)	7	4	5	9	4	7	8	9	53

Appendix 27: Themes in Spoken Thoughts Referencing Evaluating

Theme Groups	Annette	Bonnie	Carol	Ellen	Frances	Gail	Howard	Isabel	TOTALS
Terms for Querying									
Inadequate	0	1	0	0	0	0	0	0	1
Potentially Problematic	2	0	0	1	1	0	0	0	4
Potentially Useful	2	0	1	0	0	0	1	0	4
Totals: Terms for Querying (3 themes)	4	1	1	1	1	0	1	0	9
GRAND TOTALS (77 Themes)	64	48	68	68	22	96	72	61	499
% of GRAND TOTALS by Theme Group ⁶⁰									
Resources	19%	33%	24%	18%	45%	33%	26%	20%	26%
Results	64%	56%	68%	68%	32%	59%	61%	66%	62%
Search Process	11%	8%	7%	13%	18%	7%	11%	15%	11%
Terms for Querying	6%	2%	1%	1%	5%	0%	1%	0%	2%
	100%	100%	100%	100%	100%	100%	100%	100%	100%
% of GRAND TOTALS by Data Source									
Demonstrations	70%	48%	51%	66%	45%	52%	63%	54%	57%
Follow-up Interviews	30%	52%	49%	34%	55%	48%	38%	46%	43%
	100%	100%	100%	100%	100%	100%	100%	100%	100%

⁶⁰ Percentages may not total 100% due to rounding.

Appendix 28: Themes in Spoken Thoughts Referencing Creating Personal Understanding

Themes	Annette	Bonnie	Carol	Ellen	Frances	Gail	Howard	Isabel	TOTALS
Acquire Understanding	2			3		4		1	10
Create Understanding	3		1	2		2	3		11
Perform Quick Look-Up		1				3			4
Understand Instructor's Goals for Creating Understanding	1	1				1	2	1	6
TOTALS (4 Themes)	6	2	1	5		10	5	2	31
% of TOTALS by Theme ⁶¹									
Acquire Understanding	33%			60%		40%		50%	32%
Create Understanding	50%	50%	100%	40%		30%	60%		35%
Perform Quick Look-Up		50%				20%			13%
Understand Instructor's Goals for Creating Understanding	17%					10%	40%	50%	19%
	100%	100%	100%	100%		100%	100%	100%	100%
% of TOTALS by Data Source									
Demonstrations	17%	50%		80%		50%			35%
Interviews	83%	50%	100%	20%		50%	100%	100%	65%
	100%	100%	100%	100%		100%	100%	100%	100%

⁶¹ Percentages may not total 100% due to rounding.

Appendix 29 Themes in Advanced Thinking

Themes in Advanced Thinking	Annette	Bonnie	Carol	Ellen	Frances	Gail	Howard	Isabel	TOTALS
<u>Using Strategy</u> (32 themes)									
Conduct Search (9 themes)									
Adjust Strategy	1			1					2
Broad Considerations		1		1				1	3
Chart Next Steps	2		1	1		4		1	9
Choose Resources	2	1		1					4
Choose Topic or Focus						3	7	1	11
Include Multiple Perspectives	1			1		1	1	1	5
Decide How Much Information is Needed	1			1			1		3
Handle Search Impasse	1		3	1		2			7
Review Results				2		1	1	1	5
Subtotals: Conduct Search	8	2	4	9	0	11	10	5	49
Obtain Information (3 themes)									
Consult Library Staff							1		1
Consult Professors & Subject Experts			1					1	2
Use Interlibrary Loan				1	1				2
Subtotals: Obtain Information	0	0	1	1	1	0	1	1	5
Seek Information (20 themes)									
Query-Operations									
Combine Results Sets to Obtain Overlap			1						1
Exclude Specific Publication Format							1		1

Appendix 29 Themes in Advanced Thinking

Themes in Advanced Thinking	Annette	Bonnie	Carol	Ellen	Frances	Gail	Howard	Isabel	TOTALS
<u>Using Strategy-Seek Information-Query-Operations (continued)</u>									
Modify Catalogue Scope	1								1
Omit Terms	1		1						2
Search Within Relevant Source or Results	1	1					1		3
Sort Results in Reverse Chronological Order							1		1
Specify Fields to Search or Limit By	1			1					2
Specify Publication Format						1			1
Use 'Find Similar' or 'Find Related'			1			1			2
Use or Modify Boolean Operators	1		1		1				3
Use Truncation			1		1				2
subtotals: Seek Information-Query-Operations	5	1	5	1	2	2	3	0	19
Seek Information									
Query-Terms									
Search By Author Name	1					1	1		3
Select From Query Results or Full-Text Items				1			1		2
Use Broad Terms	1	1		1					3
Use Narrow Terms	1		1			1			3
Use Subject Terms Assigned to Relevant Items	1		1	1		1	1		5
Use Term or Spelling Variants	1		1	1					3
Use Terms Known to be Relevant			1				1		2
subtotals: Seek Information-Query-Terms	5	1	4	4	0	3	4	0	21

Appendix 29 Themes in Advanced Thinking

Themes in Advanced Thinking	Annette	Bonnie	Carol	Ellen	Frances	Gail	Howard	Isabel	TOTALS
<u>Using Strategy-Seek Information (continued)</u>									
Other									
Browse Library Shelves		1	1				2		4
Examine References in Relevant Source	1		1	1	1	1	2		7
subtotals: Seek Information-Other	1	1	2	1	1	1	4	0	11
Subtotals: Seek Information	11	3	12	6	3	6	11	0	51
TOTALS: Using Strategy	19	5	16	16	4	17	22	6	105
<u>% of Using Strategy TOTALS by Data Source</u>									
Demonstrations	95%	40%	69%	69%	50%	71%	59%	17%	67%
Interviews	5%	60%	31%	31%	50%	29%	41%	83%	33%
<u>Evaluating (68 themes)</u>									
Resources (17 themes)									
Catalogues									
Background or General Information		1	1			1		1	4
Links to Related Subject Terms						1			1
Recency of Indexed Content						2			2
Search Performance	2		2						4
subtotals: Resources-Catalogues	2	1	3	0	0	4	0	1	11
Indexes									
Availability of Full-Text				1					1
Content Quality							2		2
Ease of Use		1	1			1	1		4

Appendix 29 Themes in Advanced Thinking

Themes in Advanced Thinking	Annette	Bonnie	Carol	Ellen	Frances	Gail	Howard	Isabel	TOTALS
<u>Evaluating-Resources-Indexes (continued)</u>									
Familiarity or Preference				1					1
Links to Related Articles						1			1
Results Limitable by Subject Terms	1								1
Search Performance							1		1
Subject Coverage	3			1					4
subtotals: Resources-Indexes	4	1	1	3	0	2	4	0	15
Internet									
Background or General Information		1		1	2	2			6
Content Quality	1	1	1			1		3	7
Search Performance	1					1			2
Source Type					1		1		2
Unfamiliar or Uncertain Topic		1			1				2
subtotals: Resources-Internet Tools	2	3	1	1	4	4	1	3	19
Subtotals: Resources	8	5	5	4	4	10	5	4	45
Results (44 themes)									
Actions									
Browse Results				1			2		3
Calibrate Effort to Avoid Information Overload			1			2			3
Evaluate in Stages	1	1	1	1		2	2	1	9
Obtain Evaluative Information in Another Source			1	1					2
Read or Skim Abstract or Introduction	2	1				1			4

Appendix 29 Themes in Advanced Thinking

Themes in Advanced Thinking	Annette	Bonnie	Carol	Ellen	Frances	Gail	Howard	Isabel	TOTALS
<u>Evaluating-Results</u> (continued)									
Read or Skim Document		1	1			2	2	2	8
Skip Unknown or Uninformative Items or Terms				2		1			3
subtotals: Results-Actions	3	3	4	5	0	8	6	3	32
Criteria									
Background Information							1		1
Citation Rate			1						1
Disciplinary Treatment of Topic				1					1
Distinctive Ideas		2		1			2		5
Document Quality	1			1		1			3
Full-Text Availability	1							1	2
Genre-Book Review	1			1		1	1		4
Genre-Criticism or Interpretation		1				1		2	4
Genre-Editorial						1			1
Genre-Folk literature				1					1
Genre-Literature Review			2			2	1		5
Genre-Personal Experience or Views				1		1			2
Results: Criteria-Genre-Theory	2								2
Journal or Website Quality			2	1		1	2		6
Key Concepts or Entities	2			1	1	1		1	6
Local Availability of Source		1		1	1		1	1	5
Number of Results	5		1	2			3	1	12
Personal Interest				1		1			2

Appendix 29 Themes in Advanced Thinking

Themes in Advanced Thinking	Annette	Bonnie	Carol	Ellen	Frances	Gail	Howard	Isabel	TOTALS
<u>Evaluating-Results-Criteria (continued)</u>									
Pictures and Picture Captions		1							1
Population or Geographic Area			1	2		2			5
Potential Bias		1					1		2
Primary Source							2		2
Recency of Content				1		2	3	3	9
References Cited in Source			1				1	1	3
Relevance-Different Topic but Potentially Applicable	4		1	2			1		8
Relevance-Exactly on Topic	1		2	1	1				5
Relevance-Generally on Topic	1		1	2		1	2	4	11
Relevance-Intuition or Signals		2	1						3
Relevance-Not Relevant or Useful	1	2	2	1		1		1	8
Reputable or Familiar Authors	1		2				3		6
Research Methods			1						1
Same Item Retrieved in Different Query Results				2					2
Specificity of Topic Treatment				1		1		1	3
Time Period Covered					1	1	1		3
Title Words-Catchy Words						1			1
Title Words-Topic Words		1		1	1	1		1	5
Understandability						1			1
subtotals: Results-Criteria	20	11	18	25	5	21	25	17	142
Subtotal: Results	23	14	22	30	5	29	31	20	174

Appendix 29 Themes in Advanced Thinking

Themes in Advanced Thinking	Annette	Bonnie	Carol	Ellen	Frances	Gail	Howard	Isabel	TOTALS
<u>Evaluating-Search Process (4 themes)</u>									
Amount of Needed Sources	1			1			2	1	5
Ease	1					1			2
Outcome	2		1	2	2		3	2	12
Skills		1	1			2		1	5
Subtotals: Search Process	4	1	2	3	2	3	5	4	24
<u>Terms for Querying (3 themes)</u>									
Inadequate		1							1
Potentially Problematic	2			1	1				4
Potentially Useful	2		1				1		4
Subtotals: Terms for Querying	4	1	1	1	1	0	1	0	9
TOTALS: Evaluating	39	21	30	38	12	42	42	28	252
<u>% of Evaluating TOTALS by Data Source</u>									
Demonstrations	72%	38%	50%	71%	58%	57%	69%	36%	59%
Interviews	28%	62%	50%	29%	42%	43%	31%	64%	41%
<u>Creating Personal Understanding (4 themes)</u>									
Acquire Understanding	2			3		4		1	10
Create Understanding	3		1	2		2	3		11
Perform Quick Look-Up		1				3			4
Understand Instructor's Goals for Creating Understanding	1	1				1	2	1	6
TOTALS: Creating Personal Understanding	6	2	1	5		10	5	2	31

Appendix 29 Themes in Advanced Thinking

Themes in Advanced Thinking	Annette	Bonnie	Carol	Ellen	Frances	Gail	Howard	Isabel	TOTALS
% of Creating Personal Understanding TOTALS by Data Source									
Demonstrations	17%	50%		80%		50%			35%
Interviews	83%	50%	100%	20%		50%	100%	100%	65%
TOTALS: Using Strategy (32 themes)	19	5	16	16	4	17	22	6	105
Strategy Total as % of Cumulative Total									27%
TOTALS: Evaluating (68 themes)	39	21	30	38	12	42	42	28	252
Evaluating Total as % of Cumulative Total									65%
TOTALS: Creating Personal Understanding (4 themes)	6	2	1	5		10	5	2	31
Personal Understanding Total as % of Cumulative Total									8%
CUMULATIVE TOTALS: (104 themes)	64	28	47	59	16	69	69	36	388

Appendix 30: Selected Elements of the ANZIIL and Relational Models of Information Literacy

ANZIIL Model (excerpted from Bundy, 2004, p. 12-21)

ANZIIL Standard One: The information literate person recognises the need for information and determines the nature and extent of the information needed

1.1. defines and articulates the information need

1.1.1. explores general information sources to increase familiarity with the topic

1.1.2. identifies key concepts and terms in order to formulate and focus questions

1.1.3. defines or modifies the information need to achieve a manageable focus

1.1.4. may confer with others to identify a research topic or other information need

1.2 understands the purpose, scope and appropriateness of a variety of information sources

1.2.1. understands how information is organised and disseminated, recognising the context of the topic in the discipline

1.2.2. differentiates between, and values, the variety of potential sources of information

1.2.3. identifies the intended purpose and audience of potential resources eg. popular vs scholarly, current vs historical

1.2.4. differentiates between primary and secondary sources, recognising how their use and importance vary with each discipline

1.3 re-evaluates the nature and extent of the information need

1.3.1. reviews the initial information need to clarify, revise, or refine the question

1.3.2. articulates and uses criteria to make information decisions and choices

1.4 uses diverse sources of information to inform decisions

1.4.1. understands that different sources will present different perspectives

1.4.2. uses a range of sources to understand the issues

1.4.3. uses information for decision making and problem solving

Appendix 30: Selected Elements of the ANZIIL and Relational Models of Information Literacy

ANZIIL Standard Two: The information literate person finds needed information effectively and efficiently

2.1 selects the most appropriate methods or tools for finding information

2.1.1. identifies appropriate investigative methods eg. laboratory experiment, simulation, fieldwork

2.1.2. investigates benefits and applicability of various investigative methods

2.1.3. investigates the scope, content, and organisation of information access tools

2.1.4. consults with librarians and other information professionals to help identify information access tools

2.2 constructs and implements effective search strategies

2.2.1. develops a search plan appropriate to the investigative method

2.2.2. identifies keywords, synonyms and related terms for the information needed

2.2.3. selects appropriate controlled vocabulary or a classification specific to the discipline or information access tools

2.2.4. constructs and implements a search strategy using appropriate commands

2.2.5. implements the search using investigative methodology appropriate to the discipline

2.3 obtains information using appropriate methods

2.3.1. uses various information access tools to retrieve information in a variety of formats

2.3.2. uses appropriate services to retrieve information needed eg document delivery, professional associations, institutional research offices, community resources, experts and practitioners

2.3.3. uses surveys, letters, interviews, and other forms of inquiry to retrieve primary information

2.4 keeps up to date with information sources, information technologies, information access tools and investigative methods

2.4.1. maintains awareness of changes in information and communications technology

2.4.2. uses alert/current awareness services

2.4.3. subscribes to listservs and discussion groups

2.4.4. habitually browses print and electronic sources

Appendix 30: Selected Elements of the ANZIIL and Relational Models of Information Literacy

ANZIIL Standard Three: The information literate person critically evaluates information and the information seeking process

3.1 assesses the usefulness and relevance of the information obtained

- 3.1.1. assesses the quantity, quality, and relevance of the search results to determine whether alternative information access tools or investigative methods should be utilised
- 3.1.2. identifies gaps in the information retrieved and determines if the search strategy should be revised
- 3.1.3. repeats the search using the revised strategy as necessary

3.2 defines and applies criteria for evaluating information

- 3.2.1. examines and compares information from various sources to evaluate reliability, validity, accuracy, authority, timeliness, and point of view or bias
- 3.2.2. analyses the structure and logic of supporting arguments or methods
- 3.2.3. recognises and questions prejudice, deception, or manipulation
- 3.2.4. recognises the cultural, physical, or other context within which the information was created and understands the impact of context on interpreting the information
- 3.2.5. recognises and understands own biases and cultural context

3.3 reflects on the information seeking process and revises search strategies as necessary

- 3.3.1. determines if original information need has been satisfied or if additional information is needed
- 3.3.2. reviews the search strategy
- 3.3.3. reviews information access tools used and expands to include others as needed
- 3.3.4. recognises that the information search process is evolutionary and nonlinear

Appendix 30: Selected Elements of the ANZIIL and Relational Models of Information Literacy

ANZIIL Standard Four: The information literate person manages information collected or generated

4.1 records information and its sources

- 4.1.1. organises the content in a manner that supports the purposes and format of the product eg outlines, drafts, storyboards
- 4.1.2. differentiates between the types of sources cited and understands the elements and correct citation style for a wide range of resources
- 4.1.3. records all pertinent citation information for future reference and retrieval

4.2 organises (orders/classifies/stores) information

- 4.2.1. compiles references in the required bibliographic format
- 4.2.2. creates a system for organising and managing the information obtained eg EndNote, card files

ANZIIL Standard Five: The information literate person applies prior and new information to construct new concepts or create new understandings

5.1 compares and integrates new understandings with prior knowledge to determine the value added, contradictions, or other unique characteristics of the information

- 5.1.1. determines whether information satisfies the research or other information need and whether the information contradicts or verifies information used from other sources
- 5.1.2. recognises interrelationships between concepts and draws conclusions based upon information gathered
- 5.1.3. selects information that provides evidence for the topic and summarises the main ideas extracted from the information gathered
- 5.1.4. understands that information and knowledge in any discipline is in part a social construction and is subject to change as a result of ongoing dialogue and research
- 5.1.5. extends initial synthesis at a higher level of abstraction to construct new hypotheses

5.2 communicates knowledge and new understandings effectively

- 5.2.1. chooses a communication medium and format that best supports the purposes of the product and the intended audience
- 5.2.2. uses a range of appropriate information technology applications in creating the product
- 5.2.3. incorporates principles of design and communication appropriate to the environment
- 5.2.4. communicates clearly and in a style to support the purposes of the intended audience

Appendix 30: Selected Elements of the ANZIIL and Relational Models of Information Literacy

ANZIIL Standard Six: The information literate person uses information with understanding and acknowledges cultural, ethical, economic, legal, and social issues surrounding the use of information

6.1 acknowledges cultural, ethical, and socioeconomic issues related to access to, and use of, information

6.1.1. identifies and can articulate issues related to privacy and security in the print and electronic environments

6.1.2. identifies and understands issues related to censorship and freedom of speech

6.1.3. understands and respects Indigenous and multicultural perspectives of using information

6.2 recognises that information is underpinned by values and beliefs

6.2.1. identifies whether there are differing values that underpin new information or whether information has implications for personal values and beliefs

6.2.2. applies reasoning to determine whether to incorporate or reject viewpoints encountered

6.2.3. maintains an internally coherent set of values informed by knowledge and experience

6.3 conforms with conventions and etiquette related to access to, and use of, information

6.3.1. demonstrates an understanding of what constitutes plagiarism and correctly acknowledges the work and ideas of others

6.3.2. participates in electronic discussions following accepted practices eg Netiquette

6.4 legally obtains, stores, and disseminates text, data, images, or sounds

6.4.1. understands fair dealing in respect of the acquisition and dissemination of educational and research materials

6.4.2. respects the access rights of all users and does not damage information resources

6.4.3. obtains, stores, and disseminates text, data, images, or sounds in a legal manner

6.4.4. demonstrates an understanding of intellectual property, copyright and fair use of copyrighted material

Appendix 30: Selected Elements of the ANZIL and Relational Models of Information Literacy

Relational Model (excerpted and adapted from Bruce, 1997b, p. 117-151)

Category One: The Information Technology Conception *[not identified in this study's examination of advanced thinking relating to subject searching]*

- 1.1 Information literacy is seen as using information technology for information retrieval and communication.

Category Two: The Information Sources Conception

- 2.1 Information literacy is seen as finding information located in information sources.
- 2.2 Information is viewed as something outside the individual, contained within the sources, which may be human.
- 2.3 Information is retrievable because a user has knowledge of information sources.
- 2.4 Information literate people are able to find information because they know information sources and their structure, and are able to use them independently or with the aid of other knowledgeable individuals.

Category Three: The Information Process Conception

- 3.1 Information literacy is seen as executing a process.
- 3.2 Information is viewed as something outside the individual, the usefulness of which is shaped by the information problem that contextualizes it.
- 3.3 Information processes are strategies implemented by information users confronting a novel situation in which they experience a lack of knowledge.
- 3.4 Information literate people recognize a need for information, and use the information they access to meet the original need. This need is usually stated in terms of problem solving or decision making.

Category Four: The Information Control Conception *[not identified in this study's examination of advanced thinking relating to subject searching]*

- 4.1 Information literacy is seen as controlling information.

Appendix 30: Selected Elements of the ANZIIL and Relational Models of Information Literacy

Category Five: The Knowledge Construction Conception

- 5.1 Information literacy is seen as building up a personal knowledge base in a new area of interest.
- 5.2 Information is an object of reflection, and information use is the focus of attention.
- 5.3 Information is subjective or fluid. It is internalized as a part of the user who evaluates and analyzes it to construct and interpret meaning.
- 5.4 Information literate people develop a personal knowledge base by using strategies to adopt personal perspectives on collected information through critical analysis.

Category Six: The Knowledge Extension Conception

- 6.1 Information literacy is seen as working with knowledge and personal perspectives adopted in such a way that novel insights are gained.
- 6.2 Information use is aimed at knowledge extension, which requires a capacity for intuition.
- 6.3 Information is part of the user who transforms it through reflection and creative insight, thereby extending the knowledge base of the discipline.
- 6.4 Information literate people use personal knowledge, experience and insight or intuition to use information creatively to create new knowledge.

Category Seven: The Wisdom Conception

- 7.1 Information literacy is seen as using information wisely for the benefit of others.
- 7.2 Information use is aimed at transforming people.
- 7.3 Information is part of the user who is conscious of personal values, attitudes and beliefs that enable its wise use.
- 7.4 Information literate people supplement their knowledge base with personal values, attitudes and beliefs to use information wisely within a larger societal, cultural, and historical context.

