Information Literacy
A Study of Freshman Students' Perceptions, with Recommendations

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Abstract

The research problem for this study is focused on the need to know how students acquire and use information. Research indicates a lack of understanding of what students know about information and how they use information and this study used the Information Literacy Competency Standards for Higher Education (Appendix A) as the basis for acquiring a better understanding of what kind of information freshman students at Virginia Tech need and how they acquire it during their first semester at college. Students were asked questions about their information use during fall semester 2000, using both email questioning and in face-to-face interviews. The data collected was used to develop insights into how students acquire and use information and resulted in suggestions that could be used in revising and improving instruction for freshman students that is provided by the University Libraries at Virginia Tech.

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Chapter 1 - Introduction and Review of Literature

INTRODUCTION

In Gateway of Opportunity: Toward the Model Land-Grant University of the New Millennium (Academic Agenda Accomplishments 1998-99, Revised Implementation Plan 1999-00) (Virginia Tech, 1999) the University Libraries at Virginia Tech are charged with ensuring "that the university library supports learning, teaching, research, and outreach by providing access to information resources and services regardless of location or format of materials" (p. 59). A component of that charge is Task 3.1f.2:

> Working with the University Library Committee, develop a library plan to ensure that students are provided with opportunities to acquire the information management skills needed to support their learning needs at Virginia Tech and those they will encounter afterwards as they participate in their professional, social, and cultural environments (p. 59).

To meet this challenge, Eileen Hitchingham, Dean of University Libraries at Virginia Tech, created a new position, Director of Instruction, in August 1999, and appointed me to fill the position. In this position I am, during a three-year period, supposed to address the charge identified in Task 3.1f.2.

A fundamental component of addressing this charge is creating library instruction that will meet student needs for "information management skills" that will support both their academic and lifelong learning needs. This study looks at how students get the information they need for their coursework and for meeting their general information needs, and how they use the information they find. It identifies similarities and differences in information use patterns at three times during their first semester at Virginia Tech and, where appropriate, makes suggestions that can be used in the future for designing instruction that better meets student needs.

One constraint traditionally identified by library personnel who provide instruction is the paucity of information about how incoming freshmen understand information – how they get information or how effectively they use it. This makes it difficult to design instruction that meets student needs. Few processes are in place that attempt to redress this lack of understanding. There are few "client-centered assessments"

currently taking place in academic libraries, and Iannuzzi (1999) has suggested that librarians need to "develop assessment methods that focus on performance indicators and measure outcomes of student learning" (p. 304). The University Libraries at Virginia Tech, aware of this identified need, are investigating alternative methods for assessing student learning.

REVIEW OF LITERATURE

Four topics, covered in subsequent pages, are important to this study as foundation material:

- library instruction in general;
- information literacy;
- Web-based delivery of library instruction; and
- digital discourse, defined loosely as communication that takes place in a largely electronic or digital context.

The first three topics are addressed together. Library instruction provides the foundation for the information-literacy movement, and it is necessary to look at the former in order to have a context for the latter. The review of the literature on Web-based delivery of instruction begins with a general review that then focuses on what is happening in libraries with Web-based delivery of library instruction. This is a logical trio of topics, each building on the previous one, and offering an overview of what has led libraries and librarians to where they are now in trying to teach people how to use information in an increasingly Web-based information-delivery environment.

The literature on digital discourse is presented in a separate section. It is provided as foundation material for the data collection mechanisms for this study. It is important to understand how the nature of electronic communication is different from written or face-to-face communication as I used email to gather a significant amount of my data.

Library Instruction

Introduction

A useful context for the information-literacy movement, which is an integral component of this study, is library instruction, sometimes known as bibliographic instruction. Library instruction, usually considered to have developed in the past 150

years, makes it a relative newcomer in the context of over 2,000 years of library history. Moreover, the information-literacy movement is a relative newcomer to library instruction, having largely developed during the past 25 years. The focus here is library instruction in academic libraries, with particular emphasis on library instruction in the United States.

History

Library instruction has evolved as libraries and scholarship have evolved. Leadership in the contemporary library-instruction movement has come largely from the United States, where open access to materials (open-stack libraries) necessitated teaching library users how to use finding aids.

Writing in 1982, Hernon, using primary sources, found minimal evidence of any kind of library instruction until the 1870s. There was little need for instruction when library collections were small and focused on "theology, the classics, philosophy and history" (p.33). But as collections grew, so also grew the need for instruction on how to use them. For example, Harvard College had fewer than 13,000 volumes prior to 1800; by 1876 that collection had grown to 227,650 volumes (Salony, 1995).

Once the need for assistance in using library collections had been identified, both the profession of librarianship and a specialization in library instruction began to evolve. The American Library Association was established in 1876 with Justin Winsor as its first president. Winsor "supported the belief that a librarian is an educator and is needed to bring the library and its uses to the students" (Salony, 1995, p. 34).

The last quarter of the 19th century constituted a golden era for library instruction. Not only was instruction seen as an integral component of library services, but it was also seen as a requisite component of an academic environment (Hardesty, Schmitt, & Tucker, 1986). "Historically, library instruction has focused on the undergraduate student and emphasized the development of those bibliographic skills needed to use library resources for completing class assignments" (Smith & Montanelli, 1999, p. 132). For the most part, library instruction consisted of lectures or of courses that focused on the bibliographic tools needed for research.

Library instruction lost favor during the early 20th century. Hernon (1982) surveyed 17 institutions and discovered that eight had discontinued their library instruction programs by 1903. A survey conducted by the American Library Association in 1903 determined that only eleven colleges in the United States were providing any kind of library instruction (Salony, 1995).

However, pockets of library-instruction activity continued. Librarians throughout the United States continued to recommend that students be trained in library use, arguing that increasing amounts of materials required a student to know libraries in order "to do research with ease and become a scholar" (p. 35). Students, some argued, should start receiving library instruction in elementary and high school, and library instruction should be integrated into other classes, rather than offered separately (Salony, 1995).

Factions developed. Those who felt students should be taught about "the art of books" took issue with those who felt students should become familiar with "library procedures and resources." Non-librarian faculty and librarians disagreed over whom could best deliver the instruction (Hernon, 1982, p. 29).

The 1920s saw a resurgence of the library-instruction movement. Colleges and universities began to include library instruction in new-student orientation sessions. Elective courses in library instruction became more commonplace.

In the period leading up to World War II, there was a growing emphasis on the need for instruction. In 1931, Akers reported a study showing that students did not know how to use the card catalog and other bibliographic aids. Three years later, Hurt reported that 62% of students at the University of California and at Stanford were not receiving library instruction and that 68% of them reported a need for it (Hurt, 1934).

This was also a period of increased emphasis on cooperation between other faculty and librarians, to create a connection between the curriculum and the library. They experimented with different methods of delivering instruction: lectures, tours, workbooks, and integrated instruction (Salony, 1995).

During the 1950s, significant amounts of library instruction were delivered as a result of the post-war increases in enrollment at colleges and universities, but with limited development in the field. Classes were larger but not necessarily better and conceptual

framework for programs was lacking. At the same time, some librarians simply saw no need for library instruction (Hardesty et al., 1986).