Appendix 31: Advanced Thinking Referencing Using Strategy

Participants' Spoken Thoughts Referencing Strategy Themes By Theme Group	Advanced Thinking Criteria	Information Literacy Model + Element**
<u>Conduct Search-Adjust Strategy</u>		
S.CS.AS.01.* "I've already done some searching on this topic. I've looked for articles more recent than June of last year and that wasn't very fruitful. So I'm going to . . . broaden my search" (Annette, demo3)	- references considered choice to change strategy	ANZIIL 3.1.2.** ANZIIL 3.3.2. Relational 3.3.
S.CS.AS.03. "Initially I thought there wouldn't be very much information. So I thought I would just take as much as I could find. But then when I found there was actually a substantial amount . . . concerning [population group] specifically, then I started eliminating things that . . . [I] considered initially" (Ellen, interview3)	- reflects thinking about own search processes and changes in it	ANZIIL 1.3.1. Relational 3.3.
<u>Conduct Search-Broad Considerations</u>		
S.CS.BC.01. "my prof kind of taught me how to do it this way . . . I broadly look for my topic . . . [in] journals and Internet and books, and I look at the . . . descriptions and then . . . I'll go pick up the resource . . . or I'll order the book . . . and then I read them . . . and I'll decide . . . if it kinda corresponds to my topic. Then if it . . . kind of is negative towards my topic, but it's not exactly what my thesis is . . . I'll put it in my works cited because I just kind of do it for everything I've read." (Bonnie, interview1)	- describes a complex process	ANZIIL 2.2.5. Relational 3.1.
S.CS.BC.02. "I'm . . . looking for some ideas to see how I can approach . . . this advocacy plan . . . I think I will get some ideas on what I need to do . . . from this search of what other people have done and what people have studied to see what kind of information maybe in a third . . . subject search that I'll need to collect for . . . this project." (Ellen, interview3)	-expresses insightful approach to understanding an unfamiliar task	ANZIIL 3.1.1. Relational 2.1.
S.CS.BC.03. "I don't usually print out articles just because . . . I only use a couple of sentences here and there, so it's kind of a waste of paper." (Isabel, interview3)	- references a considered choice to avoid waste	ANZIIL 6.1.
<u>Conduct Search-Chart Next Steps</u>		
S.CS.CN.01. "the next step . . . would be to read through those articles that I marked for myself, and maybe even email my professor to ask for more resources. But it's still really early in the term, so . . . I don't necessarily need to do that yet." (Annette, demo1)	- reflects thinking about the search stage and what is needed and planning next steps	ANZIIL 1.1.4. ANZIIL 2.2.1. Relational 3.1. Relational 5.1.
S.CS.CN.02. "the next step will just be to track down those books and see what they've got for me and maybe I'll be able to find some more . . . citations in those books that will lead me to some other resources." (Annette, demo2)	- reflects thinking about next steps and a complex process for finding more information	ANZIIL 2.2.1. ANZIIL 2.3.1. Relational 2.1. Relational 3.1.

* Codes were used in data analyses to identify uniquely each instance of advanced thinking.

** Numbered information literacy elements are listed in full in Appendix 30.

Appendix 31: Advanced Thinking Referencing Using Strategy

Participants' Spoken Thoughts Referencing Strategy Themes By Theme Group	Advanced Thinking Criteria	Information Literacy Model + Element**
S.CS.CN.03. "when I read some of those papers and I get more of a feeling for the kind of terms that the papers use. . . . research papers always use a little bit different terminology to describe something . . . and each discipline has its own little lingo . . . I'll have a better grasp of how to search for articles relating to that topic. . . . or if . . . it said something . . . pertaining to my thing, I'll just look at who they referenced and then go look up their article." (Carol, interview1)	- describes complex process for gaining better knowledge of search terms	ANZIIL 1.1.2. ANZIIL 1.2.1. ANZIIL 5.1.4. Relational 2.1. Relational 5.1.
S.CS.CN.04. "I would probably stop to get the information that I have . . . and then...just have to do some . . . step-aside thinking about different things and reading through some of these things specifically to see . . . where I want to go next." (Ellen, demo1)	- reflects thinking about personal thought processes	ANZIIL 2.3.1. Relational 5.1.
S.CS.CN.05. "I think I have now enough information to . . . get some initial ideas of this. And . . . I don't think there's any point going any further . . . rather just read it and have it in . . . my head . . . then I'll probably have a little bit better . . . idea of what I'm looking for" (Gail, demo1)	- reflects thinking about own thinking, search process	Relational 5.1.
S.CS.CN.06. "I think I'm gonna talk to my professor, like what he really wants, how recent he wants, and then if he can maybe give me an idea . . . where to go for this, because I don't know." (Gail, demo2)	- references considered action to resolve search impasse	ANZIIL 1.1.4. Relational 2.1.
S.CS.CN.07. "I would . . . read over [saved citation information] and then maybe go back and . . . read the abstracts a little bit more in detail, and maybe print off some whole review articles, read it, and then . . . make my topic . . . and kind of try to organize my paper. And I'll write it and . . . what I usually do is when I write a paper and they have an interesting reference, I go back and kind of go from there." (Gail, demo3)	- describes complex process of writing and researching at the same time	ANZIIL 5.1.3. Relational 5.3.
S.CS.CN.08. "I'll probably do some more searching, but they are probably most of the time from the papers that I found. . . . for example you talk only about males, I would like to know how this affects females, but then I would go back and look for it . . . or if I feel I missed something . . . I will do some more searching, but it's not going to be very different from what I did now." (Gail, interview3)	- reflects thinking about personal research processes	ANZIIL 5.1.3. Relational 2.1. Relational 3.1.
S.CS.CN.09. "I'll look at these books and . . . their table of contents and their index and . . . see what chapters are relevant or of interest . . . and then . . . I'll look at the bibliography maybe for those four or five chapters and see what sources they use, or sometimes like further readings, they'll suggest other sources to look at. . . . or I'll talk to my professor and see if she can recommend anything. . . . I think I've exhausted the books in the library as far as [search topic], so I'll probably look at other libraries" (Isabel, interview2)	- describes complex plan for finding all information needed for task	ANZIIL 1.4.2. Relational 2.1. Relational 3.1.
Conduct Search-Choose Resources		
S.CS.CR.01. "I'll just use Academic Search Premier. I have a lot of time left before this is due, so I don't have to look for full-text. I tend to prefer looking for full-text but since my paper isn't due for several months I don't have to." (Annette, demo1)	- weighs usual preference against specific situation; chooses a resource not restricted to FT	ANZIIL 1.2.2. Relational 2.1.

Appendix 31: Advanced Thinking Referencing Using Strategy

Participants' Spoken Thoughts Referencing Strategy Themes By Theme Group	Advanced Thinking Criteria	Information Literacy Model + Element**
S.CS.CR.02. "I will start . . . with the . . . religious studies database, because I think this is a pretty narrow . . . topic, and I'm kind of worried that I'm not gonna find very much on it. So I'll start with . . . the most focused of the databases that I know because if there is anything it'll be here." (Annette, demo2) (Evaluation-Resources-Indexes-Subject Coverage E.R.IND.SC.02)	- references considered choice	ANZIIL 2.1.3. Relational 2.1.
S.CS.CR.03. "I'd probably actually just use Google if it was in class, I'd just use the . . . fast . . . explanation that that was. And then . . . if the class discussion kind of made me decide to actually do the play for my essay, I would have gone into the text, because I don't usually trust the Internet." (Bonnie, interview2)	- references considered choice	ANZIIL 1.2.3. Relational 2.1.
S.CS.CR.04. "I find that when I'm doing some of my searches . . . as a general trend that I . . . tend to stick to one . . . method . . . whether it be Internet or whether it be the databases, and I find myself really focused on the one. . . . I think it's a little bit to keep myself focused in a way, so I can . . . discriminate between different searches and different kinds of things that I'll be finding." (Ellen, interview3)	- reflects on own searching processes	ANZIIL 2.2.1. Relational 3.1.
<u>Conduct Search-Choose Topic or Focus</u>		
S.CS.CT.01. "how important it is . . . to the world. . . . For example if a drug is often used I think it's important to address it in my paper, or else something very little, not so much. Or if . . . it's something that when it was discovered it was kind of a shock, I'd say that, too, or something unusual somehow." (Gail, interview3)	- specifies criteria for topic choice	ANZIIL 3.2.4. Relational 7.1.
S.CS.CT.02. "I see that a lot of them talk about astrocytes . . . I was not necessarily thinking before about doing my paper on developmental factors on astrocytes but . . . maybe it seems . . . a good idea just because there's so much" (Gail, demo3)	- specifies a criterion for topic choice	ANZIIL 3.1.1.
S.CS.CT.03. "I might add cocaine in there or ecstasy, although I wasn't really thinking of it, but if there is quite a bit out there in the research, then . . . I might consider doing it." (Gail, interview3)	- specifies a criterion for topic choice	ANZIIL 3.1.1.
S.CS.CT.04. "This one looks particularly interesting . . . because it has selected articles, and usually . . . a book such as that indicates . . . there'll be a lot of different . . . significant subjects And sometimes reading one of the compelling articles might give me an idea to a subject that is . . . interesting, or something where there's debate over issues, which . . . makes for an interesting history paper." (Howard, demo1) (Evaluation-Criteria-Distinctive Ideas E.RT.C.DI.05)	- signifies sophisticated understanding of content of edited works	ANZIIL 3.2.1. Relational 5.1.
S.CS.CT.05. "What I'll often do is read the introduction of these monographs before I take them out of the library and see if there's anything compelling in the argument of the author. . . . At this point I'm not even sure what kind of argument I want to make or where I'm going to be coming from, so that might jump-start some ideas for me and see what some of the critical issues are, especially with some of the more contemporary writers." (Howard, demo1)	- describes a sophisticated approach to jump-start ideas	ANZIIL 3.2.1. Relational 5.1.

Appendix 31: Advanced Thinking Referencing Using Strategy

Participants' Spoken Thoughts Referencing Strategy Themes By Theme Group	Advanced Thinking Criteria	Information Literacy Model + Element**
S.CS.CT.06. "I try to find . . . subjects a) that are interesting to me, and b) something that potentially is contentious . . . I want availability of primary sources. . . . And I just kinda try to narrow it down as I go so . . . the subject and the material lines up as closely as possible with the requirements of the assignment." (Howard, interview1)	- describes complex process for choosing topic	ANZIIL 1.2.4. ANZIIL 3.2.1. Relational 5.1.
S.CS.CT.07. "I really think that that will be a narrow enough subject that I can do it justice in the time and space that I have for this paper." (Howard, interview1)	- signifies sophisticated understanding of task	ANZIIL 1.3.2. Relational 5.3.
S.CS.CT.08. "we just finished the lecture on this subject . . . which was actually part of my reason for choosing this subject. I knew it was going to be covered early in the course and if possible I really like to have the professor's take on a subject before even engaging a paper. . . . also...if I'm writing a paper on a subject that's covered on the mid-term, it makes easier studying." (Howard, interview1)	- expresses insightful approach that looks at topic choice from different angles	ANZIIL 1.3.2. Relational 3.2.
S.CS.CT.09. "I want to find . . . a specific topic within that broader . . . subject to write my paper on. And a lot of that may come down to the availability of primary sources and what kind of interesting . . . things I come up with. I gear . . . some of my paper topics towards availability of sources . . . just because . . . going the other way around can sometimes be frustrating if you're looking for sources of subjects that . . . you're first interested in, if you can't find stuff to substantiate your arguments" (Howard, interview2) (Evaluation-Results-Criteria-Primary Sources E.RT.C.PS.02)	- describes a complex process for determining an appropriate paper topic	ANZIIL 1.2.4. ANZIIL 1.3.2. Relational 3.2.
S.CS.CT.10. "Along with another student . . . we're presenting . . . on the topic [American history topic] . . . following the Civil War. So I'm really trying to double up some of my research because I may be presenting on the same time period that I'm wanting to use in my research paper." (Howard, interview2)	- expresses insightful approach that looks at all of the angles in choosing a topic	ANZIIL 1.3.2. Relational 3.2.
S.CS.CT.11. "I'm going to look at these sources and look at the bibliographies and see if there's any other [sources] . . . when I'm reading . . . I don't know exactly, but usually something will jump out at me. Or, I'll want to find out more about a specific topic within these larger books or something and then consult other sources" (Isabel, interview2)	- reflects thinking about personal process for choosing topic	ANZIIL 1.1.1. Relational 2.1.
<u>Conduct Search-Decide How Much is Needed</u>		
S.CS.DH.01. "for the most part if it had anything to do with [topic] in the way that I want to look at it, then I would mark it as relevant, because I really don't know yet what I'm specifically going to be looking at . . . it's always easier to mark too much and then go back and filter it, rather than have to look over and over again, because I missed stuff." (Annette, interview1) (Evaluation-Results-Criteria-Relevance-Generally on Topic E.RT.C.R.GT.01)	- specifies reasons for search decision to save loosely relevant items	ANZIIL 3.1. Relational 3.1.

Appendix 31: Advanced Thinking Referencing Using Strategy

Participants' Spoken Thoughts Referencing Strategy Themes By Theme Group	Advanced Thinking Criteria	Information Literacy Model + Element**
S.CS.DH.02. "I'm just thinking a little bit in relation to my assignment now, about...what . . . my professor is looking for . . . and . . . I'm not entirely sure. So . . . some of the things that I'm saving, I'm not sure if I'm going to...use them...but . . . I think it's worth having it just in case...it's something that's useable." (Ellen, demo3)	- specifies criterion that reflects thinking about personal understanding of task	ANZIIL 3.1. Relational 3.1.
S.CS.DH.03. "I'm needing to take a look at a few of these monographs and narrow it down quite substantially, so, I'm not looking for an overwhelming amount of information. Part of my tendency is to over-research a lot of these things." (Howard, demo1)	- reflects thinking about own tendencies and task requirements	ANZIIL 3.1.1. Relational 3.2.
<u>Conduct Search-Handle Search Impasse</u>		
S.CS.HS.01. "I'm having a really hard time finding recent articles that have anything to do with what I'm looking for. So I think my best bet is probably going to be asking the prof for help, because I'm not finding anything on my own." (Annette, demo3) (Evaluation-Search process-Outcome E.SP.O.02)	- reflects thinking about personal ability to overcome a search impasse	ANZIIL 2.3.2. Relational 2.4.
S.CS.HS.02. "I don't know what to do anymore... I'm going to type in . . . offenders and family, leave out [population group], maybe that'll work" (Carol, demo1)	- reflects thinking about the search process	ANZIIL 3.3. Relational 2.1.
S.CS.HS.03. "I don't even know what to search for anymore . . . Let's go to the catalogue" (Carol, demo3)	- reflects thinking about the search process	ANZIIL 3.3.3. Relational 2.1.
S.CS.HS.04. "It's frustrating sometimes. . . . I'd like to know how to limit my search more, cause a lot of the times I come up with . . . forty...fifty papers and three quarters of them aren't useful. . . . I get to the point where I just don't know what else to do . . . [so] I just browse through them . . . if I try . . . adding another factor . . . then I lose pretty much everything" (Carol, interview3) (Evaluation-Search Process-Skills E.SP.S.02)	- specifies reason for relying heavily on one approach to dealing with a search impasse	ANZIIL 3.1.2. Relational 3.3.
S.CS.HS.05. "I think what I'm going to do... 'cause I'm kind of at a loss in this, is to . . . open up...a new...window to find these journals" (Ellen, demo2)	- reflects thinking about the search process	ANZIIL 3.3.3. ANZIIL 2.3. Relational 2.1.
S.CS.HS.06. "It seems to me like the titles of the articles don't have much keyword term[s] as in scientific revolution, so I'm not too happy with this. I'm actually thinking . . . I'm on the wrong track here...and the further I go the more...lost I get. I'm just going to go somewhere else." (Gail, demo2) (Evaluation-Results-Criteria-Key Concepts or Entities E.RT.C.KC.05)	- reflects thinking about problems with the search process	ANZIIL 3.1.1. Relational 2.1.
S.CS.HS.07. "I don't really know...what to do . . . 'cause I hardly find anything . . . that talks about . . . just gonna try to see if I can find a book, now, because I'm just thinking, maybe in history it doesn't matter. Probably it doesn't need to be the most recent paper on scientific revolution." (Gail, demo2)	- reflects thinking about search process and task requirements	ANZIIL1.3.1. Relational 2.1.

Appendix 31: Advanced Thinking Referencing Using Strategy

Participants' Spoken Thoughts Referencing Strategy Themes By Theme Group	Advanced Thinking Criteria	Information Literacy Model + Element**
<u>Conduct Search-Include Multiple Perspectives</u>		
S.CS.IM.01. "this one talks about weaknesses in the . . . leisure concept. That would be...possibly useful, because I really want to make sure I have . . . all sides of an issue" (Annette, demo1)	- considers multiple perspectives	ANZIIL 1.4.1. ANZIIL 3.2.1. Relational 5.1.
S.CS.IM.02. "now I'm thinking . . . how I can approach the topic, looking at two different sides . . . two perspectives: prevention and treatment. Since I'm not sure how I need to handle the assignment, I think that might be a good approach to start with." (Ellen, demo3)	- reflects on personal understanding of task	ANZIIL 1.4.1. ANZIIL 3.2.1. Relational 5.1.
S.CS.IM.03. "Mind conscious dualism in...a certain kind of yoga philosophy . . . I always think it's interesting how in Asia they . . . sometimes have different views on things. Just to kind of see it from a different cultural perspective . . . maybe that adds something in this paper." (Gail, demo1)	- considers multiple perspectives	ANZIIL 1.4.1. ANZIIL 3.2.4. Relational 5.1.
S.CS.IM.04. "if I find . . . an article that I really like . . . I will look for critiques . . . of that . . . author's arguments, to see if there's holes within the argument or scholarship . . . that I . . . just don't pick up. And so I just kind of try to counterbalance my arguments and my sources as best I can that way, especially if I'm gonna rely heavily upon one of the sources" (Howard, demo1)	- considers multiple perspectives	ANZIIL 1.4.1. ANZIIL 3.2.1. ANZIIL 3.2.2. Relational 5.1.
S.CS.IM.05. "Ok, so maybe this article's talking about the scene in the book . . . some critics think that it was rape, this one apparently does not . . . I tend to disagree with this one, so I might use this article just as a counterargument to my own." (Isabel, demo3)	- considers multiple perspectives	ANZIIL 3.2.1. Relational 5.1.
<u>Conduct Search-Review Results</u>		
S.CS.RR.01. "I found it easier to . . . feel more natural with the subject searching when I had the writing, because that's just the normal . . . process that I go through. So, for myself that, I think it helped a lot of other things, and it helped me to voice some of the things better that I was thinking, because if it was really important then I was writing it" (Ellen, interview3)	- reflects thinking about personal processes	ANZIIL 4.1. Relational 3.1.
S.CS.RR.02. "I do tend to look at quite a few of them because I found too many times that it's always on the next page that there was something. . . . if I found like ten things or . . . some number that seems substantial in the first few pages, then I don't usually continue on. But when . . . there seems to be some things mixed in that I don't think apply but then other things that do apply, then . . . I usually will go through six or eight pages of . . . records . . . if there's twenty on a page or so, I'd go up to probably two hundred . . . not looking at every single thing precisely but . . . certainly . . . reading the titles of . . . the majority of them" (Ellen, interview3)	- reflects thinking about personal processes	ANZIIL 3.1.1. Relational 2.1.
S.CS.RR.03. "if this was at home I think . . . I would . . . spend some more time reading this so I understand it a little bit better. So I'm just gonna real quick go over it a little bit to see . . . the main points" (Gail, demo1)	- reflects thinking about personal understanding	Relational 5.1.

Appendix 31: Advanced Thinking Referencing Using Strategy

Participants' Spoken Thoughts Referencing Strategy Themes By Theme Group	Advanced Thinking Criteria	Information Literacy Model + Element**
<p>S.CS.RR.04. "as kind of a beginning historian, what I often times do is look for commonly mentioned primary sources . . . I kind of just got my sniffer out for that, and I don't want to rely on their interpretation of those primary sources, but I kind of get to see which ones are the key . . . so I can look at them myself and kind of make my own evaluation" (Howard, interview1) (Personal Understanding-Create Understanding P.C.09)</p>	- expresses insightful approach to choosing a topic	ANZIIL 1.2.4. ANZIIL 3.2.1. ANZIIL 5.1.4. Relational 5.1.
<p>S.CS.RR.05. "it's strange how I do it I think . . . it's almost like a confidence thing . . . if I know there's stuff out there, then I can kind of relax and then I'll go back and read them . . . that's when I don't read . . . one right away" (Isabel, interview3)</p>	- reflects thinking about personal approach to reviewing results	ANZIIL 3.1.1. Relational 2.1.
<u>Obtain Needed information-Consult Library Staff</u>		
<p>S.ON.CL.01. "Just from my . . . initial search there's only six monographs that came up . . . for that time period. I really expect that I'll be bringing in some stuff. So I might talk to . . . one of the research assistants . . . downstairs, maybe they can help me come up with something more, but I don't know, we'll see." (Howard, demo2)</p>	- specifies reasons for possible resource choice	ANZIIL 3.3.1. ANZIIL 2.1.4. ANZIIL 2.3.2. Relational 2.1.
<u>Obtain Needed Information-Consult Professors and Subject Experts</u>		
<p>S.ON.CP.01. "[professor] already gave me an article . . . pertaining to my topic. . . . I'll probably go through his . . . huge filing cabinet . . . I'll probably comb through that and talk to him and see what he has to say about it." (Carol, demo1)</p>	- describes knowledge of a specialized resource	ANZIIL 2.3.2. Relational 2.1.
<p>S.ON.CP.02. "my prof . . . because he's a Renaissance scholar, he has a lot of subscriptions.. some of the magazines, the journals that sometimes aren't available to libraries . . . So maybe I would consult him and . . . have him direct me a little bit more" (Isabel, interview1)</p>	- describes knowledge of a specialized resource	ANZIIL 2.3.2. Relational 2.1.
<u>Obtain Needed Information-Use Interlibrary Loan</u>		
<p>S.ON.UI.01. "I've never even looked for interlibrary loans . . . Not sure if I'm . . . I guess...either I'm impatient or I'm not understanding, but I don't know . . . Not sure... Not really sure what I'm doing, so I'll get back out of that one" (Ellen, demo1)</p>	- reflects thinking about personal understanding of ILL process	ANZIIL 2.3.2. Relational 2.1.
<p>S.ON.UI.02. "The problem with things that I need for interlibrary loans right now is that...I have already used nearly 40, and they won't give me any more [laugh]. So . . . I have to decide very carefully . . . what I want to use for interlibrary loans at this point." (Frances, demo2)</p>	- references need to make considered choices	ANZIIL 2.3.2. Relational 2.1.

Appendix 31: Advanced Thinking Referencing Using Strategy

Participants' Spoken Thoughts Referencing Strategy Themes By Theme Group	Advanced Thinking Criteria	Information Literacy Model + Element**
<u>Seek Information-Query-Operations-Combine Results Sets to Obtain Overlap</u>		
S.SI.QO.CR.01. "I . . . took those two big searches and just combined them to see if there's any overlap in them, because they're both really big" (Carol, demo1)	- describes a sophisticated process to find relevant items	ANZIIL 2.2.4. Relational 3.3.
<u>Seek information-Query-Operations-Exclude Specific Publication Format</u>		
S.SI.QO.ES.01. "I don't like getting the reviews. And there's a way I get them out of there ... Can I ask you to help me with that? Ok, yeah, that works. I just don't want reviews . . . because there's tons of reviews, and it just plugs up your search." (Howard, demo1)	- expresses unique perspective on the value of a particular academic publication format	ANZIIL 2.2.4. Relational 3.3.
<u>Seek Information-Query-Operations-Modify Catalogue Scope</u>		
S.SI.QO.MS.01. "[name of university] no, I'll search all three libraries because I have a lot of time" (Annette, demo1)	- references considered choice to select non-standard scope	ANZIIL 2.1.3. Relational 3.1.
<u>Seek Information-Query-Operations-Omit Terms</u>		
S.SI.QO.OT.01. "So it looks like I'm back to religion and cyberspace or Internet. Maybe I'll leave out online because that one can be too broad." (Annette, demo2)	- specifies reason for modifying query	ANZIIL 3.1.1. Relational 3.1.
S.SI.QO.OT.02. "I really like that search, but I think I'm going to . . . cut it down a little bit more and...not include treatment and see what I get." (Carol, demo1)	- specifies reason for modifying query	ANZIIL 3.1.1. Relational 3.1.
<u>Seek Information-Query-Operations-Search Within Relevant Source or Results</u>		
S.SI.QO.SW.01. "Journal ...of ..contemporary...religion..in . . . journal name. . . . Just see what all is there. Oh, there's a lot . . . on new religious movements. . . . could definitely be a journal that I would look into more, once I've narrowed down my topic." (Annette, demo2)	- describes a complex process to find relevant items	ANZIIL 3.1. Relational 2.1.
S.SI.QO.SW.02. "in . . . The Republic there's . . . different people talking or different sections . . . so I think I'm going to . . . search...Plato...and forms and see if I can find exactly what section it is so . . . if I was going to actually get the book I'd know . . . what section in the book so I wouldn't spend like nine hours reading Plato." (Bonnie, demo1)	- describes a complex process to find relevant items	ANZIIL 2.1. Relational 3.1.

Appendix 31: Advanced Thinking Referencing Using Strategy

Participants' Spoken Thoughts Referencing Strategy Themes By Theme Group	Advanced Thinking Criteria	Information Literacy Model + Element**
<p>S.SI.QO.SW.03. "I might just do a search for [primary source] on the Internet. . . . I'm sure there is probably dozens of sites where I could find the complete work. . . . the effectiveness of that is what I'll do is cut and paste it into a Word file. And then instead of just using an index, I can do . . . word searches that are way more exhaustive than the index." (Howard, interview3)</p> <p><u>Seek Information-Query-Operations-Sort Results in Reverse Chronological Order</u></p> <p>S.SI.QO.SC.01. "there's only 4,300 hits . . . That's something I probably need to narrow down a little bit. I'll just look at the most recent ones" (Howard, demo2)</p> <p><u>Seek Information-Query-Operations-Specify Fields to Search or Limit By</u></p> <p>S.SI.QO.SF.01. "I'm worried about if I just put in leisure that I'll get too many results. So maybe I'll put in leisure and I'll change it to in the subject" (Annette, demo1)</p> <p>S.SI.QO.SF.02. "Searching just for the subject, then. Trying to narrow it down a little bit" (Ellen, demo2)</p> <p><u>Seek Information-Query-Operations-Specify Publication Format</u></p> <p>S.SI.QO.SP.01. "I also think it would be handy if I had maybe a review paper . . . it's always handy if people summarize it for you" (Gail, demo3)</p> <p><u>Seek Information-Query-Operations-Use 'Find Similar' or 'Find Related'</u></p> <p>S.SI.QO.UF.01. "So maybe if I go find similar I'll find something ... related to it" (Carol, demo2)</p> <p>S.SI.QO.UF.02. "I can also do related articles . . . 'cause that usually gives you a lot...of similar papers." (Gail, demo3)</p>	<p>- describes a sophisticated process to find relevant items</p> <p>- references action to display results in nonstandard order</p> <p>- references choice of search option that is not the default</p> <p>- specifies reason for search action</p> <p>- signifies sophisticated knowledge of a particular academic publication format</p> <p>- references choice of a specialized search option not offered in all databases</p> <p>- references choice of a specialized search option not offered in all databases</p>	<p>ANZIIL 2.1. Relational 3.1.</p> <p>ANZIIL 3.1.1. Relational 3.1.</p> <p>ANZIIL 2.2.4. Relational 3.1.</p> <p>ANZIIL 2.2.4. Relational 3.1.</p> <p>ANZIIL 1.2.2. ANZIIL 1.4.2. Relational 2.1.</p> <p>ANZIIL 2.2.4. Relational 2.1.</p> <p>ANZIIL 2.2.4. Relational 2.1.</p>

Appendix 31: Advanced Thinking Referencing Using Strategy

Participants' Spoken Thoughts Referencing Strategy Themes By Theme Group	Advanced Thinking Criteria	Information Literacy Model + Element**
<u>Seek Information-Query-Operations-Use or Modify Boolean Operators</u>		
S.SI.QO.UB.01. "if I add anything it will just make it more broad . . . well, let's . . . try ... religion or new religious movement or new age...which will probably ...yeah, ok, it only added a few." (Annette, demo2)	- references knowledge of complex querying logic	ANZIIL 2.2.4. Relational 3.1.
S.SI.QO.UB.02. "I really like that search, but I think I'm going to, um ... cut it down a little bit more and ... not include treatment and see what I get." (Carol, demo1)	- references knowledge of complex querying logic	ANZIIL 2.2.4. Relational 3.1.
S.SI.QO.UB.03. "I started to put [author] and this title, or this title, and then I thought, oh no, I should have put and, or because if I say or all I'm . . . going to find [author] and this title . . . and so I was confusing myself about how the 'or' was working in that particular set of terms" (Frances, interview2)	- references knowledge of complex querying logic	ANZIIL 2.2.4. Relational 3.1.
<u>Seek Information-Query-Operations-Use Truncation</u>		
S.SI.QO.UT.01. "maybe I should put a tuncation in . . . that makes it longer, right? Like, more options, right? . . . Ok ... the tuncation, the dollars sign...means . . . you take it and it halves it, right? So anything after that, like it'll be just like the first half of the word" (Carol, demo1)	- references knowledge of a specialized querying device	ANZIIL 2.2.4. Relational 3.1.
S.SI.QO.UT.02. "Ok, what if we try autobiography, asterisk" (Frances, demo2)	- references knowledge of a specialized querying device	ANZIIL 2.2.4. Relational 3.1.
<u>Seek Information-Query-Terms-Search by Author Name</u>		
S.SI.QT.SA.01. "there's one . . . author . . . I know his stuff is what I'm looking for. So maybe I'll see if he's on here anywhere and I'll see what descriptors are used to describe what he writes about." (Annette, demo2)	- describes a complex search technique	ANZIIL 2.2.2. ANZIIL 2.2.4. Relational 3.1.
S.SI.QT.SA.02. "I think that . . . researcher at the university . . . has done some research on this, so...I think it should show up...as a review." (Gail, demo3)	- signifies sophisticated knowledge of the relevant literature	ANZIIL 1.2.2. ANZIIL 1.4.2. Relational 2.1.
S.SI.QT.SA.03. "Actually [historian] was another...name that our professor used . . . I'm just gonna take a look at this one here . . . Now I'm . . . gonna try another little search here . . . I'm gonna add [historian's] name" (Howard, demo1)	- describes a complex search technique	ANZIIL 2.2.4. Relational 3.1.

Appendix 31: Advanced Thinking Referencing Using Strategy

Participants' Spoken Thoughts Referencing Strategy Themes By Theme Group	Advanced Thinking Criteria	Information Literacy Model + Element**
<u>Seek information-Query-Terms-Select From Query Results or Full-Text Items</u>		
S.SI.QT.SQ.01. "Just writing down some of these key words and points that seem to be coming up . . . some of the things that should then be of importance to...a search later" (Ellen, demo2)	- expresses insightful approach preparing for a future search	ANZIIL 2.2.2. Relational 3.1.
S.SI.QT.SQ.02. "from some of these titles, perhaps I can find...a new search that will...bring up something here" (Howard, demo3)	- describes a complex search process	ANZIIL 2.2.2. Relational 3.1.
<u>Seek information-Query-Terms-Use Broad Terms</u>		
S.SI.QT.UB.01. "I know that religion and the Internet is quite broad but I think I really have to . . . start broadly with this topic because I'm not going to find the more narrow things that I'm interested in." (Annette, demo2)	- specifies reasons for search actions	ANZIIL 2.2.1. Relational 3.1.
S.SI.QT.UB.02. "I used to just . . . look for exactly what I wanted and use that and not getting a broad scope of . . . many ideas . . . so what I do is I broadly look for my topic" (Bonnie, interview1)	- specifies reasons for changing usual search approach	ANZIIL 2.2.1. Relational 3.1.
S.SI.QT.UB.03. "Ideally . . . if I could find stuff on women and [disease] and activism would be the best but I'm going to start broad, and see if I have to be more specific" (Ellen, demo3) [because "initially I thought there wouldn't be very much information" (Ellen, interview3)]	- specifies reasons for search actions	ANZIIL 2.2.1. Relational 3.1.
<u>Seek Information-Query-Terms-Use Narrow Terms</u>		
S.SI.QT.UN.01. "Now I've thought a little bit about which search terms I would use, and I think I'm just going to start ...generally... no, I think I'm going to start with [specific search term] just to see if there's anything at all. And then I'll back up if there isn't anything." (Annette, demo1)	- references actions based on consideration of the approach to take	ANZIIL 1.1.2. ANZIIL 2.2.1. Relational 3.1.
S.SI.QT.UN.02. "just trying to specify it more because I'm getting a whole bunch of economic stuff I don't need" (Carol, demo3)	- specifies reasons for search action	ANZIIL 3.1.1. Relational 3.1.
S.SI.QT.UN.03. "This doesn't narrow it down at all. So I think I'm actually gonna type in a specific environmental factor like...stress" (Gail, demo3)	- specifies reasons for using different search action	ANZIIL 3.1.1. Relational 3.1.
<u>Seek Information-Query-Terms-Use Subject Terms Assigned to Relevant Items</u>		
S.SI.QT.US.01. "So I'm just gonna look through the descriptors and see if there are any other . . . descriptors that I think might be useful to add as search terms." (Annette, demo3)	- describes complex process to find more query terms	ANZIIL 2.2.2. Relational 3.1.

Appendix 31: Advanced Thinking Referencing Using Strategy

Participants' Spoken Thoughts Referencing Strategy Themes By Theme Group	Advanced Thinking Criteria	Information Literacy Model + Element**
S.SI.QT.US.02. "What are the topics they used for this?...Subject" (Carol, demo2)	- references complex process to find more query terms	ANZIIL 2.2.2. Relational 3.1.
S.SI.QT.US.03. "reading the subjects in the list . . . This one . . . subject they have here, 'festivals and comparative studies,' seems like it could be useful if nothing of this . . . seems to be useful" (Ellen, demo2)	- describes complex process to find more query terms	ANZIIL 2.2.2. Relational 3.1.
S.SI.QT.US.04. "if you can choose yourself the topic, and I'm not too sure yet and I type it in, and then on the bottom it sometimes gives me some related topics, and sometimes that kind of . . . roll[s] into something else. Then once I know kind of, what I want to do, then I continue with doing the search." Gail, interview1)	- describes complex process to find more query terms	ANZIIL 2.2.2. Relational 3.1.
S.SI.QT.US.05. "I'm also just looking at some of the other subject headings in the screen that pops up here, and seeing another one, 'United States – History – Revolution and causes'. That might be another link that I will check out, shortly." (Howard, demo1)	- describes complex process to find more query terms	ANZIIL 2.2.2. Relational 3.1.
<u>Seek Information-Query-Terms-Use Term or Spelling Variants</u>		
S.SI.QT.UV.01. "So, RV or recreational vehicle because it's the same thing." (Annette, demo1)	- specifies reason for including a pair of terms	ANZIIL 2.2.2. Relational 3.1.
S.SI.QT.UV.02. "I wouldn't find anything, and then . . . started to realize that . . . I have to think about synonyms because sometimes they won't classify something as juvenile or they won't classify it as youth" (Carol, interview1)	- reflects thinking about personal learning about search process	ANZIIL 2.2.2. Relational 3.1.
S.SI.QT.UV.03. "I want to try now, back to that...one with this new spelling . . . Just reducing [i.e., redoing] this to see if the spelling is making a difference at all" (Ellen, demo2)	- specifies reason for search actions	ANZIIL 2.2.2. Relational 3.1.
<u>Seek Information-Query-Terms-Use Terms Known to be Relevant</u>		
S.SI.QT.UR.01. "[student] and [professor] gave me those . . . key words . . . I've had a lot of help in just talking to them. . . it's . . . kind of an ongoing dialogue and you just learn the lingo" (Carol, interview2)	- signifies sophisticated understanding of how to identify query terms	ANZIIL 1.1.2. ANZIIL 5.1.4. Relational 5.1.
S.SI.QT.UR.02. "I want to add in the term 'reconstruction'...because there's at least three different periods . . . when the [secret society] was really revived in American history and I want the earliest period" (Howard, demo2)	- specifies reason for search action	ANZIIL 3.3.1. Relational 3.1.

Appendix 31: Advanced Thinking Referencing Using Strategy

Participants' Spoken Thoughts Referencing Strategy Themes By Theme Group	Advanced Thinking Criteria	Information Literacy Model + Element**
<u>Seek Information-Other-Browse Library Shelves</u>		
S.SI.O.BL.01. "before I did any more searching, I'd go down to that section [of the library shelves] 'cause . . . I'd check both of them just really quickly. I usually find most of my best stuff that way, actually . . . just going through the general section where I find something that sounds...like it's about right" (Bonnie, demo2)	- describes a complex process to find relevant items	ANZIIL 2.1. Relational 2.1.
S.SI.O.BL.02. "I usually start my things in the library catalogue . . . if I find something I'll usually go into that section and . . . search through some of the books . . . I'm a hand searcher too" (Carol, interview1)	- describes a complex process to find relevant items	ANZIIL 2.1. Relational 2.1.
S.SI.O.BL.03. "The other thing I often do, once I have some of these . . . monographs, I . . . browse the shelf around these documents, and often times I'll find more books that don't necessarily come up in . . . my subject search that I do on the university site" (Howard, demo1)	- describes a complex process to find relevant items	ANZIIL 2.1. Relational 2.1.
S.SI.O.BL.04. "There was a lot of stuff and not only was I able to get some hits and look on the shelves or the stacks, but when you're at the stack, there's just lines of books on that subject all there, so you're able to just browse and...and just sample a lot of different stuff that was all kind of in the general area." (Howard, interview3)	- describes a complex process to find relevant items	ANZIIL 2.1. Relational 2.1.
<u>Seek Information-Other-Examine References in Relevant Source</u>		
S.SI.O.ER.01. "the other thing I do when I'm having a hard time finding articles is I will look at the people that are quoted in the articles that I'm looking at, and sometimes that kind of snowballs my resources." (Annette, demo1)	- describes a complex process to find relevant items	ANZIIL 2.1. Relational 2.1.
S.SI.O.ER.02. "I don't really care about treatment...Mind you . . . the reference list ...might be able to give me more ideas . . . if they do . . . literature reviews, in the beginning of documents." (Carol, demo1)	- describes a complex process to find relevant items	ANZIIL 2.1. Relational 2.1.
S.SI.O.ER.03. "I have a couple of good things I could get started from. I'm—probably...would look more in-depth at the four or five that were interesting and then see maybe where, where they've gone to get their information." (Ellen, demo1)	- describes a complex process to find relevant items	ANZIIL 2.1. Relational 2.1.
S.SI.O.ER.04. "once I get my hands on a couple of these articles, they will have further sources in their work cited, that I might be able to look up by title instead of by key words that might have not found them this time." (Frances, interview2)	- describes a complex process to find relevant items	ANZIIL 2.1. Relational 2.1.
S.SI.O.ER.05. "I have some papers written by [two professors]. . . and I'll probably use those to . . . find references" (Gail, interview3)	- describes a complex process to find relevant items	ANZIIL 2.1. Relational 2.1.

Appendix 31: Advanced Thinking Referencing Using Strategy

Participants' Spoken Thoughts Referencing Strategy Themes By Theme Group	Advanced Thinking Criteria	Information Literacy Model + Element**
S.SI.O.ER.06. "I can find a couple of really good journal articles with a lot of references, that's usually a pretty good springboard to other information that I can look for." (Howard, demo2)	- describes a complex process to find relevant items	ANZIIL 2.1. ANZIIL 3.1.1. Relational 2.1.
S.SI.O.ER.07. "if I'm looking within a book who I know is written by a reputable scholar, I can look at his references or her references as well, and that's usually I think a . . . pretty good guide to . . . which sources I can look to" (Howard, interview2)	- describes a complex process to find relevant items	ANZIIL 2.1. ANZIIL 3.1.1. Relational 2.1.

Appendix 32: Advanced Thinking Referencing Evaluating

Participants' Spoken Thoughts Referencing Evaluation Themes By Theme Group	Advanced Thinking Criteria	Information Literacy Model + Element**
<u>Resources-Catalogues-Background or General Information</u>		
E.R.CAT.BG.01.* "I'm just going to look . . . in the library catalogue . . . and just see if I can find any . . . general, anything...on [country]" (Bonnie, demo2)	- specifies a reason for resource choice	ANZIIL 1.1.1.** Relational 2.1.
E.R.CAT.BG.02. "the first place I'm going is . . . the . . . library and see if I can't find a quick little book to see . . . basic definitions and that kind of thing" (Carol, demo1)	- specifies a reason for resource choice	ANZIIL 1.1.1. Relational 2.1.
E.R.CAT.BG.03. "I think I did find some titles I liked [in the catalogue] that probably will give me a broad view so I at least . . . know what's going on in the scientific revolution, and they might give me a starting point to continue from." (Gail, interview2)	- reflects thinking about outcome of just-completed search	ANZIIL 1.1.1. Relational 2.1.
E.R.CAT.BG.04. "I think the library catalogue in this instance is useful for providing the background information. . . . there was even more than three books that dealt . . . with the background to the Victorian literature that will be useful for understanding the texts." (Isabel, interview3)	- specifies reasons for judgement	ANZIIL 1.1.1. Relational 2.1.
<u>Resources-Catalogues-Links to Related Subject Terms</u>		
E.R.CAT.LS.01. "The only thing that I do like about it [the catalogue] . . . if you can choose yourself the topic, and I'm not too sure yet and I type it in, and then on the bottom it sometimes gives me some related topics, and sometimes . . . I start with something then I kind of roll into something else." (Gail, interview1)	- specifies a reason for judging resource to be useful	ANZIIL 1.1.2.
<u>Resources-Catalogues-Recency of Indexed Content</u>		
E.R.CAT.RC.01. "just gonna try to see if I can find a book [in the catalogue] . . . because I'm just thinking, maybe in history . . . it doesn't need to be the most recent paper on scientific revolution. I don't know, but I can imagine if it isn't." (Gail, demo2)	- specifies a reason for judging resource to be useful	ANZIIL 1.1.1. Relational 2.1.
E.R.CAT.RC.02. "I used to do it more [use the catalogue] when I was . . . in my first two years, because that's kind of what they teach you. But . . . the chapter is usually dated, maybe . . . the chapter is at least three years old even it was a . . . brand new chapter, then it still takes a year after writing to publish it" (Gail, interview1)	- specifies a reason for judging resource not to be useful	ANZIIL 1.2.2. Relational 2.1.

* Codes were used in data analyses to identify uniquely each instance of advanced thinking. ** Numbered information literacy elements are listed in full in Appendix 30.

Appendix 32: Advanced Thinking Referencing Evaluating

Participants' Spoken Thoughts Referencing Evaluation Themes By Theme Group	Advanced Thinking Criteria	Information Literacy Model + Element**
<u>Resources-Catalogues-Search Performance</u>		
E.R.CAT.SP.01. "I don't like books as much as articles -- it's often much harder to find books that are on the topic that I need." (Annette, demo1)	- specifies a reason for judging resource not to be useful	ANZIIL 1.2.2. Relational 2.1.
E.R.CAT.SP.02. "I don't like the library catalogue very much because it doesn't have abstracts so I tend to not use it very often." (Annette, demo1)	- specifies a reason for judging resource not to be useful	ANZIIL 1.2.2. Relational 2.1.
E.R.CAT.SP.03. "I don't like the library catalogue very much. . . . but I'm comfortable with it and I can use it . . . well enough. . . .often you can't get enough info from the title . . . so I'll Google the book and I'll read reviews of it . . . or else I'll just . . . go and get the book if I have the time" (Carol, interview1)	- specifies a reason for judging resource not to be useful	ANZIIL 1.2.2. Relational 2.1.
E.R.CAT.SP.04. "I found a lot actually really frustrating . . . I had a really, really hard time finding anything . . . really, really useful, in the catalogue . . . I was hoping to find . . . one or two books . . . but apparently not" (Carol, interview1)	- reflects thinking and feelings about own search process	ANZIIL 1.2.2. Relational 2.1.
<u>Resources-Indexes-Availability of Full-Text</u>		
E.R.IND.FT.01. "I don't think [I had used that database before], I think I just chose on the basis of the . . . description . . . because I find that I always use the same ones and so sometimes I know if you look at different ones, different journals are there . . . it was a bit better I think, just because I thought I was going to find more full text and I initially thought it was going to be very good" (Ellen, interview2)	- specifies a reason for judging resource to be potentially useful	ANZIIL 1.2.2. Relational 2.1.
<u>Resources-Indexes-Content Quality</u>		
E.R.IND.CQ.01. "I like JSTOR because . . . everything's scholarly and peer-reviewed . . . so it's a pretty reliable source." (Howard, demo1)	- specifies a reason for judging resource to be potentially useful	ANZIIL 1.2.3. Relational 2.1.
E.R.IND.CQ.02. "And they're a bit older, I think that's the biggest drawback to JSTOR . . . you don't find a lot that is really contemporary." (Howard, interview3)	- specifies a reason for reservations about the usefulness of a resource	ANZIIL 1.2.2. Relational 2.1.
<u>Resources-Indexes-Ease of Use</u>		
E.R.IND.EU.01. "if I was going to continue this search, I would definitely go into . . . the MLA, although the format seems to be changing so I don't like it any more. But I used to use it . . . MLA was my favourite, especially for interlibrary loans and stuff, it was awesome. . . it didn't . . . make as many hits as other things but I couldn't find as much as I wanted to." (Bonnie, interview1)	- specifies a reason for judging resource to be difficult to use	ANZIIL 1.2.2. Relational 2.1.