Four weaknesses contributed to a decline in library instruction during this period: librarians' inability to distinguish between orientation and instruction, instruction provided without a context of what students needed to know, instructional content based on librarians' reference training, and an insensitivity to changes taking place in higher education (Kirk, 1977). However, there is some evidence of the use of audiovisual materials to complement library instruction during the 1950s (Salony, 1995).

The 1960s were the second golden age for library instruction. A largely grassroots movement expanded variety in instruction, using whatever tools and methods librarians found available. The increasing availability of audiovisual materials to support instruction of all kinds meant that more students could receive library instruction and that librarians could include more illustrative materials in the instruction. By the late 1960s, computer-assisted instructional programs were in use at 40 universities in the United States (Wendt, 1967). Recognition grew of the need to provide instruction to all levels of students. Library instruction began to be seen as more separate from library reference, though much of the instruction taking place during this period was provided by reference librarians (Salony, 1995).

In 1971, the Association of Colleges and Research Libraries (ACRL) began the discussions that led to the establishment of what has become known as the Instruction Section of the Association of College and Research Libraries (ACRL) of the American Library Association (ALA) (Instruction Section, Association of College and Research Libraries, & American Library Association, 1999). Project LOEX (Library Orientation Exchange) was established as an "educational clearinghouse for materials used in library instruction" (¶ 1) and currently consists of over 650 member institutions around the world (Library Orientation Exchange (LOEX), 2000). Guidelines for instruction were published by ACRL in 1977 and have been updated by the addition of a Model Statement of Objectives for Academic Bibliographic Instruction adopted in 1987 (Association of College and Research Libraries & American Library Association, 1999). In addition, there was an attempt to focus on not only the tools of delivery, but also the concepts that supported those tools (Oberman, 1996).

However, many of the problems from the past still concerned instruction librarians. Methods of delivery were still being evaluated, library-faculty cooperation was still problematic, and the question of stand-alone instruction versus integrated instruction remained unresolved (Salony, 1995).

Coursework focused on the library instruction available to prospective librarians, gradually increased via schools of information and/or library science. Four graduate schools offered library-instruction coursework in the mid-1970s, marking the beginning of a perceptible increase of the "curricular commitment to the instructional role of librarians" (Westbrook, 1999, p.93).

During the 1980s critical thinking and problem-solving skills were included as a component of library instruction. This, along with the increasing use of technology in libraries, created a new landscape for library instruction. Also, the lack of evaluation in library instruction was acknowledged, and a need for better and more comprehensive evaluation of programs was identified (Bober, Poulin, & Vileno, 1995).

As an increased emphasis on accountability in all areas of higher education spilled over to library instruction, Martin and Jacobsen (1995) identify a shift in the late 1980s toward more theoretical writings on library instruction – a shift they feel reflects a discipline coming of age.

Library instruction in the 1990s has been characterized by an increasing emphasis on technologies, both as part of the problem and as part of the solution. "Technology has touched almost all facets of librarianship; organizationally the library, particularly in academic settings, has been gradually redefined as an information service, rather than an academic one…" (Oberman, 1996, p.316). This redefinition of the library as an information service inevitably has had an impact on library instruction. As outlined in the next section, the role of information literacy in library instruction has increased, largely in response to technology.

Shirato and Badics (1997) looked at trends in library instruction, comparing data collected in 1979, 1987 and 1995. Asserting that a survey done two years later would probably have identified even more technology-induced changes in library instruction, they point to evidence of the "massive impact of the Web" (p. 223) on library instruction even by 1995. There was a dramatic increase in available instructional materials for a

specific electronic tool or database, the quality of which has improved thanks in large part to desktop-publishing software programs. In 1995 there was limited use of Web pages for instruction, a point the authors say would have been different had the survey been distributed a year later. Comments from participants indicated that the impact of electronic resources on library instruction were "huge" and "overwhelming." They conclude, "…instruction librarians are scrambling to keep up with constant change" (p. 237).

Conclusions – Library Instruction

Hernon (1982) pointed out that writings about the history of library instruction show much similarity with contemporary writings about the same topic: "…they both stress the importance of knowing how to use the library, describe programs in operation at their institutions, encourage librarians to initiate library instruction at their institutions, and/or suggest programs that might serve as models" (p. 33). In other words, there is a certain sameness about all of the discussion regarding library instruction, regardless of when it has taken place.

A summary article by Rader (2000), written about her 25 years of compilations and reviews of publications in the area of library instruction and information literacy, provides a sense of how the discipline has grown. Looking just at the numbers of articles written on the subject from 1973 to 1999, it is interesting to note where increases in library-instruction literature have occurred. By type of library, the greatest increase has been in the literature for academic libraries. In addition, the total number of publications has increased dramatically. Rader reports that "[t]he field of user instruction has expanded phenomenally during the past three decades, as demonstrated by the fact that 28 publications were reviewed in 1973, the first year of these reviews, while 286 publications were reviewed in 1998, the 25th year of these reviews" (p. 290). This growth in the number of publications is indicative of the growth in interest among librarians and others working in these areas.

Looking ahead, Herrington (1998) proposed that "[l]ibrary instruction needs to focus on helping the user become more independent in locating and retrieving

information" (p. 383), providing a segue to the concepts of information literacy, a recent development in library instruction.

Information literacy posits an individual who can recognize when information is needed, and has the ability to locate, evaluate, and effectively use the needed information (Association of College and Research Libraries & American Library Association, 2000). Most interestingly, the assumed context of teaching information literacy is a library, with instruction provided by a librarian – yet the word *library* doesn't appear in any of the standards developed for either the K-12 or the higher-education environment.

The foundation for information literacy is the broader library-instruction movement, developed over more than 100 years of experimentation and implementation. Change has been forced on library instruction as a result of technological advances, and the next phase is the information-literacy phase.

What is striking in reviewing this literature is the paucity of research on library instruction. Not only is it limited in quantity, but also much of it is based on largely anecdotal information. Questions about how best to deliver library instruction have existed almost from its inception, but there is little research to support any of the different views. It has become a firmly entrenched component of, initially, library reference programs and, more recently, stand-alone library instruction programs. But those few who question the utility of library instruction probably can make almost as strong a case against library instruction as its supporters can make for it.

Information Literacy

Introduction

Focusing on information literacy, with particular emphasis on its role in higher education, is a logical next step. Included is information on its importance to librarianship, how it is being implemented in higher education settings, what kind of evaluation is taking place, and what the future directions seem to be.

Information literacy is significantly more library-based in higher education than in the K-12 setting. To some extent this is because the functions of the library media center are much more integrated into the curriculum in a K-12 environment then is the stand-alone college or university library. What this further means is that information literacy has developed much differently in higher education than in K-12 over the past decade.

As the focus of this study is higher education, developments in that setting have been reviewed more closely, though it is appropriate to acknowledge the contributions made by practitioners in the K-12 environment.