Appendix 32: Advanced Thinking Referencing Evaluating

Participants' Spoken Thoughts Referencing Evaluation Themes By Theme Group	Advanced Thinking Criteria	Information Literacy Model + Element**
E.R.IND.EU.02. "The ones where you have to type in TS, like the topic and stuff like that, I don't really like them so much." (Carol, interview3)	- specifies a reason for judging resource to be difficult to use	ANZIIL 1.2.2. Relational 3.1.
E.R.IND.EU.03. "I know everybody says it's really good, but I have a hard time working with it. Web of Science . . . I don't really know how to . . . sometimes you have to do little tricks to it, like minimizing things or using different . . . search words. But I can't myself." (Gail, interview3)	- specifies a reason for judging resource to be difficult to use	ANZIIL 1.2.2. Relational 3.1.
E.R.IND.EU.04. "I get frustrated because [other databases] might have full text, where as JSTOR always has full text. And I love that. . . I don't want to be clicking on fifteen different links, checking for a full text of a particular . . . article that I'm looking for." (Howard, demo3)	- specifies a reason for judging resource to be difficult to use	ANZIIL 1.2.2. Relational 3.1.
<u>Resources-Indexes-Familiarity or Preference</u>		
E.R.IND.FP.01. "thinking a little bit about a specific database that was suggested to me by this professor but I'm not sure if it's going to be completely applicable . . . so I'm gonna go to Academic Search Premier because I'm more familiar with it. I tend to fall back on that one" (Ellen, demo3)	- specifies a reason for judging a resource not to be useful	ANZIIL 1.2.2. Relational 2.1.
<u>Resources-Indexes-Links to Related Articles</u>		
E.R.IND.LR.01. "what I really like about PubMed, is if you have related articles—'cause I use it a lot." (Gail, interview 3)	- specifies a reason for judging resource to be potentially useful	ANZIIL 1.2.2. Relational 2.1.
<u>Resources-Indexes-Results Limitable by Subject Terms</u>		
E.R.IND.RL.01. "I always like this . . . database [SocAbs] because I like the descriptors available on the side. It lets me click and search for other terms that I wouldn't have thought of." (Annette, demo2)	- specifies a reason for judging resource to be potentially useful	ANZIIL 1.2.2. ANZIIL 2.2.2. Relational 3.1.
<u>Resources-Indexes-Search Performance</u>		
E.R.IND.SP.01. "I always seem to have the best luck with...that one [JSTOR]. Well maybe it's because I always use it." (Howard, demo3)	- reflects thinking about own search habits	ANZIIL 1.2.2. Relational 2.1.
<u>Resources-Indexes-Subject Coverage</u>		
E.R.IND.SC.01. "it's not a very general topic so, I'll go to Sociological Abstracts." (Annette, demo1)	- specifies a reason for judging resource to be useful	ANZIIL 1.2.2. Relational 2.1.

Appendix 32: Advanced Thinking Referencing Evaluating

Participants' Spoken Thoughts Referencing Evaluation Themes By Theme Group	Advanced Thinking Criteria	Information Literacy Model + Element**
E.R.IND.SC.02. "I will start with . . . the . . . religious studies database, because I think this is a pretty narrow . . . topic, and I'm kind of worried that I'm not gonna find very much on it. So I'll start with...the most focused of the databases that I know because if there is anything it'll be here." (Annette, demo2) (Strategy-Conduct Search-Choose Resources S.CS.CR.02)	- specifies a reason for judging resource to be potentially useful	ANZIIL 1.2.2. Relational 2.1.
E.R.IND.SC.03. "I'm going to go and check in . . . Academic Search Premier, because it is the biggest of all of them." (Annette, demo2)	- specifies a reason for judging resource to be useful	ANZIIL 1.2.2. Relational 2.1.
E.R.IND.SC.04. "Since I need even just general information I think I'm gonna start...in the . . . search engine for . . . religious studies . . . Here we have Asian studies, that looks like it could be quite relevant, so we'll go with that" (Ellen, demo2)	- specifies a reason for judging resource to be potentially useful	ANZIIL 1.2.2. Relational 2.1.
<u>Resources-Internet Tools-Background or General Information</u>		
E.R.INT.BG.01. "I would use it [Google] to find information like I did today on something . . . that I didn't know but I should know, and it's basically...almost common knowledge. . . I'm skeptical normally of the Internet and . . . the reliability of its sources." (Bonnie, interview2)	- specifies a reason for judging resource to be useful	ANZIIL 1.1.1. ANZIIL 1.2.2. Relational 2.1.
E.R.INT.BG.02. "Just thinking here if I could get...I don't know...some other information...What I want to find out is maybe...general information" (Ellen, demo2)	- specifies a reason for judging resource to be useful	ANZIIL 1.1.1. ANZIIL 1.2.2. Relational 2.1.
E.R.INT.BG.03. "The only other thing I was thinking about was CBC . . . because she used to be a CBC personality. . . . I thought they had . . . bios of their TV personalities ... Hm ... Maybe not" (Frances, demo1)	- specifies a reason for judging resource to be useful	ANZIIL 1.2.2. Relational 2.1.
E.R.INT.BG.04. "[author] died quite recently so if I Google her, maybe what I'll find is things that people wrote shortly after she died, and they will talk about her life." (Frances, interview2)	- specifies a reason for judging resource to be useful	ANZIIL 1.1.1. ANZIIL 1.2.2. Relational 2.1.
E.R.INT.BG.05. "Google things are . . . relatively quality things, easy to just kind of get an idea of what's it all about. . . I think this is good for me just to...get a feel of what it is" (Gail, demo1)	- specifies a reason for judging resource to be useful	ANZIIL 1.1.1. ANZIIL 1.2.2. Relational 2.1.
E.R.INT.BG.06. "Wikipedia is not too bad I think ... to get some really basic information from" (Gail, demo2)	- specifies a reason for judging resource to be useful	ANZIIL 1.1.1. ANZIIL 1.2.2. Relational 2.1.

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Participants' Spoken Thoughts Referencing Evaluation Themes By Theme Group	Advanced Thinking Criteria	Information Literacy Model + Element**
<u>Resource-Internet Tools--Content Quality</u>		
E.R.INT.CQ.01. "[Google Scholar is] different from Google in that it only searches for academic sources, it searches for journal articles. So you're much more likely to get reputable sources." (Annette, interview2)	- specifies a reason for judging resource to be potentially useful	ANZIIL 1.2.2. ANZIIL 1.2.3. Relational 2.1.
E.R.INT.CQ.02. "I'm skeptical normally of the Internet and . . . the reliability of its sources" (Bonnie, interview2)	- specifies a reason for judging resource not to be useful	ANZIIL 1.2.2. ANZIIL 1.2.3. Relational 2.1.
E.R.INT.CQ.03. "I like this database because...well...I love Google. I Google everything, and this one's supposed to be reliable [Google Scholar]" (Carol, demo1)	- specifies a reason for judging resource to be useful	ANZIIL 1.2.2. ANZIIL 1.2.3. Relational 2.1.
E.R.INT.CQ.04. "one of my profs told us in science class . . . Google Scholar is very neat . . . in comparison to the library, normally you find quality, no problem [but] if you want full-text you have to go back to the library webpage to find actual articles and it takes a long time whereas Google Scholar right away gets you all abstracts. But I didn't really work with it yet, so I don't know how much it gets you" (Gail, interview1)	- specifies a reason for judging resource to be potentially useful	ANZIIL 1.2.2. ANZIIL 1.2.3. Relational 2.1.
E.R.INT.CQ.05. "My professors in particular, warn against the Internet. They would much prefer to have something come from the library here or from...an academic journal than something random on the Internet, but I mean there are . . . really good websites, too. So I would think . . . there would have to be some level of discretion about those. . . they're not my first choice" (Isabel, interview1)	- specifies a reason for judging resource not to be useful	ANZIIL 1.2.2. ANZIIL 1.2.3. Relational 2.1.
E.R.INT.CQ.06. "I am so wary about Internet sources . . . because so many of my profs are totally against them . . . I am less comfortable in that way, because to judge their authenticity might be more challenging" (Isabel, interview2)	- specifies a reason for judging resource not to be useful	ANZIIL 1.2.2. ANZIIL 1.2.3. Relational 2.1.
E.R.INT.CQ.07. "I guess the concern with Internet is that you don't really know how . . . credible the sources are, so I guess I would not be comfortable using them, just because I have no idea if . . . they're accepted by the scholarly community at all." (Isabel, interview3)	- specifies a reason for judging resource not to be useful	ANZIIL 1.2.2. ANZIIL 1.2.3. Relational 2.1.
<u>Resources-Internet Tools-Search Performance</u>		
E.R.INT.SP.01. "I don't really use Google Scholar very much so I'm not entirely sure how it works yet . . . Ok, so it just kind of gives me the citation, it doesn't really tell me where I can find any of these. So maybe it's not going to be all that useful to me" (Annette, demo2)	- specifies a reason for judging resource not to be useful	ANZIIL 1.2.2. ANZIIL 3.1.1. Relational 2.1.

Appendix 32: Advanced Thinking Referencing Evaluating

Participants' Spoken Thoughts Referencing Evaluation Themes By Theme Group	Advanced Thinking Criteria	Information Literacy Model + Element**
E.R.INT.SP.02. "Google Scholar, I know that some people said that [it is] very helpful but I, not so much, not that successful as the other ones [PubMed, ScienceDirect and Academic Search Premier]." (Gail, interview3)	- specifies a reason for judging resource not to be useful	ANZIIL 1.2.2. ANZIIL 3.1.1. Relational 2.1.
<u>Resource-Internet Tools-Source Type</u>		
E.R.INT.ST.01. "I'm wondering if I could find some kind of database based in [country] where she's sort of a hero and there would be more about her in their databases, instead of . . . here in Canada where nobody really knows who she is and the [home university] doesn't even hold any of her books" (Frances, interview2)	- specifies a reason for judging resource to be useful	ANZIIL 1.2.2. Relational 2.1.
E.R.INT.ST.02. "if I need primary sources that I can't find in written, like in a monograph. . . [the Internet is] kind of my last resort if I have to do something like that for a primary source. (Howard, interview1)	- specifies a reason for judging resource to be useful	ANZIIL 1.2.2. ANZIIL 1.2.4. Relational 2.1.
<u>Resource-Internet Tools-Unfamiliar or Uncertain Topic</u>		
E.R.INT.ST.01. "whenever . . . something like this happens and I've talked about it in class before, but I can't remember exactly who the reference was made to or what concept was referred to, I usually go and Google, even if I can't quite spell something, I go and Google." (Bonnie, interview1)	- specifies a reason for judging resource to be useful	ANZIIL 1.2.2. Relational 2.1.
E.R.INT.ST.02. "first thing I'm gonna use is Google, actually, because I'm not sure where I'm going to be able to find anything on her" (Frances, demo2)	- specifies a reason for choosing a resource.	ANZIIL 1.2.2. Relational 2.1.
<u>Results-Actions-Browse Results</u>		
E.RT.A.BR.01. "I do find myself doing that in general, just looking through, because sometimes I'm not necessarily sure how to eliminate things . . . that aren't related, because sometimes I . . . refine my search by saying not some kind of word and then that could have potentially been useful in a different kind of a way." (Ellen, interview3)	- describes complex process used to judge usefulness of items	ANZIIL 3.1.1. Relational 3.1.
E.RT.A.BR.02. "Just scanning through the titles here...I'm also . . . noticing a familiar name here . . . so that's a significant thing for me as well here" (Howard, demo1)	- specifies criterion used to judge items	ANZIIL 3.2.1. Relational 3.1.
E.RT.A.BR.03. "I'll just scan through these here, looking at some of the years of publication and seeing what kind of things we come up here and just take a look at some of these." (Howard, demo1)	- specifies a criterion used to judge items	ANZIIL 3.2.1. Relational 3.1.
<u>Results-Actions-Calibrate Effort to Avoid Information Overload</u>		
E.RT.A.CI.01. "I already have a lot of stuff on alcohol [and therefore did not evaluate query results referring to alcohol] . . . I probably have like twenty articles, and I get a little overwhelmed if I add too much more" (Carol, interview3)	- specifies reasons for deciding not to judge the usefulness of some items	ANZIIL 3.3.1. Relational 2.1.

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Participants' Spoken Thoughts Referencing Evaluation Themes By Theme Group	Advanced Thinking Criteria	Information Literacy Model + Element**
E.RT.A.CI.02. "In the beginning . . . it really can be very bombarding with information, but I just like . . . to choose something simple to begin. A book chapter" (Gail, interview1)	- specifies a reason for taking a particular approach to judging the usefulness of items	ANZIIL 1.1.1. Relational 2.1.
E.RT.A.CI.03. "I did it [stopped retaining abstracts while saving citations to relevant articles] because if it's too big and I print it off I kind of get lost . . . I have a tendency to have lots of information and then I have no clue on what's going on . . . in my first year, I think I printed all papers I thought was useful, so I kind of learned not to do that anymore." (Gail, interview3)	- reflects thinking about own search process and why it changed over time	ANZIIL 4.1.3. Relational 3.1.
<u>Results-Actions-Evaluate in Stages</u>		
E.RT.A.ES.01. "I don't really know if this one would be useful, but it's possible, so I'll mark it anyway and I can look through it later and decide if I want to keep it or not. It's better to mark too many things, I think, because then I can scan through and filter them." (Annette, demo1)	- describes staged process of evaluating results	ANZIIL 2.2.1. ANZIIL 3.1.1. Relational 3.1.
E.RT.A.ES.02. "I broadly look for my topic and . . . I look at the . . . descriptions and then from that I'll . . . pick up the resource . . . and then I read them . . . and I'll decide . . . if it kinda corresponds to my topic" (Bonnie, interview1)	- describes complex process of searching for information and evaluating results	ANZIIL 2.2.1. ANZIIL 3.1.1. Relational 3.1.
E.RT.A.ES.03. "if the header [title] looks good, I go for it, and I usually get it and then . . . after that I usually end up skimming it and just kind of like looking through, look at charts, look at things like that . . . later on, and decide if I'm going to actually read it or not." (Carol, interview2)	- describes staged process of evaluating results	ANZIIL 2.2.1. ANZIIL 3.1.1. Relational 3.1.
E.RT.A.ES.04. "the book is...about the goddess ...I would assume something of her festival would be in there, then. I'll write that down as useful...just writing the call number and brief title information to check about it later." (Ellen, demo2)	- specifies a reason for judging item to be potentially useful	ANZIIL 3.1.1. Relational 3.1.
E.RT.A.ES.05. "I'm just going to paste it to a Word document . . . I'm just going to look a little bit further [later] if it's useful. 'Cause I used to do [print] it, but then I ended up with . . . so much paper, because if you continue a little bit later...then you actually really know where you're going" (Gail, demo2)	- specifies a reason for postponing closer evaluation of item	ANZIIL 3.1.1. Relational 3.1.
E.RT.A.ES.06. "I have to . . . decide if I want to do something really . . . specific, or if I just want to have a broad idea. But I think I'll...just copy the abstract so at least I know that this paper exists. And I can later always go back" (Gail, demo3)	- specifies a reason for postponing closer evaluation of item	ANZIIL 3.1.1. Relational 3.1.
E.RT.A.ES.07. "That might be kind of interesting. I'm just gonna save this . . . and I'll have to take a closer look at that later" (Howard, demo2)	- describes staged process of evaluating results	ANZIIL 3.1.1. Relational 3.1.

Appendix 32: Advanced Thinking Referencing Evaluating

Participants' Spoken Thoughts Referencing Evaluation Themes By Theme Group	Advanced Thinking Criteria	Information Literacy Model + Element**
E.RT.A.ES.08. "when I save, it doesn't mean I'm going to use it, it's more I'm going to look at it . . . I don't try to break up, I don't like getting bogged down . . . in sources when I'm searching for them." (Howard, interview2)	- specifies a reason for separating searching from close evaluation	ANZIIL 3.1.1. Relational 2.1.
E.RT.A.ES.09. "anything that had to do with [search topic], I kind of just grabbed. I'll look at them closer, and if I have to, go search more." (Isabel, interview3)	- describes staged process of evaluating results	ANZIIL 3.1.1. Relational 3.1.
<u>Results-Actions-Obtain Evaluative Information in Another Source</u>		
E.RT.A.OE.01. "Most of those ones I put down, I'll probably go and Google them and get some abstracts and read that and stuff before I actually waste my interlibrary loan on them." (Carol, interview2)	- references complex process used to judge usefulness of item	ANZIIL 3.1.1. ANZIIL 2.3.2. Relational 3.1.
E.RT.A.OE.02. "Just recently I was told that you can sometimes search in the books just to see if they're even relevant or something that you're interested in, so let's see if...that's true" (Ellen, demo2)	- references a complex process used to judge usefulness of item	ANZIIL 3.1.1. Relational 3.1.
<u>Results-Actions-Read or Skim Abstract or Introduction</u>		
E.RT.A.RA.01. "I'm reading the abstract right now . . . Ok, it looks like there's a little bit – it's right at the end of the abstract so it's probably not an important part, but...I ...will mark it...because . . . it looks like it might be useful." (Annette, demo1)	- specifies basis on which usefulness of item was judged	ANZIIL 3.1.1. Relational 2.1.
E.RT.A.RA.02. "I don't think this is what I'm looking for, but I'll read the abstract anyways just to see." (Annette, demo3)	- specifies basis on which usefulness of item was judged	ANZIIL 3.1.1. Relational 2.1.
E.RT.A.RA.03. "I don't actually know what that means, so I'm just going to . . . read the abstract." (Bonnie, demo3)	- specifies basis on which usefulness of item was judged	ANZIIL 3.1.1.
E.RT.A.RA.04. "I am not really familiar with looking for humanities papers, but in a science paper they always give you an abstract that kind of tells you . . . what it's all about. And I don't really find that with this. I don't know if I missed it, maybe it's probably in the introduction . . . but it's a little bit longer . . . for me to right away says yes or no I . . . want this paper. So I'm just going to read through the introduction...quickly." (Gail, demo1)	- specifies basis on which usefulness of item was judged	ANZIIL 1.2.1. ANZIIL 3.1.1. Relational 2.1.

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Participants' Spoken Thoughts Referencing Evaluation Themes By Theme Group	Advanced Thinking Criteria	Information Literacy Model + Element**
<u>Results-Actions-Read or Skim Document</u>		
E.RT.A.RD.01. "I'd actually have to go and look at the text. When in doubt, if there's not like a note or anything, I usually just pick up all the texts and kind of sift through them and see what I find." (Bonnie, demo1)	- specifies basis on which usefulness of item was judged	ANZIIL 3.1.1. Relational 3.1.
E.RT.A.RD.02. "I'll probably end up going and . . . flipping through the book and seeing if there's anything actually useful in it. I find...there's really no abstracts, then I can't really determine whether there's anything actually good in it, or . . . applicable to my topic" (Carol, demo1)	- specifies basis on which usefulness of item was judged	ANZIIL 3.1.1. Relational 3.1.
E.RT.A.RD.03. "I only kind of read the first sentence and the last sentence of the [article] paragraph, kind of skim over it" (Gail, demo1)	- specifies basis on which usefulness of item was judged	ANZIIL 3.1.1. Relational 3.1.
E.RT.A.RD.04. "I'm gonna see if I can get a full-text . . . I'm just reading the first paragraph of the abstract [of the full-text article] . . . I always like to go to the last page to see how they . . . end." (Gail, demo2)	- specifies basis on which usefulness of item was judged	ANZIIL 3.1.1. Relational 3.1.
E.RT.A.RD.05. "So these are some things I'm gonna have to look at, in person, and see . . . if there's any . . . information there that is interesting to me. I still don't have a specific topic as of yet. I want to just take a look at some of those monographs and see if anything jumps...out at me." (Howard, demo2)	- specifies basis on which usefulness of item was judged	ANZIIL 3.1.1. Relational 3.1.
E.RT.A.RD.06. "just scanning the opening and closing paragraphs of . . . a journal article . . . especially the conclusion will usually give you a pretty good idea about what the argument is . . . about, and that can help you decide whether or not that's an article . . . that I want to work with." (Howard, interview2)	- specifies basis on which usefulness of item was judged	ANZIIL 3.1.1. Relational 3.1.
E.RT.A.RD.07. "sometimes . . . it will look good on the screen and then I'll go get the book and it will be totally not useful, just because you have to look. Sometimes it doesn't give enough information" (Isabel, interview2)	- specifies criteria for judging usefulness of items	ANZIIL 3.1.1. Relational 3.1.
E.RT.A.RD.08. "I'll look at these books and look at their table of contents and their index . . . and see what chapters are relevant or of interest . . . because I'm still trying to focus on . . . a topic. . . And then . . . once I've looked at those chapters of interest, I'll look at the bibliography maybe for those four or five chapters and see what sources they use, or sometimes . . . they'll suggest other sources to look at." (Isabel, interview2)	- specifies criteria for judging usefulness of items	ANZIIL 3.1.1. Relational 2.1. Relational 3.1.
<u>Results-Actions-Skip Unknown or Uninformative Items or Terms</u>		
E.RT.A.SU.01. "some of these things I'm not sure – there's...some names and words in the titles I don't really know so I'm kind of avoiding them." (Ellen, demo3)	- specifies reasons for deciding not to judge the usefulness of some items	ANZIIL 3.1.1. Relational 2.1.