Background

Information literacy in both settings is generally defined as a set of abilities requiring individuals "to recognize when information is needed and to have the ability to locate, evaluate, and use effectively the needed information" (American Library Association, 1989, ¶ 3). However, these sets of abilities have been developed and defined in two separate, though somewhat parallel, tracks for the K-12 environment and for the higher education environment.

In the K-12 environment, there are Nine Information Literacy Standards for Student Learning (American Association School Librarians & Association for Educational Communications and Technology, 1998), divided into three sections: Information Literacy

> Standard 1: The student who is information literate accesses information efficiently and effectively.
>
> Standard 2: The student who is information literate evaluates information critically and competently.

Standard 3: The student who is information literate uses information accurately and creatively.

Independent Learning

Standard 4: The student who is an independent learner is information literate and pursues information related to personal interests.

Standard 5: The student who is an independent learner is information literate and appreciates literature and other creative expressions of information.

Standard 6: The student who is an independent learner is information literate and strives for excellence in information seeking and knowledge generation.

Social Responsibility

Standard 7: The student who contributes positively to the learning community and to society is information literate and recognizes the importance of information to a democratic society.

Standard 8: The student who contributes positively to the learning community and to society is information literate and practices ethical behavior in regard to information and information technology.

Standard 9: The student who contributes positively to the learning community and to society is information literate and participates effectively in groups to pursue and generate information (p. 8-9).

Higher education has taken a slightly different route but has arrived at much the same place with its five Information Literacy Competency Standards for Higher Education (Appendix A), which were approved by the board of the Association of College and Research Libraries in January 2000:

Standard One: The information literate student determines the nature and extent of the information needed.

Standard Two: The information literate student accesses needed information effectively and efficiently.

Standard Three: The information literate student evaluates information and its sources critically and incorporates selected information into his or her knowledge base and value system.

Standard Four: The information literate student, individually or as a member of a group, uses information effectively to accomplish a specific purpose.
Standard Five: The information literate student understands many of the economic, legal, and social issues surrounding the use of information and accesses and uses information ethically and legally.

Much of the literature on implementation of these standards in both K-12 and higher education is anecdotal, largely due to the relative newness of both sets of standards. Though the concepts have been discussed for a number of years, K-12 information-literacy programs, also frequently know as Information Power programs, have been in place for only a few years, with standards formally adopted in 1988 by the American Association of School Librarians (AASL) and Association for Educational Communications and Technology (AECT). In higher education much the same is true. The concepts have been incorporated into library-instruction programs, but the standards have only recently been approved by the agency that created them.

Development of the Definition

According to both Bruce (1997) and Behrens (1994), the term *information literacy* is generally first attributed to Zurkowski, writing in 1974: "People trained in the application of information resources to their work can be called information literates. They 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" (p. 6). He goes on to assert that, "[w]hile the population of the U.S. today is nearly 100% literate, only a small portion – perhaps one-sixth, could be characterized as information literates" (p. 7). He further states (the emphasis is his) that, "The top priority of the Commission [National Commission on Libraries and Information Science (NCLIS)] should be directed toward establishing a major national program to achieve universal information literacy by 1984" (p. 27).

Throughout the 1970s and into the mid-1980s, understanding of the term continued to evolve with input from librarians, communication experts (information science and technology) and educators. Computer literacy was becoming an increasingly familiar concept. Tied to that was the idea that a critical-thinking skill should be

associated with the technical skills required of an information-based society where the amount of information available was increasing exponentially (Behrens, 1994).

K-12 circles proceeded to evolve their own definition. A position paper entitled "Educating Students to Think: The Role of the School Library Media Program" appeared in 1985, produced jointly by the U. S. National Commission on Library and Information Science (NCLIS) and the American Association of School Librarians (AASL). It focused on the need for students to learn, use and present information appropriately (1989).

A parallel development for K-12 was the Big Six skills approach, developed by Eisenberg and Berkowitz (1988). Though the phrase *information literacy* does not appear as a fundamental concept of the Big Six Skills© (a phrase that has since been copyrighted by Eisenberg and Berkowitz), the identified components of information literacy are incorporated into this approach. The Big Six Skills© is important because it crystallizes the idea of integrating library instruction into a school's curriculum, rather than treating library instruction as a stand-alone instructional unit, taught in an instructional void.

In 1988, the American Association of School Librarians, in cooperation with the Association for Educational Communications and Technology and published Information Power: Guidelines for School Library Programs (1988b) and so began the process of formalizing information literacy in the K-12 curriculum. Included are five challenges that faced school library media specialists:

> Challenge 1: To provide intellectual and physical access to information and ideas for a diverse population whose needs are changing rapidly.
>
> Challenge 2: To ensure equity and freedom of access to information and ideas, unimpeded by social, cultural, economic, geographic, or technological constraints.
>
> Challenge 3: To promote literacy and the enjoyment of reading, viewing, and listening for people at all ages and stages of development.
>
> Challenge 4: To provide leadership and expertise in the use of information and instructional technologies.
>
> Challenge 5: To participate in networks that enhance access to resources located outside the school (p. 3-13).

Though the phrase *information literacy* does not appear in these stated challenges, the inherent concepts of information literacy are a part of the stated "Context and Implications" that are included with each of the challenges.

In addition, a symposium held in Leesburg, Virginia, in April 1989, sponsored by the U. S. National Commission on Libraries and Information Science (NCLIS) and the American Association of School Librarians (AASL), began the process of identifying how information literacy should be integrated into the educational context. Information literacy and education for the 21st century: toward an agenda for action (1989), the proceedings of the conference, provides a snapshot of how school library media specialists intended their standards to be implemented. Educators committed to incorporating information literacy into the K-12 curriculum developed an extensive list of recommendations covering teacher education, classroom instruction, school administration, education funding and school library media programs.

Developments were also taking place in higher education information literacy. In 1985 a working definition appears that seems to provide the foundation for what was to come. Martin Tessmer, at Auraria Library at the Denver campus of the University of Colorado, offered this description (as quoted by Breivik): "Information literacy is the ability to effectively access and evaluate information for a given need" (p. 723). This definition was accompanied by characteristics to be used as part of a program to ensure the information literacy of 30,000 students enrolled at the Denver campus of the University of Colorado (Breivik, 1985, p. 723).

A global and collaborative look at some challenges facing academic institutions was offered by Breivik and Gee (1989), with libraries and information literacy offered as prospective solutions. Breivik was library director at the Denver campus of the University of Colorado and Gee was president of the university; their collaboration points out the often-neglected role of libraries in educational reform and quality education. "In partnership with academic administrators and classroom faculty, librarians can enhance instruction, research, and service while supporting the eventual transformation of higher education" (p. 3). In a well-articulated attempt to cure several of the perceived ills of academe in a newly evolving information society, they offered a new definition of

literacy by proposing an information-literacy goal of graduating students who are effective consumers of information.