Appendix 32: Advanced Thinking Referencing Evaluating

Participants' Spoken Thoughts Referencing Evaluation Themes By Theme Group	Advanced Thinking Criteria	Information Literacy Model + Element**
E.RT.A.SU.02. "sometimes I don't look at things that just have short titles because I . . . don't have enough time to look at every single thing. So if it just says book review, I . . . skip over it just because I don't have enough information to go into it." (Ellen, interview3)	- specifies reasons for deciding not to judge the usefulness of some items	ANZIIL 3.1.1. Relational 2.1.
E.RT.A.SU.03. "since I don't really know if it's gonna be helpful, I'm not going to put my time in writing all the numbers down, go to the library and find them" (Gail, demo2)	- specifies a reason for opting not to try to judge the usefulness of an item	ANZIIL 1.3.2. Relational 3.1.
<u>Results-Criteria-Background Information</u>		
E.RT.C.BI.01. "I'm gonna save this one here, too. Looks like a general overview . . . well, at the introduction here, might be helpful for background" (Howard, demo2)	- specifies reasons for judging an item to be potentially useful	ANZIIL 1.1.1. Relational 2.1.
<u>Results-Criteria-Citation Rate</u>		
E.RT.C.CR.01. "I might reread through the references or . . . go into Google and see if they're really well cited. If they have lots of citations, I might go for them." (Carol, interview3)	- specifies basis on which quality of item was judged	ANZIIL 3.1.1. Relational 3.1.
<u>Results-Criteria-Disciplinary Treatment of Topic</u>		
E.RT.C.DT.01. "I think that's going to be the biggest challenge . . . to find things that are kind of in the department I'm looking for, of more philosophical than anthropological" (Ellen, demo1)	- specifies a criterion for judging the usefulness of items	ANZIIL 1.2.1. Relational 2.1.
<u>Results-Criteria-Distinctive Ideas</u>		
E.RT.C.DI.01. "I'm just going to go over all the titles and see if there's anything that . . . may signal to me that there's some sort of racist meaning in the article. Usually something to do with immigrants works out really well" (Bonnie, demo3) (Evaluation-Results-Criteria-Relevance-Intuition or signals E.RT.C.R.IS.01)	- specifies criteria for judging usefulness of items	ANZIIL 3.1.1. Relational 2.1.
E.RT.C.DI.02. "I looked around the shelves and I found some that . . . had some more general information and some that had different sources . . . because I thought maybe the German one might be biased as the British one would be too maybe . . . I just thought that the information might differ a little, and I wanted to say that it differed a little, from book to book, if it did." (Bonnie, interview2) (Evaluation-Results-Criteria-Potential Bias E RT.C.PB.01)	- specifies a reason for judging item to be potentially useful	ANZIIL 3.2.4. Relational 2.1.
E.RT.C.DI.03. "Oh, that sounds interesting, different . . . approaches to activism . . . that might be useful to talk about" (Ellen, demo3)	- specifies a reason for judging item to be potentially useful	ANZIIL 1.1.3. Relational 2.1.

Appendix 32: Advanced Thinking Referencing Evaluating

Participants' Spoken Thoughts Referencing Evaluation Themes By Theme Group	Advanced Thinking Criteria	Information Literacy Model + Element**
E.RT.C.DI.04. "Some of these look like good places, general topics that I'll start with. What I'll often do is read the introduction of these monographs before I take them out of the library and see if there's anything compelling in the argument of the author." (Howard, demo1)	- specifies a reason for judging item to be potentially useful	ANZIIL 1.1.1. Relational 2.1.
E.RT.C.DI.05. "This one looks particularly interesting . . . because it has selected articles, and usually . . . a book such as that indicates . . . there'll be a lot of different . . . significant subjects . . . And sometimes reading one of the compelling articles might give me an idea to a subject that is . . . interesting, or something where there's debate over issues, which . . . makes for an interesting history paper." (Howard, demo1) (Strategy-Conduct Search-Choose Topic or Focus S.CS.CT.04)	- specifies a reason for judging item to be potentially useful	ANZIIL 1.1.3. ANZIIL 1.2.1. ANZIIL 3.1.1. Relational 3.1.
<u>Results-Criteria-Document Quality</u>		
E.RT.C.DQ.01. "I was specifically looking for articles that had full text available . . . And that were peer reviewed journals" (Annette, interview3) (Evaluation-Results-Criteria-Full-text Availability E.RT.C.FT.01)	- specifies criteria used to judge usefulness of items	ANZIIL 2.2.1. ANZIIL 1.2.3. Relational 2.1.
E.RT.C.DQ.02. "I was looking for . . . basic information . . . but . . . I still wanted to try and find some things that were academic sources." (Ellen, interview2)	- specifies criteria used to judge usefulness of items	ANZIIL 1.1.1. ANZIIL 1.2.3. Relational 2.1.
E.RT.C.DQ.03. "Kind of trying to see where this is from because it doesn't look too bad . . . think it's just written by some students, almost, but...I definitely . . . would read it . . . This is . . . surprisingly useful, I think ...And also because it's kind of written by students, I think they . . . talk kind of the core things . . . so...I am gonna keep this" (Gail, demo1)	- specifies basis on which usefulness of item was judged	ANZIIL 1.1.1. ANZIIL 3.1.1. Relational 2.1.
<u>Results-Criteria-Full-Text Availability</u>		
E.RT.C.FT.01. "I was specifically looking for articles that had full text available . . . and that were peer reviewed journals . . . because my paper is due quite soon, so I don't really have time to wait for anything to come in." (Annette, interview3) (Evaluation-Results-Criteria-Document Quality E.RT.C.DQ.01)	- specifies criteria for judging the usefulness of items	ANZIIL 2.3.1. Relational 3.1.
E.RT.C.FT.02. "as far as searching for English articles, so much of them are unavailable from the library, so I am really attracted when it says the text is actually just right there . . . I see that right away when I'm searching just because it is so convenient, it -- that article is relevant " (Isabel, interview1)	- specifies criteria for judging an item to be useful	ANZIIL 2.3.1. Relational 2.1.

Appendix 32: Advanced Thinking Referencing Evaluating

Participants' Spoken Thoughts Referencing Evaluation Themes By Theme Group	Advanced Thinking Criteria	Information Literacy Model + Element**
<u>Results-Criteria-Genre-Book Review</u>		
E.RT.C.G.BR.01. "Oh, it's a review of the book. Ok, that's not important to me. I'll just have to go out and find the book." (Annette, demo1)	- specifies a reason for judging resource not to be useful	ANZIIL 1.2.2. Relational 2.1.
E.RT.C.G.BR.02. "it does seem to be looking at some of the other topics that I'm interested in, so this potentially—just as a book review—might be useful, to see if the book would be useful." (Ellen, demo3)	- specifies a reason for judging an item to be potentially useful	ANZIIL 1.2.2. Relational 2.1.
E.RT.C.G.BR.03. "it's actually also a book review, so it's for sure not something I want" (Gail, demo2)	- specifies a reason for judging resource not to be useful	ANZIIL 1.2.2. Relational 2.1.
E.RT.C.G.BR.04. "Oh, it's only a book review, I'm not interested in that. Never mind." (Howard, demo2)	- specifies a reason for judging resource not to be useful	ANZIIL 1.2.2. Relational 2.1.
<u>Results-Criteria-Genre-Criticism or Interpretation</u>		
E.RT.C.G.CI.01. "it would be the one I would have chosen if it wasn't out . . . because . . . it had 'translated with notes, an interpretive essay'. Maybe the interpretive essay might have been helpful since I'm really not good on philosophy." (Bonnie, interview1)	- specifies a reason for judging an item to be potentially useful	ANZIIL 1.1.1. Relational 2.1.
E.RT.C.G.CI.02. "I kind of was looking for arguments why . . . he's right or wrong, or why . . . he makes sense, his claim . . . I'm looking . . . for writers . . . just to get some more insight in this argument." (Gail, interview1)	- specifies criteria for judging item to be useful	ANZIIL 1.1.1. Relational 2.1.
E.RT.C.G.CI.03. "Ok, this is . . . little fragments of what people have thought about the play...so that might be helpful" (Isabel, demo1)	- specifies a reason for judging an item to be potentially useful	ANZIIL 1.2.2. Relational 2.1.
E.RT.C.G.CI.04. "Shakespeare, is so ambiguous in his language that it's good, because when you are doing some researching, if you find a resource, there's so many different interpretations of things that are possible . . . there's more options, more easy to find, something that kind of suits what you're thinking about the play" (Isabel, interview1)	- expresses insightful perspective on the task type and topic	ANZIIL 1.2.2. Relational 2.1.

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Participants' Spoken Thoughts Referencing Evaluation Themes By Theme Group	Advanced Thinking Criteria	Information Literacy Model + Element**
<u>Results-Criteria-Genre-Editorial</u>		
E.RT.C.G.E.01. "Just kind of . . . reading quick through it to see...Well, it's an editorial, so...I don't think ...it's going to be very helpful, actually...Yeah, it is very small" (Gail, demo3)	- specifies a reason for judging item not to be useful	ANZIIL 1.2.2. Relational 2.1.
<u>Results-Criteria-Genre-Folk Literature</u>		
E.RT.C.G.FL.01. "I think some of these are . . . good for...starting to generate some... kinds of classifications like . . . what types of [folk literature] they would be" (Ellen, demo1)	- specifies a reason for judging items to be useful	ANZIIL 1.2.2. Relational 2.1.
<u>Results-Criteria-Genre-Literature Review</u>		
E.RT.C.G.LR.01. "a literature review will probably be really good just because . . . I'll be able to figure out who's actually written on these things" (Carol, demo1)	- specifies a reason for judging source type to be useful	ANZIIL 1.2.2. Relational 2.1.
E.RT.C.G.LR.02. "oh, a literature review, well, lots of good references" (Carol, demo2)	- specifies a reason for judging item to be useful	ANZIIL 1.2.2. Relational 2.1.
E.RT.C.G.LR.03. "I think I'm first gonna look at a review . . . a review normally tells like the basics of . . . the core things of other papers" (Gail, demo1)	- specifies a reason for judging source type to be useful	ANZIIL 1.2.2. Relational 2.1.
E.RT.C.G.LR.04. "I also think it would be handy if I had maybe a review paper . . . it's always handy if people summarize it for you" (Gail, demo3)	- specifies a reason for judging source type to be useful	ANZIIL 1.2.2. Relational 2.1.
E.RT.C.G.LR.05. "I just don't want reviews . . . because there's tons of reviews, and it just plugs up your search." (Howard, demo1)	- specifies a reason for judging source type not to be useful	ANZIIL 1.2.2. Relational 2.1.
<u>Results-Criteria-Genre-Personal Experience or Views</u>		
E.RT.C.G.PE.01. "so, personal...account in a way of – that might be very important" (Ellen, demo3)	- specifies a reason for judging item to be potentially useful	ANZIIL 1.2.2. Relational 2.1.
E.RT.C.G.PE.02. "it [an article with high relevance ranking] doesn't appeal to me . . . I guess that his position is more like a personal, like his religious belief" (Gail, interview1)	- specifies a reason for not judging an item to be useful	ANZIIL 1.2.2. Relational 2.1.

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Participants' Spoken Thoughts Referencing Evaluation Themes By Theme Group	Advanced Thinking Criteria	Information Literacy Model + Element**
<u>Results-Criteria-Genre-Theory</u>		
E.RT.C.G.T.01. "That could be interesting. . . I'm interested in the concept of choice. I could probably work that into my paper." (Annette, demo1)	- specifies a reason for judging item to be potentially useful	ANZIIL 1.2.2. Relational 2.1.
E.RT.C.G.T.02. "that one could be interesting. I'm very interested in Robert Putnam and social capital theory, so virtual capital is definitely an important part of religion on the Internet." (Annette, demo2)	- specifies a reason for judging item to be potentially useful	ANZIIL 1.2.2. Relational 2.1.
<u>Results-Criteria-Journal or Website Quality</u>		
E.RT.C.G.JW.01. "Hmm...[journal title]- I've never heard of it. Kind of makes me question it" (Carol, demo2)	- specifies basis on which usefulness of item was judged	ANZIIL 3.1.1.
E.RT.C.G.JW.02. "if I've never heard about a journal, I'm a little more skeptical of it, because generally if you hear about a journal and it's really, really well cited . . . it just tends to be reputable . . . I'll see what kind of articles they publish, and then I'll make a real decision . . . I look at the way it's written, I look at the conclusions they draw from the research and whether the conclusions are actually supported by the research" (Carol, interview2)	- specifies criteria used to judge usefulness of items	ANZIIL 3.1.1. Relational 2.1.
E.RT.C.G.JW.03. "I like to initially . . . look at the website . . . to see if I can decipher some level of accountability, whether it's a university based website, or a publisher's web site . . . as opposed to just some one single person's . . . information" (Ellen, interview1)	- specifies basis on which usefulness of item was judged	ANZIIL 3.1.1. Relational 2.1.
E.RT.C.G.JW.04. "I don't know the quality of certain journals so I don't know if it's something good or not." (Gail, interview1) (Personal Understanding-Identify Gap in Understanding P.I.02)	- specifies basis on which quality was usually judged	ANZIIL 1.3.2.
E.RT.C.G.JW.05. "I really do not like searching on the Internet because there's so much garbage and I looked at that one specifically because the Professor mentioned it, and it is a university website" (Howard, interview2)	- specifies basis on which usefulness of item was judged	ANZIIL 1.2.2. Relational 2.1.
E.RT.C.G.JW.06. "I'm looking for . . . recognized journal titles and . . . recent scholarship as well . . .that's kind of the ideal for some of these things" (Howard, demo3)	- specifies criteria used to judge usefulness of items	ANZIIL 1.2.3. ANZIIL 3.2.1. Relational 2.1.

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Participants' Spoken Thoughts Referencing Evaluation Themes By Theme Group	Advanced Thinking Criteria	Information Literacy Model + Element**
<u>Results-Criteria-Key Concepts or Entities</u>		
E.RT.C.KC.01. "I looked for the word community a lot . . . And a lot of them did have community, or network . . . if it mentioned certain groups that . . . I know . . . And I know certain terms like social capital, virtual social capital is related to . . . community formation online, so I knew that that would be something useful as well" (Annette, interview2)	- specifies basis on which usefulness of item was judged	ANZIIL 2.2.2. Relational 3.1.
E.RT.C.KC.02. "I was looking specifically for articles about [theorist 1] and disenchantment or [theorist 1] and religion, and . . . same thing for [theorist 2]. [theorist 2] . . . and the sacred, because I know that those are the concepts from both of them that I'm going to be using. If . . . it related at all to [group of countries] or to [religion] or to censorship, or to freedom of speech, then that was even better." (Annette, interview3)	- specifies basis on which usefulness of item was judged	ANZIIL 2.2.2. Relational 3.1.
E.RT.C.KC.03. "it was just things that seemed to encompass both the festival and the goddess . . . that was . . . a deciding factor I guess." (Ellen, interview2)	- specifies basis on which usefulness of item was judged	ANZIIL 2.2.2. Relational 2.1.
E.RT.C.KC.04. "because I had in mind a specific part of [political figure's] life that I wanted more information on, what I was doing was scanning for . . . those kind of words for more about her life in [country] . . . it was pretty much a quick scan for key words that I thought I was looking for" (Frances, interview1)	- specifies basis on which usefulness of item was judged	ANZIIL 2.2.2. Relational 2.1.
E.RT.C.KC.05. "It seems to me like the titles of the articles don't have much keyword term as in scientific revolution, so I'm not too happy with this. I'm actually thinking . . . I'm on the wrong track here...and the further I go the more...lost I get. I'm just going to go somewhere else." (Gail, demo2) (Strategy-Conduct Search-Handle Search Impasse S.CS.HS.06)	- specifies basis on which usefulness of item was judged	ANZIIL 3.1.1. Relational 2.1.
E.RT.C.KC.06. "anything that had to do with sexuality or interpretations of her in the text, I kind of just grabbed . . . anything that kind of had those key words" (Isabel, interview3)	- specifies basis on which usefulness of item was judged	ANZIIL 2.2.2. Relational 2.1.
<u>Results-Criteria-Local Availability of Source</u>		
E.RT.C.LA.01. "so I clicked on that, 'cause it sounded about right, the dates are 1913 to 1923...which would be perfect... And it's not here... so ...that's not helpful." (Bonnie, demo2)	- specifies a basis on which usefulness of items was judged	ANZIIL 3.2.1.
E.RT.C.LA.02. "I wanted to check the library, if the library had that book available, and it didn't appear that we do here just locally, and because the presentation is so soon I won't even bother looking anywhere else." (Ellen, interview2)	- specifies a basis on which usefulness of items was judged	ANZIIL 2.3. ANZIIL 1.3.2. Relational 2.1.

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Participants' Spoken Thoughts Referencing Evaluation Themes By Theme Group	Advanced Thinking Criteria	Information Literacy Model + Element**
E.RT.C.LA.03. "because we had already looked up several journal titles and discovered I couldn't get them . . . nearing the very end of the results, I was looking only at the journal title to see if it was one we had already looked at . . . I stopped looking as much at the title of the article so much as at the title of the journal." (Frances, interview2)	- specifies a basis on which usefulness of items was judged	ANZIIL 2.3. ANZIIL 1.3.2. Relational 2.1.
E.RT.C.LA.04. "Hmm – it's in the library, all right. I like the convenience of the PDFs but this might be worth looking at, so what I'm actually going to do is...to save this reference here (Howard, demo2)	- specifies a basis on which usefulness of items was judged	ANZIIL 2.3.1. Relational 2.1.
E.RT.C.LA.05. "a lot of the books that would have been really relevant, are already taken out . . . so I would say it was a good search, in light of that. However, there would have been more relevant sources had they been available" (Isabel, interview1)	- specifies a basis on which a search outcome was judged	ANZIIL 3.1.1. ANZIIL 3.3.1. Relational 2.1.
<u>Results-Criteria-Number of Results</u>		
E.RT.C.NR.01. "Doesn't look like there is a next page. Ok, I guess that's all there is . . . I did find one article that . . . could be ...useful. But that's pretty much what I expected. I didn't think that there would be a heck of a lot." (Annette, demo1)	- specifies a reason for not being concerned that a query retrieved only one potentially useful item	ANZIIL 3.1.1. Relational 2.1.
E.RT.C.NR.02. "Let's just see how many I get. Yeah, almost 4,000. That's...way too much . . . I'm not even gonna look at these. If there's 4,000 of them, most of them are going to be completely unrelated to what I need." (Annette, demo1)	- specifies a reason for judging a query results set not to be useful	ANZIIL 3.1.1. Relational 2.1.
E.RT.C.NR.03. "So since there's 50 of them, that means that I can actually narrow down my search more." (Annette, demo2)	- specifies a reason for judging a query results set to be useful	ANZIIL 3.1.1. Relational 3.1.
E.RT.C.NR.04. "I'm trying to get something less than 50 but definitely more than 1." (Annette, demo2)	- specifies criteria for the desired query results set	ANZIIL 3.1.1. Relational 3.1.
E.RT.C.NR.05. "And, there are 35 peer-reviewed journals ... which is not all that many. I'm actually kind of surprised that there's only so few. So ... 35 is enough that I could actually kind of skim through and see ... see what there is" (Annette, demo3)	- specifies a reason for judging a query results set to be useful	ANZIIL 3.1.1. Relational 3.1.
E.RT.C.NR.06. "Ok, so I'm gonna see if I can't...combine searches . . . and we'll see if we come up with any overlap. 39 – a reasonable number. Ok, I want to display these...and see what's going on." (Carol, demo1)	- specifies a reason for judging a query results set to be useful	ANZIIL 2.2.4. ANZIIL 3.1.1. Relational 3.1.

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Participants' Spoken Thoughts Referencing Evaluation Themes By Theme Group	Advanced Thinking Criteria	Information Literacy Model + Element**
E.RT.C.NR.07. "I'm a little bit surprised at how much stuff there is on the...topic. I didn't think there was going to be very much, but it looks like there is." (Ellen, demo3)	- reflects thinking about the search process and its unexpected results	ANZIIL 3.1.1. Relational 3.1.
E.RT.C.NR.08. "it depends on if there's six thousand that came up, I'm not looking at all of them. But . . . with . . . a hundred or something like that . . . I do tend to look at quite a few of them, because I found too many times that it's always on the next page that there was something." (Ellen, interview3)	- specifies a criterion for judging the outcome of a search	ANZIIL 3.1.1. Relational 3.1.
E.RT.C.NR.09. "All right, 28 sources, that's not too huge. I'll just scan through these here, looking at some of the years of publication and seeing what kind of things we come up here" (Howard, demo1)	- specifies a criterion for judging a query results set to be useful	ANZIIL 3.1.1. Relational 3.1.
E.RT.C.NR.10. "I'm just going to try and actually sort by date here...I suppose there is 4,000 in there came up on that so that's pretty huge" (Howard, demo1)	- specifies a reason for slight hesitation in performing search action	ANZIIL 2.2.4. ANZIIL 3.1.1.
E.RT.C.NR.11. "It's probably going to come up with a lot of stuff, I'm guessing but we'll see what happens here. Yup, that's kind of what I thought . . . almost 1200 things here...Yup, there's a lot of stuff going on . . . I would really like to see, yeah, because [treatise] is such a large work and there's so many different themes involved . . . so . . . I'll try something a little bit different in here. I'll put and just war, see what that does" (Howard, demo3)	- signifies in-depth knowledge of the search topic, and specifies a criterion for judging the size of the results set	ANZIIL 3.1.1. ANZIIL 2.2.4. Relational 3.1.
E.RT.C.NR.12. "I was a little struck by the fact that there's not a lot written about [character], which I thought was kind of strange . . . because she is a large character in the text. So I don't know why she hasn't been written about" (Isabel, interview3)	- reflects thinking about a puzzling aspect of the query results	ANZIIL 3.1.1.
<u>Results-Criteria-Personal Interest</u>		
E.RT.C.PI.01. "oh, yeah, of course I'll be interested in something like that – talking about art and, other things that are kind of interesting to me. . . . so now I'm not sure if I'm interested in it because it seems applicable or just because there's been some words in here that...have enticed me." (Ellen, demo3)	- reflective thoughts about personal interest in a topic	ANZIIL 3.1.1. Relational 2.1.
E.RT.C.PI.02. "I'm just going to see what it gives me because this person of this paper probably . . . gives me some reasons to believe that . . . the mind is . . . more than a computer ... So I'm just going to read this thing because I wanna read it, kind of interesting" (Gail, demo1)	- specifies reasons for judging an item to be potentially useful	ANZIIL 3.1.1. Relational 2.1.