A report issued in 1989 by the American Library Association's Presidential Committee on Information Literacy (1989) provided a capstone for information-literacy efforts. "The report emphasized the importance of achieving information literacy and stressed that it could be achieved only by means of a new model of resource-based learning" (Behrens, 1994, p.315). The report, widely distributed and discussed, resulted in a definition of information literacy that is perhaps the most widely accepted in higher education circle:

> To be information literate, a person must be able to recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information. Producing such a citizenry will require that schools and colleges appreciate and integrate the concept of information literacy into their learning programs and that they play a leadership role in equipping individuals and institutions to take advantage of the opportunities inherent within the information society. Ultimately, information literate people are those who have learned how to learn. They know how to learn because they know how knowledge is organized, how to find information, and how to use information in such a way that others can learn from them. They are people prepared for lifelong learning, because they can always find the information needed for any task or decision at hand (American Library Association, 1989, ¶ 3).

This is frequently abbreviated to a one-sentence statement: Information literacy is a set of abilities requiring individuals "to recognize when information is needed and to have the ability to locate, evaluate, and use effectively the needed information" (American Library Association, 1989, ¶ 3).

As a result of these developments, 1989 stands out as the apparent beginning of the implementation phase of information-literacy programs and standards. Though the AASL/AECT standards for K-12 (1998) were not adopted until 1998, and the ALA/ACRL standards for higher education even more recently, the process of defining and refining the term seemed at an end. Two sets of definitions and standards had been developed, to be promoted to educators and educational administrators at all levels. Both

ensured a shift away from library-centric instruction toward a more global focus emphasizing lifelong information literacy skills.

Two national organizations have been created to address information literacy concerns. The National Forum on Information Literacy (NFIL) (1999) was founded in 1990, as a response to the recommendations that were in the ALA Presidential Committee Final Report. NFIL is a coalition of education, business, and governmental organizations who are working to promote awareness of the need for information literacy and who are encouraging activities leading to the adoption of the information literacy tenets. The mission of the organization and its members is to promote information literacy nationally, internationally, and within the member organizations – with no particular emphasis on educational levels. The Institute for Information Literacy (formerly the National Information Literacy Institute), established by the American Library Association in 1998, is intended to play a "leadership role in assisting individuals and institutions in integrating information literacy throughout the full spectrum of the education process" (p. 703). The focus of the institute is on providing "educational opportunities for librarians …[and] educational administrators and faculty" in the area of information literacy" (Oberman, 1998, p. 703).

The focus of this study is on information-literacy developments in higher education. In addition, the focus is largely on developments that have occurred in the United States, though the topic is of international interest.

Information Literacy in the 1990s: higher education implementation

Progress in implementation has been surprisingly slow during the decade since the American Library Association's Presidential Committee on Information Literacy issued the report. It has taken over ten years for the standards that came from that report to be reviewed and evaluated, and the Association of College and Research Libraries (ACRL) of the American Library Association (ALA) has only recently adopted them. During that time the higher education information literacy literature seems to fall roughly into several categories: why-to, how-to, assessment and evaluation, and update and future projection.

Reasons for adopting information literacy

One pressing reason to teach information-literacy skills is that accrediting agencies require it. According to criteria from the Southern Association of Colleges and Schools (SACS) (2000), “Libraries and learning resource centers should provide point-of-use instruction, personal assistance in conducting library research, and traditional reference services. This should be consistent with the goal of helping students develop information literacy – the ability to locate, evaluate, and use information to become independent life-long learners” (¶ 7).

A report of information-literacy programs of institutions in the Middle States Association of Colleges and Schools (MSACS) indicates that these institutions lead the nation in incorporating various aspects of information literacy into their curricula. Among the 259 of 830 institutions of higher education that responded to an information-literacy survey, 31 percent had some kind of information-literacy program at their institution. In addition, 38 percent indicated that they had in place some kind of faculty and staff support program for information-literacy programs, and 19 percent had developed some mechanism for formal assessment of information-literacy skills (Ratteray & Simmons, 1995).

There is also a sense that a higher education institution should have as part of its mission the teaching of life-long learning skills, particularly in the context of an information society, and that one place those skills may be taught is through the library (Marchionini, 1999). This is paralleled by research that discusses the information needs of employers, needs that can be met by prospective employees who have acquired information literacy skills. “In order for the new information infrastructure to aid development by the people, for the people and of the people, it seems imperative that people’s capacities are developed to ensure that they can participate in shaping the development of the global information society” (Karelse, 1999, p. 11).

Developing students’ critical-thinking skills is also cited as a reason to teach information-literacy skills. Gibson (1995) ties critical-thinking theory to library instruction, presenting ideas on its impact and potential impact of librarians. He answers hypothetical questions regarding the teaching of critical thinking skills by librarians but concludes that “[w]hen librarians become critical thinkers and demonstrate critical

thinking abilities and traits, interactions with students reached through instruction programs will become more reflective and oriented toward critical thinking" (p. 33).

Oberman (1995) likens the availability of large amounts of information in an electronic environment to the availability of large numbers of consumables at a grocery store. With the large amounts of information, as with consumables, comes the need to make considered choices and decisions. She reviews studies pointing out that "the most basic critical thinking skills required for matching subject relevance with appropriate sources of information are sorely missing in the vast majority of undergraduates" (p. 109). Using electronic information sources effectively "demand[s] significant critical thinking skills on the part of the user" (p. 112). She goes on to state, "[t]he cognitive skills of analysis, synthesis, and evaluation are no where more obviously needed then when students encounter the online information environment" (p. 113). A prospective solution proffered by Oberman is a shift to an active learning/teaching methodology that "offers an opportunity for students to discover the concepts that that they will need to operate in an information-rich environment" (p. 114).

As distance education expands, there is a need to ensure that students taking advantage of these kinds of offerings have the necessary information-retrieval skills to support their academic endeavors. Research at Governors State University (GSU) in Illinois shows that these frequently non-traditional students indicated a desire for mandatory library instruction, and that the skills they had learned were transferable to other settings (Leverence, 1997). User demographics also indicate an increase in the number of students for whom English is not the primary language. Changing demographics, including the increase in distance-education students, are given as reasons for reviewing the goals of a bibliographic-instruction program (Holland, 1997).

Helping students develop life-long learning skills is also presented as a reason for implementing an information literacy program. At the U. S. Coast Guard Academy, such a library program was seen as a way to promote some of the Academic Division's desired outcomes, several of which address life-long learning skills (Daragan & Stevens, 1996).

It can also be argued that libraries have a responsibility to teach students how to effectively use available information technologies, and that information-literacy programs that incorporate hardware and software components go far in supporting an

educational mission of computer literacy, particularly if the parent institution is technologically advanced. The skills that librarians bring to this kind of instruction argue for their inclusion in instructional-technology support programs. The information-management skills, incorporated with technology-use skills, go far in supporting information-literacy goals (Koltay, 1996).

A recent study from the University of California – Berkeley makes a strong case for continuing to teach information literacy skills. During the past seven years, students have been surveyed regarding their information literacy skills. Maughan (2001) reports, "…students think they know more about accessing information and conducting library research than they are able to demonstrate when put to the test" (p. 83). She goes on to say, "…the UC-Berkeley experience confirms that students continue to be confused by elementary conventions for organizing and accessing information" (p. 83).

In contrast to the "why to" literature is the "why not to" literature. A number of short quotes from a variety of sources present a view of information literacy as one of a string of reactionary crusades in which librarians have engaged. Perhaps the strongest statement from this collection is that "librarians do not consider information literacy in relationship to the larger theoretical issues that encircle the notion of literacy or acknowledge that literacy is a contested term in other scholarly discussions. They propose new literacy without clarifying its relationship to other literacy theories" (Strege, 1997, p. 20).

The debate also addresses the lack of cohesion, both inside and outside the profession, regarding the term information literacy. The disagreement focuses both on the term itself and on the definitions of the term: "The authors recommend embracing the term *information literacy*, using it carefully and with clarity" (p. 13). Reasons given are that it is a learner-focused term and preferable to coming up with and promulgating a new alternative. But included is a caution that librarians must not let information literacy be old library instruction with a new name (Snavely & Cooper, 1997).

Implementation of information literacy guidelines

These materials tend to be reports of how a specific institution has elected to provide information-literacy instruction. Several approaches are presented: incorporating

the instruction into existing courses or curricula, linking instruction to students' level of development, and creating completely new information-literacy courses. Frequently, however, the approach is hybridized to include a teaching session in the library, plus integrated components.

Integration of information-literacy components into existing courses is a fairly common method of implementation. Earlham College has a well-known integrated program in existence for a number of years in which librarians and faculty members working together in curriculum development. Though it has encountered some implementation setbacks due to budget constraints, Cleveland State University requires each faculty member who proposes a course for areas within the basic curriculum to answer questions on how that course will address issues of information literacy within the field (Rader, 1995).

Discussions of faculty-librarian partnerships appear throughout the literature. Kotter (1999), in a comprehensive review of the literature on faculty-library relations, points out the benefits of such relationships, argues that a method for evaluating the relationships needs to be established and suggests that improved relationships would benefit both populations. From the viewpoint of information-literacy instruction, he points out that this kind of partnership offers the possibility of improved instructional design, classroom instruction, and curriculum development.

The role of the librarian in faculty-development efforts is demonstrated by Florida International University's Model for Information Literacy, which is touted as a template for establishing campus partnerships throughout the university. Iannuzzi (1998) argues that librarians should participate in faculty development programs on their campuses, thus developing relationships with faculty members that will lead to implementation of successful information literacy initiatives.

California State University library faculty and education faculty collaborated on a program that developed instruction strategies to ensure that education students were prepared to use resources through their academic careers (Nesbitt, 1997). Using an *Electronic Information Survey*, information was collected which was then "used in planning, developing and designing instructional strategies" (p. 8). The program that was

developed, though specific to education students and faculty, had transferability to other academic units at the University.

The Coast Guard Academy (CGA) program, mentioned earlier, looks at ways to determine levels of students' cognitive development and to then develop instruction that matches those levels. By interpreting levels of developmental models, librarians at the CGA developed a tiered approach to information literacy, the first year of which culminated in a research paper completed during the second semester of chemistry. Though the article (Daragan & Stevens, 1996) talks only about implementation for two consecutive years of freshman students, there is evidence that this kind of program has the potential to be successful in building skills, particularly with a population as homogeneous as that of the CGA, where there is no flexibility in the courses students take during their freshman year.

A program at Arizona State University (ASU) reports relying heavily on Kuhlthau's research on the information search process (ISP), which has been incorporated into a one-hour credit-bearing course created as a component of a writing certificate program (Isbell & Kammerlocher, 1998). It is the first required library/research skills class offered at ASU and was first taught in fall 1997. Early findings indicate that this model, which is creative and learner-centered, has been successful and has blurred the lines between the research process and the writing process, more fully integrating the instruction into the curriculum.

At Millersville University in Pennsylvania, a completely new course was created. A two-week graduate course on information literacy was developed, team-taught by a librarian and faculty member, intended for teachers and librarians in elementary and secondary schools. The course, entitled *Information Literacy: Creating Active Learners*, was first taught during the 1994-95 academic year. Warmkessel and McCade (1997) describe as "constructivist-cognitive" methodologies used for instruction and evaluation (p. 81).

A related concern is the question of where librarians learn teaching skills. Leadley (1998) refers to this as the "plight" of the instruction librarian: "This individual often receives little or no formal preparation for the responsibilities of teaching, has few opportunities for continuing education, struggles to balance teaching with his or her other

responsibilities (reference, collection development, supervision)…" (p. 104). She goes on to argue that more active involvement in the classroom, where attention is being paid to the issue of improving teaching, will benefit instruction librarians. She also points out that library participation in "campuswide conversations about teaching" (p. 106), can help support teaching improvement and that "teaching meetings" will help librarians develop as teachers and can be used "as a way to make *thinking* about teaching a part of [librarians'] daily working lives" (p. 108).

Assessment and evaluation

The distinction between assessment and evaluation is not always clear in the materials under review and the words are frequently used interchangeably. A variety of materials address evaluation of library-instruction programs, though few specifically focus on information-literacy programs. Materials selected for discussion here are those that appear to have a more direct information-literacy component.

An interesting starting point is Doyle's (1992) development of outcome measures, based on the National Education Goals of 1990. Doyle used a Delphi study in an attempt to reach consensus regarding "(1) focus statements dealing with a definition and attributes of information literacy; and (2) evaluation of national goals' relationships to information literacy and possible outcome measures" (p. 1). The result illustrates a continuum of learning, starting with children who are well prepared to enter school and ending with adults who have skills necessary for jobs and for participation in citizenship roles.

An article by Hammond and Mitchell (1997) outlines the survey methods used at an unnamed Arizona university to determine whether practitioners who had completed various library-instruction programs were well-prepared to be information consumers. Results indicated an ongoing need for these programs, though suggesting that content should be more focused. The authors also suggest that the opportunity to upgrade ones' information-gathering skills should be offered to practitioners, as the need for information is ongoing.

However, it is Iannuzzi's (1999) article on accountability and assessment that is perhaps most telling in this area. She says academic libraries do little with "client-

centered assessments" (p. 304). She urges librarians to "develop assessment methods that focus on performance indicators and measure outcomes of student learning" (p. 304). She suggests that assessment of information literacy competencies might be done at four levels: "within the library; in the classroom; on campus; and beyond campus" (p. 304), thus suggesting that information-literacy competencies must be developed in a collaborative environment. But her ultimate message is that little is currently in place in higher education to provide a mechanism for evaluating students' information-literacy skills.

Update and future projection

Herrington (1998) looks at a technology-based future for library instruction and argues that this requires a substantive change in how instruction is viewed. She argues, "…library instruction needs to focus on helping the user become more independent in locating and retrieving information" (p. 383). Though not a new idea, she says that this takes place most effectively at the point of need rather than in a general classroom setting, usually days before the information is needed. This means "[i]nformation literacy concepts should be built into the systems so users can select and evaluate information independently. For example, sources of all formats can be linked by subject and the user guided from general to specific sources" (p. 384). She points out that the Ohio State University (OSU) library system (The Gateway) is "built on a positive foundation of beliefs and assumptions; the library is easy to use and the library user is capable and independent" (p. 384). "The Gateway system is designed to help students identify, find, evaluate, and select the most useful information…" (p. 384), a concept that echoes the tenets of information literacy. Instruction librarians should be focused on design rather than instruction – ensuring user-friendly interfaces, not teaching. "The new library instruction model features a library system, which is user-friendly, seamless, efficient, and effective. This system will *serve* the user and act as a *filter* and *bridge* between the information and the user. This new model is based on a positive belief system and assumes that the library user wants to be self-sufficient and that the library system is easy to use" (p. 385).