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Participants' Spoken Thoughts Referencing Evaluation Themes By Theme Group	Advanced Thinking Criteria	Information Literacy Model + Element**
<u>Results-Criteria-Pictures and Picture Captions</u>		
E.RT.C.PC.01. "When I was searching through the newspapers . . . things like pictures helped . . . sometimes, or . . . captions under pictures . . . There was one . . . that had two black men in the picture, and I was like oh, maybe that has something to do with racism, and it did" (Bonnie, interview3)	- specifies a basis on which the usefulness of items was judged	ANZIIL 3.2.1. Relational 2.1.
<u>Results-Criteria-Population or Geographic Area</u>		
E.RT.C.PG.01. "a lot of the time . . . if they had things like alcohol, or . . . if they had something like bar scene or college students, or things like that, that related kind of to my topic, because a lot of the research that I'll be doing will be on college or university students . . . to me that seemed interesting." (Carol, interview2)	- specifies a rationale for using a particular criterion to judge the usefulness of items	ANZIIL 3.1.1. Relational 2.1.
E.RT.C.PG.02. "it's talking more about Latin America. I'm not sure if that's the area I would . . . be focusing on for my project. But then it talks a little bit more about African and . . . Kind of interesting" (Ellen, demo3)	- specifies a reason for judging item to be potentially useful	ANZIIL 3.1.1. Relational 2.1.
E.RT.C.PG.03. "I was initially just looking for [disease] and activism to see how . . . it could pertain to . . . the communities that I have in mind. . . . And then later on I was able to more incorporate the idea . . . specifically in relation to women." (Ellen, interview3)	- specifies bases on which usefulness of items was judged	ANZIIL 3.1.1. Relational 2.1.
E.RT.C.PG.04. "this is more about humans, I see a lot . . . I don't know, I was more thinking about experimental animals, but it's always good to have a link back to humans, of course, so maybe...I can use some of them" (Gail, demo3)	- specifies a reason for judging item to be potentially useful	ANZIIL 1.3.1. Relational 2.1.
E.RT.C.PG.05. "I think I – at the end of my paper, when it's appropriate, would also make a link to humans. But just because all of the studies are done with rats, I was looking for rat studies . . . And . . . because they are . . . easy to control them, more than human studies so, that is why I took rats but . . . I'm not really interested in rats necessarily." (Gail, interview3)	- specifies a basis on which usefulness of items was judged	ANZIIL 1.3.1. Relational 2.1.
<u>Results-Criteria-Potential Bias</u>		
E.RT.C.PB.01. "I looked around the shelves and I found some that . . . had some more general information and some that had different sources . . . because I thought maybe the German one might be biased as the British one would be too maybe . . . I just thought that the information might differ a little, and I wanted to say that it differed a little, from book to book, if it did." (Bonnie, interview2) (Evaluation-Results-Criteria-Distinctive Ideas E.RT.C.DI.02)	- describes an approach to try to counter potential bias by considering more than one perspective	ANZIIL 3.2.1. Relational 2.1.

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Participants' Spoken Thoughts Referencing Evaluation Themes By Theme Group	Advanced Thinking Criteria	Information Literacy Model + Element**
<p>E.RT.C.PB.02. "I might be able to get my hands on one of those [edited works]. . . and that might be a good . . . source as well. The disadvantage . . . is that the very fact that they're included within a compilation is interpretation in and of itself, through the editor. So that is something when you're researching you have to be careful of, because you don't know what they've neglected or what they've included if it's promoting some kind of a specific angle . . . on the subject" (Howard, interview2)</p> <p><u>Results-Criteria-Primary Source</u></p>	- signifies a sophisticated understanding of potential problems with quality of edited works	ANZIIL 1.2.2. ANZIIL 3.2.1. Relational 2.1.
<p>E.RT.C.PS.01. "the library here is good, but it's not as extensive as some, and so I want availability of primary sources" (Howard, interview1)</p>	- specifies a criterion for judging the usefulness of items	ANZIIL 1.2.4. Relational 2.1.
<p>E.RT.C.PS.02. "I want to find . . . a specific topic within that broader . . . subject to write my paper on. And a lot of that may come down to the availability of primary sources and what kind of interesting . . . things I come up with. I gear . . . some of my paper topics towards availability of sources . . . just because . . . going the other way around can sometimes be frustrating if you're looking for sources of subjects that . . . you're first interested in, if you can't find stuff to substantiate your arguments" (Howard, interview2) (Strategy-Conduct Search-Choose Topic or Focus S.CS.CT.09)</p> <p><u>Results-Criteria-Recency of Content</u></p>	- specifies a reason for valuing highly a particular type of source	ANZIIL 1.2.4. ANZIIL 2.2.5. Relational 2.1.
<p>E.RT.C.RC.01. "it was also important for it to be quite current, because I wanted to know a little bit about the history, but I also wanted to know about the practice of the festival now, so that was good in the . . . Internet search finding that kind of thing . . . to see what was going on currently." (Ellen, interview2)</p>	- specifies a reason for judging an item to be potentially useful	ANZIIL 3.1.1. ANZIIL 3.2.1. Relational 2.1.
<p>E.RT.C.RC.02. "I think . . . this might be useful. Just going to go to the references . . . I don't know why I actually go there...partly I guess if he cites really old things or very recent" (Gail, demo2)</p>	- specifies a reason for particular approach to judging the usefulness of items	ANZIIL 3.2.1. Relational 2.1.
<p>E.RT.C.RC.03. "I always make sure there are a certain number of papers that are not older than three years old." (Gail, interview3)</p>	- specifies a criterion for judging an item's quality	ANZIIL 3.2.1. Relational 2.1.
<p>E.RT.C.RC.04. "some of these articles are getting a little bit on the old side here . . . and that's my only...concern . . . because history professors do not like to see old...sources in your bibliography especially with articles" (Howard, demo1)</p>	- specifies a reason for particular approach to judging the usefulness of items	ANZIIL 3.2.1. Relational 2.1.

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Participants' Spoken Thoughts Referencing Evaluation Themes By Theme Group	Advanced Thinking Criteria	Information Literacy Model + Element**
E.RT.C.RC.05. "I like to look for contemporary sources, that's a huge criteria. The big exception to that is if there is really a ground breaking author in an earlier period of time who represents a school of thought . . . I'll usually try to hit upon some of those . . . older sources that really were significant for a certain period of time in shaping a particular view." (Howard, interview2)	- specifies a basis for judging an item's quality, and an exceptional situation when the criterion would not apply	ANZIIL 3.2.1. ANZIIL 3.2.4. Relational 2.1.
E.RT.C.RC.06. "I'm attracted to the recent date . . . but it doesn't look like this title or anything in there is jumping at me" (Howard, demo3)	- specifies a basis considered in judging the usefulness of an item	ANZIIL 3.2.1. Relational 2.1.
E.RT.C.RC.06. "that one seems to be more recent so the bibliography in it might be helpful" (Isabel, demo2)	- specifies basis on which usefulness of item was judged	ANZIIL 3.2.1. Relational 2.1.
E.RT.C.RC.08. "That's 1999, my prof will like that, it's somewhat recent." (Isabel, demo3)	- specifies a criterion on which usefulness of item was judged	ANZIIL 3.2.1. Relational 2.1.
E.RT.C.RC.09. "part of the consideration went to how recent they were . . . [the professor] mentioned in class that . . . she preferred something past the 80's, so contemporary" (Isabel, interview3)	- specifies a criterion on which usefulness was judged	ANZIIL 3.2.1. Relational 2.1.
<u>Results-Criteria-References Cited in Source</u>		
E.RT.C.RS.01. "I think about references a lot, like who are they going to reference, how am I going to be able to comb through their references and see what I can find . . . because I found that that really helps with finding resources." (Carol, interview1)	- specifies a basis on which usefulness of items was judged	ANZIIL 3.1.1. Relational 2.1.
E.RT.C.RS.02. "if I'm looking within a book . . . I know is written by a reputable scholar, I can look at his . . . or her references . . . and that's usually . . . a pretty good guide to . . . which sources I can look to." (Howard, interview2)	- specifies a basis on which usefulness of items was judged	ANZIIL 3.1.1. Relational 2.1.
E.RT.C.RS.03. "this might be useful. It says 'presents a bibliography of scholarship and criticism...' So that might lead us to other . . . sources of authors" (Isabel, demo1)	- specifies a basis on which the potential usefulness of items was judged	ANZIIL 3.1.1. Relational 2.1.

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Participants' Spoken Thoughts Referencing Evaluation Themes By Theme Group	Advanced Thinking Criteria	Information Literacy Model + Element**
<u>Results-Criteria-Relevance-Different Topic But Potentially Applicable</u>		
E.RT.C.R.DT.01. "That could be useful. I could see that as applying to my topic. Even though this article's on dog sports, I think that some of the . . . issues that they're mentioning in the abstract could be useful." (Annette, demo1)	- specifies reasons for judging a somewhat off-topic item to be potentially useful	ANZIIL 1.3.1. Relational 2.1.
E.RT.C.R.DT.02. "That looks like something that could be useful to me . . . it looks at [topic] as an alternative lifestyle. Maybe not so much what I want because I'm looking more at [topic] as leisure. But it could be related and there could be some theory in there that could be useful." (Annette, demo1)	- specifies reasons for judging a somewhat off-topic item to be potentially useful	ANZIIL 1.2.2. ANZIIL 1.3.1. Relational 2.1.
E.RT.C.R.DT.03. "Once again, it's not directly related to my topic, but I don't really know very much about sociology of leisure at all so any kind of theoretical or background stuff is definitely useful." (Annette, demo1)	- specifies reasons for judging a somewhat off-topic item to be potentially useful	ANZIIL 1.1.1. ANZIIL 1.3.1. Relational 2.1.
E.RT.C.R.DT.04. "charisma, collective effervescence...these weren't actually ideas that I was considering but I'm thinking about my topic and those could definitely be useful ideas. Ok, and the full-text is right on here, so I will mark it" (Annette, demo3)	- specifies reasons for judging items to be potentially useful	ANZIIL 1.3.1. Relational 2.1.
E.RT.C.R.DT.05. "even if this one doesn't have . . . [query terms] it will...give some insight into...the kinds of . . . factors that lead to . . . other [population group members] . . . to offend." (Carol, demo1)	- specifies reasons for judging items to be potentially useful	ANZIIL 3.1.1. Relational 2.1.
E.RT.C.R.DT.06. "It might not be quite the...same approach as I'm looking for but still valuable information." (Ellen, demo1)	- specifies reasons for judging items to be potentially useful	ANZIIL 3.1.1. Relational 2.1.
E.RT.C.R.DT.07. "it says about gay men, and this [task] is supposed to be a subject of women so I'm going to avoid that article . . . but I still feel . . . [it] might be useful. I'm going to look at it anyways . . . because . . . the rest of the title and subject matter seems to be applicable . . . Might be something worth considering even if . . . it's maybe not exactly what . . . my professor is interested in." (Ellen, demo3)	- specifies reasons for judging items to be potentially useful	ANZIIL 3.1.1. Relational 2.1.
E.RT.C.R.DT.08. "There's something fairly recent here, too, The problem of service to unjust regimes. Not quite what I'm relating to, but might be interesting" (Howard, demo3)	- specifies reasons for judging items to be potentially useful	ANZIIL 3.1.1. ANZIIL 3.2.1. Relational 2.1.

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Participants' Spoken Thoughts Referencing Evaluation Themes By Theme Group	Advanced Thinking Criteria	Information Literacy Model + Element**
<u>Results-Criteria-Relevance-Exactly on Topic</u>		
E.RT.C.R.ET.01. "I'm reading the abstract . . . and it's talking about secularization leading to disenchantment and religion and . . . it compares it to USSR which is not really useful to me, but the concept of secularization leading to disenchantment is exactly what I'm looking for" (Annette, demo3)	- specifies a reason for judging an item to be useful	ANZIIL 3.1.1. Relational 2.1.
E.RT.C.R.ET.02. "This is . . . precisely what I want: [population group], violent and nonviolent comparison. I'm so happy" (Carol, demo1)	- specifies a reason for judging an item to be useful	ANZIIL 3.1.1. Relational 2.1.
E.RT.C.R.ET.03. "I like this one . . . aggressive decision making. Exactly what I want." (Carol, demo2)	- specifies a reason for judging an item to be useful	ANZIIL 3.1.1. Relational 2.1.
E.RT.C.R.ET.04. "Oh, this is good . . . kind of surprised at finding something that seems . . . so fitting but I guess when you ask for exactly what you want, you sometimes...can find it." (Ellen, demo1)	- reflects thinking about the search process	ANZIIL 3.1.1. Relational 2.1.
E.RT.C.R.ET.05. "Ah, so, this is good. This is perfect because what I'm hoping for here...is ...the title of her autobiography because I know she's written one." (Frances, demo2)	- specifies a reason for judging an item to be useful	ANZIIL 3.1.1. Relational 2.1.
<u>Results-Criteria-Relevance-Generally on Topic</u>		
E.RT.C.R.GT.01. "when I was trying to decide which articles were relevant, I would look at the title and I would look at the abstract, and for the most part if it had anything to do with [leisure activity] in the way that I want to look at it, then I would mark it as relevant, because I really don't know yet what I'm specifically going to be looking at." (Annette, interview1) (Strategy-Conduct Search-Decide How Much Is Needed S.CS.DH.01)	- specifies criteria used to judge usefulness of items	ANZIIL 3.1.1. Relational 3.1.
E.RT.C.R.GT.02. "I pick articles that either . . . directly pertain to the topic . . . or something that . . . the abstract or a literature review of that article might have . . . mentioned something pertaining to my topic." (Carol, interview1)	- specifies reasons for judging items to be useful	ANZIIL 3.1.1. Relational 2.1.
E.RT.C.R.GT.03. "ethical behavior in [folk literature], that's a lot more along the lines of what I'm...thinking about" (Ellen, demo1)	- specifies a reason for judging an item to be useful	ANZIIL 3.1.1. Relational 2.1.
E.RT.C.R.GT.04. "interesting because I am...looking at little bit of . . . the local but also international, and so the epidemic situation in Africa would be useful for the project that I'm doing. So information on that . . . could be helpful" (Ellen, demo3)	- specifies a reason for judging an item to be useful	ANZIIL 3.1.1. Relational 2.1.
E.RT.C.R.GT.05. "This is interesting...It's always good to have some statistics – 20% of the women smoke, which seems a lot...Probably should see, if I'm writing my paper, what it is in Canada" (Gail, demo3)	- specifies reasons for judging items to be useful	ANZIIL 1.2.2. Relational 2.1.

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Participants' Spoken Thoughts Referencing Evaluation Themes By Theme Group	Advanced Thinking Criteria	Information Literacy Model + Element**
E.RT.C.R.GT.06. "Actually this looks quite interesting—I remember seeing something about him building on this . . . old testament reference for his . . . theory, so I'm gonna . . . save . . . this one as well" (Howard, demo3)	- specifies reasons for judging items to be useful	ANZIIL 3.1.1. Relational 2.1.
E.RT.C.R.GT.07. "I was able to find a number of monographs . . . relating to [theologian] and also his, obviously the primary source . . . that's going to be the focus of my analysis." (Howard, interview3)	- specifies reasons for judging query results to be productive	ANZIIL 1.2.4. ANZIIL 3.1.1. Relational 2.1.
E.RT.C.R.GT.08. "Shakespeare's so big, that you can . . . write on many themes in this play, but I needed . . . a source that really just dealt specifically with [hero] and his characterization, or relevant scenes and texts that somehow related to him like the one that was on mourning" (Isabel, interview1)	- specifies criteria used to judge usefulness of items	ANZIIL 3.1.1. Relational 2.1.
E.RT.C.R.GT.09. "[book is] missing! . . . I'm still gonna write that author down though, just because..."second world war and [population group]" sounds kind of appropriate" (Isabel, demo2)	- specifies a reason for search action	ANZIIL 3.1.1. Relational 2.1.
E.RT.C.R.GT.10. "anything that kind of had Canadian [population group] in World War II, just generally kind of grabbed my attention right away, because I'm in the preliminary stages of research." (Isabel, interview2)	- specifies criteria used to judge usefulness of items	ANZIIL 3.1.1. Relational 2.1.
E.RT.C.R.GT.11. "I think this article's maybe playing upon...the notion of [heroine] as a pure woman because it was written in the Victorian times. . . . she's not technically pure...so this might have something good...in terms of how women are perceived" (Isabel, interview3)	- specifies a reason for judging item to be useful	ANZIIL 3.1.1. Relational 2.1.
<u>Results-Criteria-Relevance-Intuition or Signals</u>		
E.RT.C.R.IS.01. "I'm just going to go over all the titles and see if there's anything that...may signal to me that there's some sort of racist meaning in the article. Usually something to do with immigrants works out really well." (Bonnie, demo3) (Evaluation-Results-Criteria-Distinctive Ideas E.RT.C.DI.01)	- specifies basis on which usefulness of items was sensed	ANZIIL 3.2.1. Relational 2.1.
E.RT.C.R.IS.02. "I'm not looking for a specific . . . it's really hard to pinpoint exactly what racism is and I'm not really looking for certain words" (Bonnie, interview3)	- reflects on own process of determining relevance	ANZIIL 3.2.1. Relational 2.1.
E.RT.C.R.IS.03. "I don't know how to explain why it's good . . . it's kind of an intuitive connection that I know of, it's just...from all the reading that I've done." (Carol, interview3)	- reflects on own process of determining relevance	ANZIIL 3.1.1. Relational 2.1.
<u>Results-Criteria-Relevance-Not Relevant or Useful</u>		
E.RT.C.R.NR.01. "this is more about democracy than I'm interested in...although there is the full-text...No, that's really not what I'm looking for" (Annette, demo3)	- specifies a reason for judging an item not to be useful	ANZIIL 3.1.1. Relational 2.1.

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Participants' Spoken Thoughts Referencing Evaluation Themes By Theme Group	Advanced Thinking Criteria	Information Literacy Model + Element**
E.RT.C.R.NR.02. "I got the New York Times book of archaeology...and in the contents it says...I don't know – it doesn't really look useful, just the name, even – book of archaeology – I don't think so. (Bonnie, demo2)	- specifies a reason for judging an item not to be useful	ANZIIL 3.1.1. Relational 2.1.
E.RT.C.R.NR.03. "I don't actually know what that means, so . . . I'm going to read the abstract. And . . . no, it has something to do with . . . financial stuff and...I found out in my last searches that that hasn't worked out too well" (Bonnie, demo3)	- specifies a reason for judging an item not to be useful	ANZIIL 3.1.1. Relational 2.1.
E.RT.C.R.NR.04. "Environmental risks . . . doesn't seem like they have . . . so much to do with family, more to do with school . . . so, not really what I want" (Carol, demo1)	- specifies a reason for judging an item not to be useful	ANZIIL 3.1.1. Relational 2.1.
E.RT.C.R.NR.05. "interesting but no – it's more social science" (Carol, demo3)	- specifies a reason for judging an item not to be useful	ANZIIL 3.1.1. Relational 2.1.
E.RT.C.R.NR.06. "Hmm...no, it takes us too far away from the Hindu tradition" (Ellen, demo2)	- specifies a reason for judging an item not to be useful	ANZIIL 3.1.1. Relational 2.1.
E.RT.C.R.NR.07. "see now it goes into Watson and stuff [Crick] . . . no, this is not what I need." (Gail, demo2)	- specifies a reason for judging an item not to be useful	ANZIIL 3.1.1. Relational 2.1.
E.RT.C.R.NR.08. "I'm not finding anything so far that jumps out at me...This one says the role of [population group] in world war two, but I'm not...convinced that it's Canada...Nothing really there that...I think is good" (Isabel, demo2)	- specifies a reason for judging an item not to be useful	ANZIIL 3.1.1. Relational 2.1.
<u>Results-Criteria-Reputable or Familiar Authors</u>		
E.RT.C.R.RA.01. "the author of this one is . . . <i>the</i> researcher on [subject], at least in Canada . . . he's coming to teach my class so...I know that . . . he's a really good resource and I know that my prof really likes him so anything by him might be useful." (Annette, demo1)	- specifies basis on which the quality of items was judged	ANZIIL 3.2.1. Relational 2.1.
E.RT.C.R.RA.02. "Hm...this is a good one. Ah, this is my prof . . . it's why it's good." (Carol, demo1)	- specifies basis on which the quality of items was judged	ANZIIL 3.2.1. Relational 2.1.

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Participants' Spoken Thoughts Referencing Evaluation Themes By Theme Group	Advanced Thinking Criteria	Information Literacy Model + Element**
E.RT.C.R.RA.03. "I think I have two or three really good articles by [author], that don't necessarily deal with [topic] per se, but I actually got him through another reference . . . I don't remember which paper but, and it turned out to be really useful, so it just kind of blossomed from there. . . . So yeah, name recognition, definitely." (Carol, interview3)	- specifies basis on which the quality of items was judged	ANZIIL 3.2.1. Relational 2.1.
E.RT.C.R.RA.04. "Just scanning through the titles here...I'm . . . noticing a familiar name here, too, on the authors, so that's a significant thing for me" (Howard, demo1)	- specifies basis on which the quality of items was judged	ANZIIL 3.2.1. Relational 2.1.
E.RT.C.R.RA.05. "I'm just gonna grab this one from [author] because . . . our professor has actually given us some material to read from [author] already so that indicates to me that that is a...reputable scholar and I definitely want to take a look at that...work" (Howard, demo1)	- specifies basis on which the quality of items was judged	ANZIIL 3.2.1. Relational 2.1.
E.RT.C.R.RA.06. "I also try to . . . cross reference some of the top scholars in the field . . . for those journal articles, I'll look back and . . . I didn't bring my textbook today, but . . . they have a bibliography in there, I'll . . . want to reference the . . . front running scholars within the field . . and then from there obviously down to how well it relates to the specific subject that I'm looking for" (Howard, interview2)	- specifies basis on which the quality of items was judged	ANZIIL 3.2.1. Relational 2.1.
<u>Results-Criteria-Research Methods</u>		
E.RT.C.R.RM.01. "I look at the way it's written, I look at the conclusions they draw from the research and whether the conclusions are actually supported by the research . . . it's a big problem, especially in behavioural psychology. People want to generalize more than they should with the research, because you can't generalize to the population from a sample of even two hundred people. You can support a theory but you can't generalize the results, a big mistake." (Carol, interview2)	- specifies basis on which quality of item was judged	ANZIIL 3.2.2.
<u>Results-Criteria-Same Item Retrieved in Different Query Results</u>		
E.RT.C.R.SD.01. "it takes me back to that same...book with the other spelling, which...makes me [think] . . . that must be...a good source. So I'm gonna ...make a note of that to myself" (Ellen, demo2)	- specifies a reason for judging an item to be potentially useful	ANZIIL 3.1.1. Relational 2.1.
E.RT.C.R.SD.02. "I'm just going to do another quick search . . . about women and activism, and see if some of these things that I found to be useful with [disease] and activism will come up again" (Ellen, demo3)	- specifies a criterion for judging the quality of items	ANZIIL 3.1.1. Relational 2.1.
<u>Results-Criteria-Specificity of Topic Treatment</u>		
E.RT.C.R.ST.01. "[disease], activism and prison . . . No, sounds too specific, and not necessarily what I'm looking for." (Ellen, demo3)	- specifies basis on which usefulness of item was judged	ANZIIL 1.1.3. ANZIIL 3.1.1. Relational 2.1.