Smith and Montanelli (1999) take much the same view, but they also concede that "[e]ducating individuals to become self-reliant users of information is one of the most important and challenging responsibilities facing librarians today" (p. 133) and see a bright future for teaching librarians. Kilman (1995) expands on this view, arguing that 21st century resources will not be user-friendly and thus require greater gatekeeper and instructional role for librarians, roles she sees as complementary and essential.

Conclusions – Information Literacy

Breivik's and Gee's book (1989) is a comprehensive view of the issues of information literacy and is a seminal work in information literacy. It is still an exciting and articulate piece of writing. However, it also points up how little has changed in ten years, which is quite dismaying.

Less empirical data appears to have been collected on information literacy in higher education than in K-12. One result is less discussion in the higher-education literature that moves the concepts forward – a fair amount is being written but much of it seems to say the same thing. Apparently only a handful of people have led the discussion in higher-education circles, and newcomers are only now joining them.

There is a surprising divide between librarianship in the K-12 environment and in higher education. As the definitions and standards have developed separately, so have implementation and the ongoing research in this area. Regrettably, there appears to be little overlap or cross-fertilization. An optimistic note is the recent notice of collaborative efforts planned between K-12 and higher education, announced in December 1999 (AASL/ACRL Task Force on the Educational Role of Libraries, 2000).

The arguments for the concepts of information literacy are compelling, and the supporting documentation for academic institutions having an integrated information literacy component is almost as compelling. The question is why the implementation of information literacy standards, on all levels, has been so slow.

On a national level, it took more than ten years for librarians to endorse the standards proposed in 1989. The next step was endorsement from the American Association for Higher Education (AAHE), which took place in Spring 2000 and which may signal the beginning of increased implementation of these standards. At the local

level, few academic institutions appear to be incorporating information literacy into their curricula or attempting to ensure that their graduates have acquired these skills.

Breivik (1989) also states "[c]omputer technology has proven extremely useful for quick retrieval of short pieces of information and for the sharing of in-process research activities among scholars and organizations. It raises, however, a number of serious issues concerning the quality of information, access and commercialization of information, and development and preservation of knowledge" (p. 15). She goes on to discuss computer technology encourages people to have more faith in information they see on a computer screen than in information they get from other sources.

The lack of information-literacy programs in higher education is a bit baffling, given that this kind of statement reflects a widely identified and recognized need, at least as statement supported by informal surveys done with Virginia Tech students and articulated by local faculty members who teach these students.

Perhaps some of the lack of action is a result of the lack of research. In ten years of implementation, little has been done to identify or evaluate the best ways to teach information literacy. One of the few significant research works on information literacy is The seven faces of information literacy, by Bruce (1997). The publisher's note for this work says "it is believed to be the first Australian doctoral thesis on information literacy and one of few worldwide" (p. [iii].) In a similar vein, Iannuzzi (1999) has been critical of how little is being done in libraries and on campuses to evaluate the information literacy skills of students.

The field of information literacy is firmly established in the field of librarianship and is now being seen as of value to the academic community on a more global scale. In large part, this is due to the increase in information resulting from technology advances. The ability to locate, evaluate, and use information effectively becomes increasingly important as the amount of information increases.

Web-Based Delivery of Instruction for Libraries

Breivik's (1989) acknowledgement of the role of computers in an information age, and thus in libraries, requires a look at the role of technology in the delivery of library instruction. With the increasing role of the Internet in all aspects of librarianship, focusing on the role of Web-based delivery of instruction seems most appropriate. Literature is limited regarding Web-based delivery of library-specific instruction. Therefore, it seems appropriate to look at what the general literature has to offer, and subsequently cover materials specific to libraries.

General Information – Web-Based Delivery of Instruction

Khan's book (1997) offers a diverse view of many of the components of Web-based instruction (WBI). He has compiled a collection that looks at the issues that need to be addressed as Web-based instruction continues to evolve, and he includes a number of submissions on designing and delivering Web-based instruction. Though much in this collection is anecdotal, there is also a significant amount of information on designing instruction for effective and maximum use of the variety of Web-based teaching tools.

A systematic approach to designing for the Web is offered by both Harrison (1999) and Hall (1997). Both are written for people with minimal instructional-design background and provide a step-by-step approach for creating Web-based instruction. Though both are written from a training viewpoint, much of the content is widely applicable and could be used as a basic introduction to creating Web-based instruction. As both focus on all aspects of self-directed learning using the Web, their logical and practical approach is worth consideration. Of particular interest and value in both books is the checklist approach and, in Harrison, the availability of self-assessment tools useful for tracking student progress and identifying areas in need of improvement.

A review of both the organizational and pedagogical issues involved in Web-based instruction is presented in Schrum's article (1998). Based on others, and her own investigations, she has identified strategies to help in the development of online instruction. Though focusing on all of media useful for online delivery of instruction, her observations regarding decisions in designing such a course provide a concise inventory

of items to be considered for Web-based instruction, including student, administrative and pedagogical concerns.

In recent years, the emphasis has moved away from general computer technologies and toward the Web as the tool for teaching and training. Watson and Rossett (1999) cite statistics on the growth of the Web and then discuss learner support in Web-based training. They point out less-than-successful realities of Web-based training and raise questions to answer when looking at this form of delivery. Included are such things as matching the right kind of training to the individual, sustaining interest, keeping track of progress, and motivation. Though the emphasis is on training, there is instructional application inherent in the discussion.

Harmon and Jones (1999) equate the rush to embrace the Web as an instructional tool with a video game that featured lemmings: The rush in academia to get courses on the Web is characterized as "a frenzied drive toward the Web-based cliff" (p. 28). They argue that this rush is "ill-advised" (p. 28) and though they hold out hope for the future of the Web in education, they argue that there are first questions to be answered regarding implementation. They point out that the Web is "amorphous, messy, and chaotic" (p. 28) and suggest five levels of its educational use: informational, supplemental, essential, communal, and immersive. (They also offer a level of zero Web use but believe it will be uncommon.) Much of the educational use of the Web is supplemental, they argue, with communal uses only recently becoming widespread. They also identify eleven factors that influence how Web-based instruction is received, including such considerations as distance, number of students, infrastructure, and access. They conclude with a suggestion that there is a need to "think about Web-based instruction a bit more systematically" (p. 32). They argue that moving to higher levels of Web use will "require more of a conceptual shift among faculty and students" (p. 32), and suggest that in the rush toward Web-based instruction it is helpful to stop and occasionally take a wider view of what is happening.

One broad view of the impact of computers on learning is offered by Hazzan (1999) as he reviews what has happened and what has changed as computers have become commonplace. He presents three components of a teaching Web site (pieces of information, links, and the view of the users of the site), discusses them as objects, and

concludes that construction of an effective site is far from simple. He also looks at electronic communication and how it helps students to process ideas and to express their thoughts.

Berge (1999) looks at the question of how to design interactions in Web-based instruction and suggests that it is the instructional designer, rather than the technology, who "sets limits on the quality of instruction" (p. 5). He defines interaction as "a continuum from teacher-centered to student-centered approaches" (p. 9) and suggests that it is "the responsibility of the institution and the instructor to provide a learning environment in which the learner has the opportunity for appropriate interactions…" (p. 9) and to select the design that "will best enhance the presentation of information and facilitate interaction among students and faculty" (p. 10).

Library Information – Web-Based Delivery of Instruction

Library-specific literature on Web-based instruction is limited and has begun to appear only within the past few years. In 1997 Hansen and Lombardo described their experience working with librarians from ten colleges and universities to create a one-credit-hour Web-based course to be offered at all ten institutions. First offered in 1996, the Internet Navigator course was created collaboratively and was intended to be completely Web-based and self-paced. The course focused on information-literacy skills: "using the Internet as a research tool, critically evaluating Internet information, and creating new knowledge" (p. 70). In the preliminary evaluation of the course with the initial group of registered students, student satisfaction was found to be high, and though there was some instructor frustration, there were plans to continue to offer the course and to look at other collaborative opportunities for development of library-based Web-based instruction.

Librarians at California Polytechnic State University developed a student-centered electronic teaching library (SET) as a mechanism for creating a collaborative learning environment while teaching techniques to help students "to develop increase their information competency skills" (p. 13). Using "sophisticated animation, sound, digital video, and 3D graphics" (p. 19) stand-alone programs were created to teach various databases. Also developed were various self-paced instructional modules offered to

students via the Web. Though much of this article discusses the design of a classroom created to support this initiative, there is also information on how the instructional components were developed and how they have been adjusted. One adjustment was creating a stronger link between the research components and the design components, when librarians realized that "students did not see the relationship between finding, evaluating, and presenting information" (Adalian, Hoffman, Rockman, & Swanson, 1997, p. 21).

In an essay that discusses the characteristics of the current college student, Dupuis (1998) includes discussion of the Texas Information Literacy Tutorial (TILT) she has developed at the University of Texas–Austin. She points out the need to analyze resources before beginning such a project and suggests that estimates regarding time and resources will probably be double what was initially projected.

Several essays from Finding common ground talk about Web-based or electronic delivery of library instruction. Basile (1998) finds both "promises and problems" (p. 111) in electronic instruction for remote library users. The promises include an expanded role for the library, more access time and self-pacing of instruction for library users, and context-sensitive help offered on-line as a complement to electronic instruction. Problems she identifies include differences among users and differences in teaching and learning styles, and the impact of instruction on library staffs as they struggle with design issues. Her solution is increased use of the Web to consolidate as well as individualize library instruction. She raises the idea of creating more intuitive interfaces so that library instruction will become less necessary for users.

The UWired program at the University of Washington, discussed by Zald, Sreebny, Mudrock, Laden and Bartelstein, also in Finding common ground (1998), was begun in 1994 and initially focused on working with a 24-student freshman learning community to "build information retrieval and evaluation skills in to the course objectives" (p. 87). The program has evolved and expanded "to become an umbrella for campus efforts to incorporate technology into the curriculum" (p. 91). As a result, labs have been built for students and faculty and a variety of workshops offered to both populations. In addition, the program has come to include Web-based components geared toward distance students. An appendix to the essay includes enthusiastic comments from

students regarding the many positives of the program. A review of the Web site for this program (University of Washington, 1999) indicates an apparently comprehensive program whose stated goals are to "provide access to the tools and resources that students and teachers need to use technology to enhance teaching and learning, promote fluency with information and information technology [and] foster innovation in technology-enabled teaching and learning" (¶ 2). Also included at the site are assessment reports that indicate a high level of satisfaction with the program.

Gutierrez and Trail (1998) in their essay from Finding common ground discuss a computer conferencing system used for a Research Strategies course at Richard Stockton College of New Jersey. Advantages and disadvantages of this kind of course delivery are presented; though not strictly Web-based, this kind of delivery has components transferable to Web-based courses. Designed initially in 1994, the technology "bridges the gap between print and electronic media" (p. 141). A point made by Gutierrez and Trail was the inordinate amount of time taken to teach the "largely computer-illiterate class" (p. 142) basic computing functions. There are also several references to technical problems, including in the discussion of why initial evaluations were lower than expected. In looking to the future of the class, they acknowledge the need to include the Web as a tool for future instruction.

Milton's Web at Johns Hopkins University was created in response to a recognized need for "creation of an electronic instruction system that would function as part of … general instructional activities" (p. 152). Kirk describes the process of creating the site, begun in 1994, and includes reasons why the Web seemed the appropriate tool (1998). Included were demands made by existing distance education offerings, coupled with the realization that, by designing for the distance population, a product could be created that would also meet "the information and instructional needs of the other populations in a diverse research environment" (p. 154). The result was a series of modules providing access to both the resources and the instruction and support for using the resources. A "homegrown" system is better than a "canned" system, Kirk observes, because the modules can be tailored to the specific demands of the Johns Hopkins community. Another point is the breadth of material available in a variety of formats:

"Even though Milton's Web itself is an electronic creature, it points to worlds beyond the computer" (p. 157).

At Arizona State University, an institutional mandate to the library's instructional unit to evaluate its mission led librarians to transform instructional delivery and redefine the library to include the Web (Brunning & Konomos, 1998). A new library unit that included system and instruction librarians, instructional designers, and programmers and systems support staff was created, based on the assumption that "[a]ll library services would be provided over the Web" (p. 66). The mandate as this project evolved was that the "systems should be designed to provide help for the user at the 'point of need,' and … that the systems should have no complicated instructions either in print or on the help screen" (p. 66). Requests for instructional classes have diminished over time, and Brunning and Konomos report that librarians and users seem satisfied with both the approach and the product.

It is interesting to look at human-computer interactions (HCI) in the context of information retrieval in an attempt to perhaps identify factors that affect the success of these interactions. Church (1999) finds little in the library literature on HCI or the relationship between HCI and information literacy. He looks at HCI in a library context and reviews various factors that should be considered in looking at electronic delivery of information-literacy components. His emphasis is more on HCI than on information literacy, but he does provide some guidelines for designing information-literacy instruction and talks about the kind of human-information interface that would best serve the information seeker, providing support for some of the ideas presented by Herrington (1998).