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Participants' Spoken Thoughts Referencing Evaluation Themes By Theme Group	Advanced Thinking Criteria	Information Literacy Model + Element**
E.RT.C.R.ST.02. "think it has a lot of detail I probably don't . . . need... 'cause I'm just more interested in the general social issues and this is . . . really detailed, if you want to know specifics about scientific revolution" (Gail, demo2)	- specifies basis on which usefulness of item was judged	ANZIIL 1.1.3. ANZIIL 3.1.1. Relational 2.1.
E.RT.C.R.ST.03. "these ones are more...specific to a really narrow theme that I wouldn't want to incorporate in my essay" (Isabel, demo1)	- specifies basis on which usefulness of item was judged	ANZIIL 1.1.3. ANZIIL 3.1.1. Relational 2.1.
<u>Results-Criteria-Time Period Covered</u>		
E.RT.C.R.TP.01. "this one actually looks like it might be a little bit better. It gives her age when she left [country] and . . . this paragraph, as a child in [Canada]" (Frances, demo1)	- specifies reasons for judging an item to be potentially useful	ANZIIL 3.2.1. Relational 2.1.
E.RT.C.R.TP.02. "If it says . . . scientific revolution and then it talked about . . . the people that discovered how the structure of DNA is, then I know it's not going to be useful because I want it from the 17th century." (Gail, interview2)	- specifies basis on which usefulness of items was judged	ANZIIL 3.2.1. Relational 2.1.
E.RT.C.R.TP.03. "Whoo, South Carolina. An article. This looks like...a...document published . . . in 1880 . . . Looks pretty interesting." (Howard, demo2)	- specifies a reason for judging an item to be potentially useful	ANZIIL 3.2.1. Relational 2.1.
<u>Results-Criteria-Title Words-Catchy Words</u>		
E.RT.C.TW.CW.01. "most people title their paper in a catchy way so . . . it kind of takes my attention, but I'd rather have something that exactly tells . . . what it's going to be about rather than like for example, a paper about the prefrontal cortex, you can call it 'The prefrontal cortex in relation to brain plasticity and experience' or you can call it 'Can you teach a dog new tricks?'. I guess most people would say the dog one was . . . kind of different, but I prefer this [the latter]" (Gail, demo1)	- specifies reasons for preferring a particular type of title on which to base the usefulness of items	ANZIIL 3.1.1. Relational 2.1.
<u>Results-Criteria-Title Words-Topic Words</u>		
E.RT.C.TW.TW.01. "it's normally just title [to identify potential relevance], and then if the title isn't very useful, or it seems like it possibly could work, then I'll go in and I'll look in the . . . contents part [catalogue 'contents' note], and I'd look in there and see if . . . the words in my search just hit randomly on words in the text" (Bonnie, interview2)	- describes complex process used to judge usefulness of items	ANZIIL 3.1.1. Relational 2.1.
E.RT.C.TW.TW.02. "just reading the title again, there, the [disease] epidemic looms large around the globe . . . That looks like a very good, could be very useful" (Ellen, demo3)	- specifies basis on which usefulness of item was judged	ANZIIL 3.1.1. Relational 2.1.

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Participants' Spoken Thoughts Referencing Evaluation Themes By Theme Group	Advanced Thinking Criteria	Information Literacy Model + Element**
E.RT.C.TW.TW.03. "I was trying to sort of gauge from the title whether it was even about her autobiographies, or whether it was about things like some of the novels she's written are autobiographical fiction, which isn't what I was looking for." (Frances, interview2)	- specifies basis on which usefulness of item was judged	ANZIIL 3.1.1. Relational 2.1.
E.RT.C.TW.TW.04. "I just used the title . . . I think myself that it's going to be maybe I missed some just by going over the title, but I ended up with some." (Gail, interview2)	- specifies basis on which usefulness of item was judged	ANZIIL 3.1.1. Relational 2.1.
E.RT.C.TW.TW.05. "the title I find is usually fairly indicative, and they talk about the title in the abstracts where you usually have a good indication of whether the resource will be useful." (Isabel, interview1)	- specifies basis on which usefulness of item was judged	ANZIIL 3.1.1. Relational 2.1.
<u>Results-Criteria-Understandability</u>		
E.RT.C.U.01. "it looked like a paper for students . . . it was . . . to the point . . . actually like a student was telling me about it, rather than someone in college . . . for the other papers I had a hard time, like I read a few lines and then I kind of perused it in my mind. . . . [it had a] high level of understandability but it still had quality . . . it wasn't like philosophy for dummies . . . it was . . . kind of a cross between those two. It was short and I assume it was important." (Gail, interview1)	- specifies basis on which usefulness of item was judged	ANZIIL 3.1.1. Relational 5.1.
<u>Search Process-Amount of Needed Sources</u>		
E.SP.AS.01. "Because it is quite a short paper . . . I don't think I'll have a lot of space to include a lot of sources . . . So a few really good sources would be better than a lot of sources." (Annette, demo3)	- expresses insightful perspective on quality versus quality of sources for a task	ANZIIL 1.1.3. Relational 2.1.
E.SP.AS.02. "because it's kind of a . . . I guess I would call it like a knowledge building kind of stage, I'm not sure . . . what won't be useful or what will be very useful . . . I'd probably have at least five or six solid things now, and I would probably get upwards of twelve or something like that to get kind of an idea of where I want to go. But if I found something really useful in the five or six I have now, then I may be able to stop. So between five and twelve, I don't think I would need any more than that." (Ellen, interview3) (Personal Understanding-Acquire Understanding P.A.05)	- specifies a basis for estimating how many sources were needed	ANZIIL 1.1.3. Relational 3.1.
E.SP.AS.03. "only seven [sources are needed] as a minimum . . . I'd say for a paper of this length, I typically allow at least twenty sources" (Howard, demo1)	- specifies basis for estimating how many sources were needed	ANZIIL 1.1.3. Relational 2.1.

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Participants' Spoken Thoughts Referencing Evaluation Themes By Theme Group	Advanced Thinking Criteria	Information Literacy Model + Element**
E.SP.AS.04. "I didn't find a lot in this particular search, but at the same time I feel that I already have more than . . . enough material . . . I think that there would be a minimum of probably seven or so, but I already have . . . close to a dozen monographs" (Howard, interview3)	- specifies a reason for judging enough sources had been identified	ANZIIL 1.1.3. Relational 2.1.
E.SP.AS.05. "So that gives us three sources . . . It's not a very long essay and it really only needed...one or two secondary sources to consider...So what we have would probably be sufficient for that." (Isabel, demo1)	- specifies a reason for judging enough sources had been identified	ANZIIL 1.1.3. Relational 2.1.
<u>Search Process-Ease</u>		
E.SP.E.01. "wow, this is much easier now that I'm not just looking for articles written in the past eight months" (Annette, demo3)	- reflects thinking about differences in search outcomes when different search parameters are used	ANZIIL 3.3.1. Relational 3.1.
E.SP.E.02. "I think I won't have a problem finding papers... which is interesting because . . . I know this topic fairly well and it goes really easy, but if I have to do a search for something I'm not as familiar it looks like I can't find anything" (Gail, demo3)	- reflects thinking about how own search processes differ, depending on topic knowledge	ANZIIL 3.3. Relational 3.1.
<u>Search Process-Outcome</u>		
E.SP.O.01. "I think that's probably...pretty good . . . I found a few . . . articles that may be useful, but I actually found three books which was...really...good news." (Annette, demo1)	- specifies a reason for judging a search outcome to be positive	ANZIIL 3.3.1. Relational 2.1.
E.SP.O.02. "I'm having a really hard time finding recent articles that have anything to do with what I'm looking for. So I think my best bet is probably going to be asking the prof for help, because I'm not finding anything on my own." (Annette, demo3) (Strategy-Conduct search-Handle search impasse S.CS.HS.01)	- specifies reasons for lack of search success	ANZIIL 3.3.1. ANZIIL 2.3.2. Relational 2.1.
E.SP.O.03. "Ok, I'm done. Found a couple of good articles." (Carol, demo3)	- specifies a reason for concluding a search	ANZIIL 3.3.1. Relational 2.1.
E.SP.O.04. "I think most of this is fairly successful in finding at least others who have done work with [folk literature] and just of examples . . . because there's a lot to look through" (Ellen, demo1)	- specifies a reason for judging a search outcome to be positive	ANZIIL 3.3.1. Relational 2.1.

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Participants' Spoken Thoughts Referencing Evaluation Themes By Theme Group	Advanced Thinking Criteria	Information Literacy Model + Element**
E.SP.O.05. "I think this website . . . will have information that I need, and knowing that . . . I will be able to get information from the other class that I'm taking . . . and then...I think some of these other books, if I need more . . . scholarly information, we have...what I need." (Ellen, demo2)	- specifies a reason for judging a search outcome to be positive	ANZIIL 3.3.1. Relational 2.1.
E.SP.O.06. "I think...we had the best stuff back here . . . I think this one's gonna be one of the more helpful...and the Wikipedia article, I think this is gonna be the best I'm gonna find . . . don't know where else I'd be able to find anything about her" (Frances, demo1)	- specifies a reason for ending a search	ANZIIL 3.3.1. Relational 2.1.
E.SP.O.07. "that's where I'm gonna stop because this is frustrating, and I have . . . three volumes of autobiography and at least two articles, as well as that...first autobiographical bit from the author's page, so . . . it's good enough for me." (Frances, demo2)	- specifies a reason for concluding a search	ANZIIL 3.3.1. Relational 2.1.
E.SP.O.08. "I'm thinking that this is more than enough for me to get started with. I have 5 journal articles and more than half a dozen monographs to kind of get me going here." (Howard, demo1)	- specifies reasons for judging a search outcome to be positive	ANZIIL 3.3.1. Relational 2.1.
E.SP.O.09. "I feel that I've got . . . definitely a place to start with some of these journal articles and monographs" (Howard, demo2)	- specifies reasons for judging a search outcome to be positive	ANZIIL 3.3.1. Relational 2.1.
E.SP.O.10. "I've only come up with three...but it is a place to start. This search hasn't been...totally huge, I don't know . . . how much more I'm gonna be able to find here." (Howard, demo3)	- specifies reasons for judging a search outcome to be positive	ANZIIL 3.3.1. Relational 2.1.
E.SP.O.11. "I came away with nine pieces of information to look at. Some of them are videos . . . so seven books . . . I think that's pretty good." (Isabel, interview2)	- specifies reasons for judging a search outcome to be positive	ANZIIL 3.3.1. Relational 2.1.
E.SP.O.12. "I've got . . . three . . . books . . . for background, and four general . . . articles right now, talking about [heroine 1] and one about [heroine 2]. So . . . this paper only needs a few." (Isabel, demo3)	- specifies a reason for concluding a search	ANZIIL 3.3.1. Relational 2.1.
<u>Search Process-Skills</u>		
E.SP.S.01. "I'm still kind of not very good at choosing the right words . . . for the search." (Bonnie, interview1)	- reflects thinking about the adequacy of own search processes	ANZIIL 2.2.2. Relational 3.1.

Appendix 32: Advanced Thinking Referencing Evaluating

Participants' Spoken Thoughts Referencing Evaluation Themes By Theme Group	Advanced Thinking Criteria	Information Literacy Model + Element**
E.SP.S.02. "It's frustrating sometimes. . . . I'd like to know how to limit my search more, cause a lot of the times I come up with . . . 40...50 papers and three quarters of them aren't useful. . . . I get to the point where I just don't know what else to do . . . [so] I just browse through them . . . cause . . . if I try . . . adding another factor . . . then I lose pretty much everything" (Carol, interview3) (Strategy-Conduct Search-Handle Search Impasse S.CS.HS.04)	- reflects thinking about the adequacy of own search processes	ANZIIL 2.2.4. Relational 3.1.
E.SP.S.03. "I don't really know ... what to do, too much ... 'cause I hardly find anything ... that talks about ... Probably something wrong with how I search ... 'cause I really do think there are some" (Gail, demo2)	- reflects thinking about the adequacy of own search processes	ANZIIL 2.2.4. Relational 3.1.
E.SP.S.04. "I was not very happy that I didn't find much, but I would like you to know that if I do science searches I'm way better than this . . . I just type it in, and get what I want" (Gail, interview2)	- reflects thinking about own searching abilities in a different domain	ANZIIL 2.2.4. Relational 3.1.
E.SP.S.05. "I think I could be better at it [searching the catalogue]" (Isabel, demo2)	- reflects thinking about the adequacy of personal search abilities	ANZIIL 2.2.4. Relational 3.1.
<u>Terms for Querying-Inadequate</u>		
E.TQ.I.01. "I'm still not really comfortable [searching topic in the catalogue] because I don't know a lot of the issues surrounding . . . [country] and World War I . . . I don't really have an idea of any other . . . words that I can use to search the subject at the moment." (Bonnie, interview2)	- specifies reasons for discomfort in searching a topic in the catalogue	ANZIIL 2.2.2. Relational 3.1.
<u>Terms for Querying-Potentially Problematic</u>		
E.TQ.PP.01. "I know that [initials] . . . was an acronym for a whole bunch of different things, but . . . that wasn't too much of a problem because there were only 10 . . . papers came back anyways. If it came back with 100, then I would make it more..." (Annette, demo1)	- specifies reasons for judging query results containing off-topic items not to be a problem	ANZIIL 2.2.2. ANZIIL 2.2.4. Relational 3.1.
E.TQ.PP.02. "religion...could be useful but I think that any article that has secularization will also have religion in it because that's kind of part of the definition." (Annette, demo3)	- specifies reasons for judging a term not to be a useful query term	ANZIIL 2.2.2. Relational 3.1.
E.TQ.PP.03. "go back to just searching for the name of the goddess instead . . . Get some information that way . . . the problem becomes...people's names and... publication companies have the word in it" (Ellen, demo2)	- specifies reasons for judging a query term to be problematic	ANZIIL 2.2.2. Relational 2.1.

Appendix 32: Advanced Thinking Referencing Evaluating

Participants' Spoken Thoughts Referencing Evaluation Themes By Theme Group	Advanced Thinking Criteria	Information Literacy Model + Element**
<p>E.TQ.PP.04. “[political figure]...biography...Again the Wikipedia article . . . Not very helpful . . . again, not really anything on that page...So maybe biography isn't exactly the best term to have searched.” (Frances, demo2)</p> <p><u>Terms for Querying-Potentially Useful</u></p>	- specifies reasons for judging a query term to be problematic	ANZIIL 2.2.2. Relational 2.1.
<p>E.TQ.PU.01. “Hmm, it's based on interviews and field notes. I know that . . . my methodology for my paper is going to be case study or interview so that's another search – topic I could look for.” (Annette, demo1)</p>	- specifies a reason for judging a term noted in a query result to be a potentially useful query term	ANZIIL 2.1.2. ANZIIL 2.2.2. ANZIIL 2.3.3. Relational 2.1.
<p>E.TQ.PU.02. “None of these are...what I was looking for. They all seem to have to do with the Internet. Globalization might be ...hmm. Ok, well let's try freedom of expression and religion...Only 1 peer-reviewed journal...I'll read the abstract...No . . . What else could I add to freedom of expression? Maybe globalization” (Annette, demo3)</p>	- references a term noted in earlier query results as a potentially useful query term in a subsequent search	ANZIIL 2.2.2. Relational 3.1.
<p>E.TQ.PU.03. “Family pathology – ah, perfect search term! . . . sometimes you know they have different subject headings [i.e., terms in abstract], and they help you to find . . . more articles relating to it,” (Carol, demo1)</p>	- specifies a reason for taking note of a term occurring in a query result item	ANZIIL 2.2.2. Relational 2.1.
<p>E.TQ.PU.05. “He's calling it the theory of holy war . . . that's a little bit of a different term than what I've used so maybe that could be another potential search . . . for me.” (Howard, demo3)</p>	- specifies a reason for judging a term noted in a query result to be a potentially useful query term	ANZIIL 2.2.2. Relational 2.1.

Appendix 33: Advanced Thinking Referencing Creating Personal Understanding

Participants' Spoken Thoughts Referencing Personal Understanding Themes	Advanced Thinking Criteria	Information Literacy Model + Element**
<u>Acquire Understanding</u>		
P.A.01.* "Ok, so I'm seeing that [author] is probably not only a Canadian major player, he seems to be the major player in leisure sociology. So I will have to definitely get a few of his...articles or books and really . . . get into his theory, because he seems to be the big one." (Annette, demo1)	- expresses insightful recognition of the need to understand topic-related theory from authors who are major players	ANZIIL 5.1.3.** Relational 5.1.
P.A.02. "I don't really know very much about at all about the sociology of leisure, but apparently no one else does either, because we only have one textbook for the course and it's written by [author name], who I found wrote just about everything that I found." (Annette, interview1)	- indicates a grasp of the state of knowledge on the search topic within the associated domain	ANZIIL 5.1. Relational 5.1.
P.A.03. "I believe it's going to be more specific now, what . . . needs to be found . . . I think I've got a place where I feel like there's a lot of information" (Ellen, demo1)	- reflects thinking about having acquired enough information to begin a process of understanding and narrowing the topic	ANZIIL 5.1. Relational 5.1.
P.A.04. "I didn't know it was connected to this, it's something that I'm working at now, so it might be interesting to use some of the stuff in doing another class, to coordinate with this . . . so it's a re-enactment of the Ramayana . . . in any case that will be easy enough to do then." (Ellen, demo2)	- references a discovery that needed understanding of the search topic is related to that associated with a task in another class	ANZIIL 5.1.3. Relational 5.1.
P.A.05. "because it's kind of a . . . I guess I would call it like a knowledge building kind of stage, I'm not sure . . . what won't be useful or what will be very useful . . . I'd probably have at least five or six solid things now, and I would probably get upwards of twelve or something like that to get kind of an idea of where I want to go" (Ellen, demo3) (Evaluation-Search Process-Amount of Needed Sources E.SP.AS.02)	- reflects thinking about a personal process of acquiring understanding	ANZIIL 5.1. Relational 5.1.
P.A.06. "I think when I'm writing the paper, it is kind of important to know where he's coming from and . . . therefore understand why he thinks what he thinks" (Gail, demo1)	- reflects thinking about need to acquire personal understanding to complete the task	ANZIIL 5.1. Relational 5.1.

* Codes were used in data analyses to identify uniquely each instance of advanced thinking.

** Numbered information literacy elements are listed in full in Appendix 30.

Appendix 33: Advanced Thinking Referencing Creating Personal Understanding

Participants' Spoken Thoughts Referencing Personal Understanding Themes	Advanced Thinking Criteria	Information Literacy Model + Element**
P.A.07. "I wanted to know more about the details of it . . . and also how he explains it and why he thinks it's . . . a problem . . . I also sometimes find out that other people give you a little bit different . . . viewpoint of it . . . especially if they are against what he proposes . . . I always found I need to understand what he's about in his viewpoint and then write it." (Gail, interview1)	- reflects thinking about need to acquire personal understanding to complete the task	ANZIIL 5.1.1. Relational 5.1.
P.A.08. "lots of people talk about Aristotle, so he seems to be key...and . . . I know Aristotle and Galileo, but I'm not too sure about . . . the times that they...lived, or who they were influenced by, or who they themselves influenced. So . . . by reading this I . . . know that I have to go back to my textbook and figure it out first" (Gail, demo2)	- reflects on an identified gap in personal understanding needing to be addressed	ANZIIL 1.3.1. Relational 5.1.
P.A.09. "it's kind of interesting for me that usually if I don't know anything, and I'm not familiar with the databases that I think, oh I'm not able to find anything. And here it's like easy, I find lots of things . . . I think searching is also part knowing what you're searching" (Gail, interview3)	- reflects recognition of the influence of domain knowledge on gaps in understanding	ANZIIL 5.1.3. Relational 5.1.
P.A.10. "the knowledge that the background information will . . . be really important but it probably won't factor into the body of my essay as much as the specific quotes that I'll use . . . from the articles . . . But in order to understand the text properly, I think they're just as important" (Isabel, interview3)	- references judgement of the role that particular sources will play in acquiring understanding to complete the task	ANZIIL 5.1.3. Relational 5.1.
<u>Create Understanding</u>		
P.C.01. "It doesn't look like there is anything about [topic] so I'm going to have to use theories of serious leisure to kind of forge my own path . . . I hoped to actually find some . . . articles specifically on [topic] so that was a little bit disappointing, but on the other side, the fact that there's a gap in the knowledge, is really exciting to me, because . . . I understand as an undergraduate, I'm not going to fill that gap, but it . . . gives me an opportunity to kind of look at things that haven't really been looked at very much before, and that's very exciting." (Annette, interview1)	- reflects thinking about the need to create new understanding	ANZIIL 5.1.4. Relational 5.1. Relational 6.1.
P.C.02. "we don't actually have an assignment specifically where I think I'm going to use this, but it is my research interest, and it is what I want to do my Masters on, so I'm trying to . . . do some research on this so I can talk to my sociology of religions prof about how else I can . . . use this in the future" (Annette, interview2)	- articulates the motivation for undertaking personally initiated research on a topic of deep personal interest	Relational 5.3. Relational 6.1.
P.C.03. "It's for a 4th year course in classical social theory, and we have to compare two of the theorists that we've been talking about . . . what we think their views would be on a current event. And so the current event that I've chosen is the [topic] controversy, and I'm going to argue that from Weber's view we can look at it using disenchantment or from Durkheim's view we can look at . . . the controversy stemming from contrasting views of what is sacred. . . . as soon as I thought of the topic, I was pretty married to it" (Annette, interview3)	- expresses insightful ideas on arguments to make in creating personal understanding on a topic of interest	Relational 5.3.

Appendix 33: Advanced Thinking Referencing Creating Personal Understanding

Participants' Spoken Thoughts Referencing Personal Understanding Themes	Advanced Thinking Criteria	Information Literacy Model + Element**
P.C.04. "I'm trying to explain why some [population group members] will commit and invest resources for long term relationships and other [population group members] . . . prefer short . . . term . . . strategies. . . it's going to be a two by two group . . . we'll end up . . . showing [subjects the treatment stimuli] . . . and then we give them risk taking tasks [in treatment and nontreatment domains]" (Carol, interview2)	- references a complex plan for conducting an experiment to create new understanding	ANZIIL 5.1.5. Relational 6.3.
P.C.05. "basically I need to determine my own classification parameters or what . . . I want to do and what I want to fit . . . into them, and how many I guess" (Ellen, demo1)	- references awareness that the task requires defining appropriate parameters for creating new understanding	ANZIIL 5.1. Relational 5.3.
P.C.06. "I think it's part of the assignment to . . . formulate how we want to do this, and . . . to then be able to . . . explain why we chose maybe a certain way . . . really the only guidelines we're to look at, local, national, and global ramifications . . . so aside from that I've never heard of any advocacy plan before and I'm just kind of trying to make up what that means. I think that's kind of part of the assignment I would think, I'm hoping actually." (Ellen, interview3)	- references awareness of the need to create a personal understanding of the task parameters associated with the search topic	ANZIIL 5.1.3. Relational 5.3.
P.C.07. "I'm not too interested in what they actually did. I'm more interested in—I think for my paper—like kind of how it came all about, what kind of influence it had . . . The cultural meaning of the scientific revolution – that is something . . . I think what I would like to write about" (Gail, demo2)	- articulates a personal goal for creating personal understanding on a research topic of interest	Relational 5.3.
P.C.08. "brain development . . . And I think resulting from that, if you know that something is bad for your brain don't do it. But also look how . . . if you have babies that their mom either smoked or drank alcohol . . . there's a lot of known already, but after . . . these babies are born, and you know how the brain works, what could you do to help them, to maybe recover from that or not . . . [my] broad interest is more how experience, what kind of experience it doesn't even matter. I like development just because . . . they're just a new life, you may as well get the best out of them. But even old people, how . . . experience changes your brain that is, and yourself resulting from that" (Gail, interview3)	- articulates the broad area of interest for creating personal understanding on a research topic	Relational 5.3. Relational 6.1.
P.C.09. "as kind of a beginning historian, what I often times do is look for commonly mentioned primary sources . . . I kind of just got my sniffer out for that, and I don't want to rely on their interpretation of those primary sources, but I kind of get to see which ones are the key . . . so I can look at them myself and kind of make my own evaluation" (Howard, interview1) (Strategy-Conduct Search-Review Results S.CS.RR.04)	- expresses a distinctive perspective on the importance of independent evaluation based on personal understanding	ANZIIL 5.1.2. Relational 5.3.

Appendix 33: Advanced Thinking Referencing Creating Personal Understanding

Participants' Spoken Thoughts Referencing Personal Understanding Themes	Advanced Thinking Criteria	Information Literacy Model + Element**
P.C.10. "public lynching in the South continued even up into the 19th and 20th centuries as a form of establishing racial supremacy. They're not directly related to the Ku Klux Klan. But it really has the similar . . . social motivation and when I speak of the ethic . . . I mean this is a . . . society that was really founded upon religious fundamentalism . . . However there was a specific ethic that justified those kinds of practices and just to kind of look into the historical construction of . . . that environment might also be an interesting . . . that's just kind of in the back of my mind, but I feel that I can deal with a lot of those same issues in this . . . subject search" (Howard, interview2)	- articulates sophisticated ideas on how two concepts (lynching and ethics) could be investigated to create personal understanding of a historical time period	Relational 5.3.
P.C.11. "what I want to explore is how that one church father . . . really influenced the scope of Western civilization throughout the Middle Ages through that one theory of just war . . . he's really on the boundary between . . . the Roman period and the Middle Ages. And I would make the argument that even if you don't consider him to be a medieval writer, his writing was enormously influential in the Middle Ages . . . that was my logic behind that anyway . . . I just love church history and everything else so, it's a subject I'm passionate about" (Howard, interview3)	- articulates sophisticated ideas on how personal understanding can be explored about a topic of deep personal interest	Relational 5.3.
<u>Perform Quick Look-Up</u>		
P.P.01. "I don't know the dates of World War I, which is kind of sad, so I'm just going to go to Google real fast, and check that out" (Bonnie, demo2)	- specifies reason for search action	ANZIIL 1.4.3. Relational 2.1.
P.P.02. "I would like to know a little bit more about exactly what [concept] means. I think it is somebody who thinks that . . . the mind is just a machine, or maybe just the opposite. So I'm just going to look to dictionary.com" (Gail, demo1)	- specifies reason for search action	ANZIIL 1.4.3. Relational 2.1.
P.P.03. "[Using Internet sources] is . . . helpful . . . just really quickly to sometimes explain a word, or to . . . look it up in Google . . . [or] Dictionary.com" (Gail, interview1)	- specifies reason for search action	ANZIIL 1.4.3. Relational 2.1.
P.P.04. "Asphyxia—I don't even know what it is . . . Hmm, don't think I really want to go that way" (Gail, demo3)	- specifies reason for search action	ANZIIL 1.4.3. Relational 2.1.
<u>Understand Instructor's Goals for Creating Understanding</u>		
P.U.01. "This professor . . . doesn't focus a lot on resources or using other people's . . . ideas. Mostly he just wants you to show that you understand the theorists, so I don't need a lot of research...a lot of citations. (Annette, interview3)	- references sophisticated understanding of instructor's pedagogical goals	Relational 5.1.
P.U.02 "I think [the professor] just wants to see . . . how much we've learned and how much we can apply . . . the topics we've been talking about to actual instances of racism in our world. . . . I never thought of it as much in those terms earlier. . . I think that was his point actually, because I don't think he thinks many people think of racism in this way." (Bonnie, interview3)	- references sophisticated understanding of instructor's pedagogical goals	Relational 6.1.

Appendix 33: Advanced Thinking Referencing Creating Personal Understanding

Participants' Spoken Thoughts Referencing Personal Understanding Themes	Advanced Thinking Criteria	Information Literacy Model + Element**
P.U.03. "the whole . . . story behind [this research paper] is that next year I'm going to start my masters in the lab. And I'm right now in another lab, so just to learn what . . . their techniques are, that I'm more familiar to learn them already. . . . And I think also [the professor] said, well you've done . . . hands on stuff, but it's also important that you know how to write, and I would like to see how you write" (Gail, interview3)	- references sophisticated understanding of instructor's pedagogical goals	Relational 5.4
P.U.04. "the purpose of this class really is to engage in . . . historical practice, because that's what historians do, is they submit works to be reviewed et cetera and that's really how this course has been kind of designed . . . it's an introduction into . . . more of the . . . loops of the discipline" (Howard, interview2)	- references sophisticated understanding of instructor's pedagogical goals	Relational 6.1.
P.U.05. "we're supposed to take a primary source for our sources . . . and . . . set it within its historical context and make an argument . . . outlining its significance and its impact generally upon the Middle Ages. But also to say specifically . . . why would this be considered . . . an influential work within that period of time. . . It's only a seven page paper . . . and I think . . . this could be a lot more than that . . . but I think . . . that's all the professor is looking for . . . because it's a second year course. . . . the expectations are not as high" (Howard, interview3)	- references sophisticated understanding of instructor's pedagogical goals	Relational 6.1.
P.U.06. "I still found some things. You know they're maybe not really perfect sources, but for the assignment . . . I'm not super concerned because I've written papers for [the professor] in the past, where he . . . doesn't like it when people rely too heavily on secondary sources. So it's almost better sometimes to not use them for this particular prof just because he wants your own reading of the play" (Isabel, interview1)	- references sophisticated understanding of instructor's pedagogical goals	Relational 6.1.

Appendix 34: 'Domain Expert' Qualities in Advanced Thinking

Instance of Advanced Thinking	Principled	Conceptual	External	Internal ⁶²
E.RT.C.G.JW.06. "I'm looking for . . . recognized journal titles and . . . recent scholarship as well . . . that's kind of the ideal for some of these things" (Howard, demo3)	U		U	
E.RT.C.R.RA.01. "the author of this one is . . . <i>the</i> researcher on [subject], at least in Canada . . . he's coming to teach my class so...I know that . . . he's a really good resource and I know that my prof really likes him so anything by him might be useful." (Annette, demo1)	U		U	
E.RT.C.R.RA.05. "I'm just gonna grab this one from [author] because . . . our professor has actually given us some material to read from [author] already so that indicates to me that that is a...reputable scholar and I definitely want to take a look at that...work" (Howard, demo1)	U		U	
P.U.03. "the whole . . . story behind [this research paper] is that next year I'm going to start my masters in the lab. And I'm right now in another lab, so just to learn what . . . their techniques are, that I'm more familiar to learn them already. . . . And I think also [the professor] said, well you've done . . . hands on stuff, but it's also important that you know how to write, and I would like to see how you write" (Gail, interview3)	U		U	
P.U.04. "the purpose of this class really is to engage in . . . historical practice, because that's what historians do, is they submit works to be reviewed et cetera and that's really how this course has been kind of designed . . . it's an introduction into . . . more of the . . . loops of the discipline" (Howard, interview2)	U		U	
P.U.05. "we're supposed to take a primary source for our sources . . . and . . . set it within its historical context and make an argument . . . outlining its significance and its impact generally upon the Middle Ages. But also to say specifically . . . why would this be considered . . . an influential work within that period of time. . . It's only a seven page paper . . . and I think . . . this could be a lot more than that . . . but I think . . . that's all the professor is looking for . . . because it's a second year course. . . . the expectations are not as high" (Howard, interview3)	U		U	

⁶² Aspects of factors differentiating instances of advanced thinking in general from those containing domain expert-like qualities:

Principled = involving scholarly criteria, domain knowledge, good research practices or other standards or domain based markers of quality

Conceptual = involving ideas, viewpoints, theory, the knowledge base, or domain-specific terminology or concepts

External = search or task aspects focused on or controlled by individuals or groups other than the study participants

Internal = search or task aspects focused on or controlled by participants independently, including thinking about their own thinking, intuition, affinities, understanding, or lack thereof

Appendix 34: 'Domain Expert' Qualities in Advanced Thinking

Instance of Advanced Thinking	Principled	Conceptual	External	Internal
E.RT.A.CI.03. "I did it [stopped retaining abstracts while saving citations to relevant articles] because if it's too big and I print it off I kind of get lost . . . I have a tendency to have lots of information and then I have no clue on what's going on . . . in my first year, I think I printed all papers I thought was useful, so I kind of learned not to do that anymore." (Gail, interview3)	U			U
E.RT.C.G.JW.02. "if I've never heard about a journal, I'm a little more skeptical of it, because generally if you hear about a journal and it's really, really well cited . . . it just tends to be reputable . . . I'll see what kind of articles they publish, and then I'll make a real decision . . . I look at the way it's written, I look at the conclusions they draw from the research and whether the conclusions are actually supported by the research" (Carol, interview2)	U			U
E.RT.C.G.JW.03. "I like to initially . . . look at the website . . . to see if I can decipher some level of accountability, whether it's a university based website, or a publisher's web site . . . as opposed to just some one single person's . . . information " (Ellen, interview1)	U			U
E.RT.C.NR.02. "Let's just see how many I get. Yeah, almost 4,000. That's...way too much . . . I'm not even gonna look at these. If there's 4,000 of them, most of them are going to be completely unrelated to what I need." (Annette, demo1)	U			U
E.RT.C.R.RM.01. "I look at the way it's written, I look at the conclusions they draw from the research and whether the conclusions are actually supported by the research . . . it's a big problem, especially in behavioural psychology. People want to generalize more than they should with the research, because you can't generalize to the population from a sample of even two hundred people. You can support a theory but you can't generalize the results, a big mistake." (Carol, interview2)	U			U
E.RT.C.TW.CW.01. "most people title their paper in a catchy way so . . . it kind of takes my attention, but I'd rather have something that exactly tells . . . what it's going to be about rather than like for example, a paper about the prefrontal cortex, you can call it 'The prefrontal cortex in relation to brain plasticity and experience' or you can call it 'Can you teach a dog new tricks?'. I guess most people would say the dog one was . . . kind of different, but I prefer this [the latter]" (Gail, demo1)	U			U

Appendix 34: 'Domain Expert' Qualities in Advanced Thinking

Instance of Advanced Thinking	Principled	Conceptual	External	Internal
E.RT.C.U.01. "it looked like a paper for students . . . it was . . . to the point . . . actually like a student was telling me about it, rather than someone in college . . . for the other papers I had a hard time, like I read a few lines and then I kind of perused it in my mind. . . . [it had a] high level of understandability but it still had quality . . . it wasn't like philosophy for dummies . . . it was . . . kind of a cross between those two. It was short and I assume it was important." (Gail, interview1)	U			U
P.C.04. "I'm trying to explain why some [population group members] will commit and invest resources for long term relationships and other [population group members] . . . prefer short . . . term . . . strategies. . . it's going to be a two by two group . . . we'll end up . . . showing [subjects the treatment stimuli] . . . and then we give them risk taking tasks [in treatment and nontreatment domains]" (Carol, interview2)	U			U
P.C.06. "I think it's part of the assignment to . . . formulate how we want to do this, and . . . to then be able to . . . explain why we chose maybe a certain way . . . really the only guidelines we're to look at, local, national, and global ramifications . . . so aside from that I've never heard of any advocacy plan before and I'm just kind of trying to make up what that means. I think that's kind of part of the assignment I would think, I'm hoping actually." (Ellen, interview3)	U			U
S.CS.RR.04. "as kind of a beginning historian, what I often times do is look for commonly mentioned primary sources . . . I kind of just got my sniffer out for that, and I don't want to rely on their interpretation of those primary sources, but I kind of get to see which ones are the key . . . so I can look at them myself and kind of make my own evaluation" (Howard, interview1) (Personal Understanding-Create Understanding P.C.09)	U		U	U
P.U.01. "This professor . . . doesn't focus a lot on resources or using other people's . . . ideas. Mostly he just wants you to show that you understand the theorists, so I don't need a lot of research...a lot of citations. (Annette, interview3)		U	U	
P.U.02 "I think [the professor] just wants to see . . . how much we've learned and how much we can apply . . . the topics we've been talking about to actual instances of racism in our world. . . . I never thought of it as much in those terms earlier. . . I think that was his point actually, because I don't think he thinks many people think of racism in this way." (Bonnie, interview3)		U	U	

Appendix 34: 'Domain Expert' Qualities in Advanced Thinking

Instance of Advanced Thinking	Principled	Conceptual	External	Internal
S.CS.CN.03. "when I read some of those papers and I get more of a feeling for the kind of terms that the papers use. . . . research papers always use a little bit different terminology to describe something . . . and each discipline has its own little lingo . . . I'll have a better grasp of how to search for articles relating to that topic. . . . or if . . . it said something . . . pertaining to my thing, I'll just look at who they referenced and then go look up their article." (Carol, interview1)		U		U
S.CS.CN.04. "I would probably stop to get the information that I have . . . and then...just have to do some . . . step-aside thinking about different things and reading through some of these things specifically to see . . . where I want to go next." (Ellen, demo1)		U		U
S.CS.CR.04. "I find that when I'm doing some of my searches . . . as a general trend that I . . . tend to stick to one . . . method . . . whether it be Internet or whether it be the databases, and I find myself really focused on the one. . . . I think it's a little bit to keep myself focused in a way, so I can . . . discriminate between different searches and different kinds of things that I'll be finding." (Ellen, interview3)		U		U
S.CS.CT.04. "This one looks particularly interesting . . . because it has selected articles, and usually . . . a book such as that indicates . . . there'll be a lot of different . . . significant subjects . . . And sometimes reading one of the compelling articles might give me an idea to a subject that is . . . interesting, or something where there's debate over issues, which . . . makes for an interesting history paper." (Howard, demo1) (Evaluation-Criteria-Distinctive Ideas E.RT.C.DI.05)		U		U
S.CS.RR.01. "I found it easier to . . . feel more natural with the subject searching when I had the writing, because that's just the normal . . . process that I go through. So, for myself that, I think it helped a lot of other things, and it helped me to voice some of the things better that I was thinking, because if it was really important then I was writing it" (Ellen, interview3)		U		U
E.RT.C.DQ.03. "Kind of trying to see where this is from because it doesn't look too bad . . . think it's just written by some students, almost, but...I definitely . . . would read it . . . This is . . . surprisingly useful, I think ...And also because it's kind of written by students, I think they . . . talk kind of the core things . . . so...I am gonna keep this" (Gail, demo1)		U		U

Appendix 34: 'Domain Expert' Qualities in Advanced Thinking

Instance of Advanced Thinking	Principled	Conceptual	External	Internal
E.RT.C.G.T.01. "That could be interesting. . . I'm interested in the concept of choice. I could probably work that into my paper." (Annette, demo1)		U		U
E.RT.C.KC.01. "I looked for the word community a lot . . . And a lot of them did have community, or network . . . if it mentioned certain groups that . . . I know . . . And I know certain terms like social capital, virtual social capital is related to . . . community formation online, so I knew that that would be something useful as well" (Annette, interview2)		U		U
E.RT.C.PB.02. "I might be able to get my hands on one of those [edited works]. . . and that might be a good . . . source as well. The disadvantage . . . is that the very fact that they're included within a compilation is interpretation in and of itself, through the editor. So that is something when you're researching you have to be careful of, because you don't know what they've neglected or what they've included, if it's promoting some kind of a specific angle . . . on the subject" (Howard, interview2)		U		U
E.RT.C.PI.01. "oh, yeah, of course I'll be interested in something like that – talking about art and, other things that are kind of interesting to me. . . . so now I'm not sure if I'm interested in it because it seems applicable or just because there's been some words in here that...have enticed me." (Ellen, demo3)		U		U
E.RT.C.R.DT.07. "it says about gay men, and this [task] is supposed to be a subject of women so I'm going to avoid that article . . . but I still feel . . . [it] might be useful. I'm going to look at it anyways . . . because . . . the rest of the title and subject matter seems to be applicable . . . Might be something worth considering even if . . . it's maybe not exactly what . . . my professor is interested in." (Ellen, demo3)		U		U
E.RT.C.R.GT.11. "I think this article's maybe playing upon...the notion of [heroine] as a pure woman because it was written in the Victorian times. . . . she's not technically pure...so this might have something good...in terms of how women are perceived" (Isabel, interview3)		U		U
E.RT.C.R.IS.01. "I'm just going to go over all the titles and see if there's anything that...may signal to me that there's some sort of racist meaning in the article. Usually something to do with immigrants works out really well." (Bonnie, demo3) (Evaluation-Results-Criteria-Distinctive Ideas E.RT.C.DI.01)		U		U

Appendix 34: 'Domain Expert' Qualities in Advanced Thinking

Instance of Advanced Thinking	Principled	Conceptual	External	Internal
E.RT.C.R.IS.03. "I don't know how to explain why it's good . . . it's kind of an intuitive connection that I know of, it's just...from all the reading that I've done." (Carol, interview3)		U		U
P.C.01. "It doesn't look like there is anything about [topic] so I'm going to have to use theories of serious leisure to kind of forge my own path . . . I hoped to actually find some . . . articles specifically on [topic] so that was a little bit disappointing, but on the other side, the fact that there's a gap in the knowledge, is really exciting to me, because . . . I understand as an undergraduate, I'm not going to fill that gap, but it . . . gives me an opportunity to kind of look at things that haven't really been looked at very much before, and that's very exciting." (Annette, interview1)		U		U
P.C.02. "we don't actually have an assignment specifically where I think I'm going to use this, but it is my research interest, and it is what I want to do my Masters on, so I'm trying to . . . do some research on this so I can talk to my sociology of religions prof about how else I can . . . use this in the future" (Annette, interview2)		U		U
P.C.03. "It's for a 4th year course in classical social theory, and we have to compare two of the theorists that we've been talking about . . . what we think their views would be on a current event. And so the current event that I've chosen is the [topic] controversy, and I'm going to argue that from Weber's view we can look at it using disenchantment or from Durkheim's view we can look at . . . the controversy stemming from contrasting views of what is sacred. . . . as soon as I thought of the topic, I was pretty married to it" (Annette, interview3)		U		U
P.C.05. "basically I need to determine my own classification parameters or what . . . I want to do and what I want to fit ... into them, and how many I guess" (Ellen, demo1)		U		U
P.C.10. "public lynching in the South continued even up into the 19th and 20th centuries as a form of establishing racial supremacy. They're not directly related to the Ku Klux Klan. But it really has the similar . . . social motivation and when I speak of the ethic . . . I mean this is a . . . society that was really founded upon religious fundamentalism . . . However there was a specific ethic that justified those kinds of practices and just to kind of look into the historical construction of . . . that environment might also be an interesting . . . that's just kind of in the back of my mind, but I feel that I can deal with a lot of those same issues in this . . . subject search" (Howard, interview2)		U		U

Appendix 34: 'Domain Expert' Qualities in Advanced Thinking

Instance of Advanced Thinking	Principled	Conceptual	External	Internal
P.C.11. "what I want to explore is how that one church father . . . really influenced the scope of Western civilization throughout the Middle Ages through that one theory of just war . . . he's really on the boundary between . . . the Roman period and the Middle Ages. And I would make the argument that even if you don't consider him to be a medieval writer, his writing was enormously influential in the Middle Ages . . . that was my logic behind that anyway . . . I just love church history and everything else so, it's a subject I'm passionate about" (Howard, interview3)		U		U
P.U.06. "I still found some things. You know they're maybe not really perfect sources, but for the assignment . . . I'm not super concerned because I've written papers for [the professor] in the past, where he . . . doesn't like it when people rely too heavily on secondary sources. So it's almost better sometimes to not use them for this particular prof just because he wants your own reading of the play" (Isabel, interview1)		U	U	U
E.RT.C.RC.05. "I like to look for contemporary sources, that's a huge criteria. The big exception to that is if there is really a ground breaking author in an earlier period of time who represents a school of thought . . . I'll usually try to hit upon some of those . . . older sources that really were significant for a certain period of time in shaping a particular view." (Howard, interview2)	U	U	U	
P.A.01.* "Ok, so I'm seeing that [author] is probably not only a Canadian major player, he seems to be the major player in leisure sociology. So I will have to definitely get a few of his...articles or books and really . . . get into his theory, because he seems to be the big one." (Annette, demo1)	U	U	U	
S.CS.IM.04. "if I find . . . an article that I really like . . . I will look for critiques . . . of that . . . author's arguments, to see if there's holes within the argument or scholarship . . . that I . . . just don't pick up. And so I just kind of try to counterbalance my arguments and my sources as best I can that way, especially if I'm gonna rely heavily upon one of the sources" (Howard, demo1)	U	U	U	U
S.CS.CT.06. "I try to find . . . subjects a) that are interesting to me, and b) something that potentially is contentious . . . I want availability of primary sources. . . . And I just kinda try to narrow it down as I go so . . . the subject and the material lines up as closely as possible with the requirements of the assignment." (Howard, interview1)	U	U	U	U