Dewald (1999b) argues that librarians must have pedagogical reasons for placing instructional materials on the Web and insists on interactivity that "engages the learner with the material in order to practice skills" (p. 26). In addition, she offers guidelines on how to motivate the learner and organize materials in such a way as to "explore as they prefer, develop their own understanding of concepts and skills, and apply learning in realistic settings" (p. 30). In a second article (Dewald, 1999a) she discusses how to turn traditional library instruction into Web-based instruction. She provides criteria for good instruction, regardless of medium: whether it is course-related or assignment-related, uses

active and/or collaborative learning techniques, uses a variety of media, has clear objectives, teaches concepts, includes access to a librarian after the instruction. She then systematically points out how to include these criteria in Web-based instruction. Web-based instruction "cannot completely substitute for a human connection in learning," she concludes, and "Web-based tutorials are best used in connection with academic classes rather than in isolation" (p. 31). An additional article by Dewald, Scholz-Crane, Booth, and Levine (2000) addresses both instructional design and pedagogical considerations in teaching information literacy skills to distance students. These three articles, taken in concert, provide an excellent review of how to provide good information literacy and library instruction in a variety of environments using many readily available electronic tools.

Conclusions – Web-Based Delivery of Library Instruction

A look at the LOEX Web site (Library Orientation Exchange (LOEX), 2000) indicates that a significant number of libraries provide their students with Web-based delivery of some kind of library instruction; a review of the literature supports that finding. Just starting to appear, however, is literature that discusses the pedagogical foundations of Web-based library instruction or that looks at how to evaluate the effectiveness of that instruction. Much of this is due to the relative newness of the medium; many libraries are just beginning to look at offering Web-based instruction and here at Virginia Tech we have only within the past year developed modules that are being used to provide and/or complement our library instructional efforts.

Although librarians have only recently begun to use Web-based instruction, there is a body of literature that might provide an underpinning for deciding to offer instruction via this route and supporting decisions made in creating such instruction. My experience in this kind of work at Virginia Tech indicates that many of the design issues are based on the largely anecdotal literature that is available, leaving unanswered the questions of a pedagogical foundation for what is being done.

Web-based instruction appears to be an appropriate tool for delivering library instruction, particularly as the resources available in libraries are also increasingly Web-based. As one moves away from resource-specific library instruction and into the area of

teaching information literacy, the Web continues to be an appropriate tool. The Virginia Tech University Libraries' module on evaluating Internet resources uses the Web to teach the Web, and as a result offers a connection to students that should support their learning about using Web resources.

Also offered in the literature is the sense that there's no turning back – educational institutions, libraries included, are expected to offer instruction via the Web and so it will happen. Ongoing assessment is needed to determine the effectiveness of such instruction, but it is an appropriate way to deliver some instruction and should work particularly well for libraries and librarians.

SUMMARY

Library instruction theory and research provides the foundation for the evolving information-literacy concepts. Information literacy and Web-based delivery of instruction are a logical marriage, given the nature of the literacy that is being taught. When looking at the world's information and trying to convey to people how to evaluate and use it, the context in which one is looking is largely Web-based; therefore, the idea of teaching aspects of the Web by using the Web is extremely logical.

SIGNIFICANCE OF THE LITERATURE

What comes to the fore as a result of this review is the limited amount of research that has been done to evaluate library-instruction and information-literacy programs. Bruce (2000) reports "[I]information literacy research is still in its infancy. Not only is the number of studies completed relatively small, the agenda is ill defined…" (p. 213). Missing is the literature on determining whether library instruction is appropriate for the skills and knowledge levels of the students being taught. The literature refers repeatedly to the need for more research into and better comprehension of the degree of success of these programs: one identified need is better data about student skills and knowledge levels as a foundation for the design of new library instruction (Salony, 1995; Bober et al., 1995; Oberman, 1996; Martin & Jacobson, 1995).

Paralleling this focus in the library-instruction literature is a similar need identified in the literature that focuses on information literacy. Different mechanisms for introducing students to information-literacy concepts are discussed, but consistent throughout the literature is reference to a need for more and better research to help identify how students use information throughout their academic careers and how that use transfers to employment and life situations after graduation (Doyle, 1992; Bruce, 1997; Hammond & Mitchell, 1997; Iannuzzi, 1999; Breivik & Gee, 1989).

Web-based delivery of information-literacy concepts is logical in an increasingly electronic environment where the Web is increasingly the tool of choice for acquiring information (Harmon & Jones, 1999; Hazzan, 1999; Dupuis, 1998). The promise of this tool is acknowledged as being enormous in both general and library-specific instructional settings, and good Web-based modules have the potential for transforming the way the librarians interact with students (Dewald, 1999b; Dewald, 1999a).

The limited amount of available research in the areas of library instruction and information literacy points to the need for this kind of research. The literature of Web-based delivery of instruction offers a framework for finding answers to questions that will be asked in the effort to design instruction that is relevant for students and addresses their need to know how to acquire and use information.

Digital Discourse

I have defined digital discourse as communication that takes place in a largely electronic or digital context. Because a significant amount of my proposed method of data collection includes electronic communications (email) I feel that is important to be attuned to what is different about this kind of communication and what ethical implications are involved. Information gathered from the following sources helped me to decide to use email communications, as opposed to online chat, as my method for collecting data.

Schrum's (1995) article "Framing the Debate: Ethical Research in the Information Age" points out that as online communications have become increasingly commonplace, it is necessary to review the accepted concepts of ethical research "because in many ways moving into an electronic community is even more invasive than joining a face-to-face organization or taking notes at a meeting" (p. 316).

The Opinion & Arts Section of The Chronicle of Higher Education for December 3, 1999, continues the discussion of ethical issues in Internet research in an essay by Hamilton (1999). He reports that his research suggests "that online researchers are not consistently employing the safeguards that are used to protect participants in traditional research" (p. B6). Questions concerning the validity of data, related to anonymity questions, are also raised, with Hamilton concerned that both return email addresses and "cookies" might compromise "the researcher's ability to guarantee confidentiality of the data" (p. B6). He points out that many institutional review boards (IRBs) are ill-equipped to address or evaluate questions regarding online research and concludes that the lack of guidelines regarding online research pose a threat to its credibility, at a time when its use is increasing. He, like Schrum, concludes with a suggestion that guidelines need to be established that will meet the needs of both researchers and participants who are meeting in cyberspace.

My intent was to use only asynchronous electronic communications in my data collection, but I felt that it was important to be aware of the differences between synchronous and asynchronous communications. Jeong (1996) differentiated between synchronous and asynchronous communications, commenting that synchronous

conversations result in overlapping threads of conversation "under the constraints of time" while asynchronous communication allows students "the convenience of reflecting and later composing responses at their own pace" (p. 51). Jeong concluded that the technology tended to impose "overlapping threads" and a "linear structure" (p. 63) onto group discussions, brought about by slow response time.

A collaborative course involving students at the Universities of Western Sydney (Australia) and Minnesota (Duin & Archee, 1996) that used both Internet Relay Chat (IRC) and email led to a higher level of student satisfaction with email than with the IRC. The source of frustration in this situation was also slow response times; students improvised by using "synchronous communication through an asynchronous medium" (p. 410) – sending email messages back and forth to communicate in real time without the delays encountered with IRC.

It is also necessary to understand what is different in electronic "writing" – what to watch for as part of the digital discussion that might be distinctive. McGrath (1997), using "synchronous electronic conferences for discussion of fiction"(p. 292) in a literary-analysis class, says her students' electronic 'voices' are different "from the voices they use in conventional classroom discussion, but also different from the voices in writing of the same students…"(p. 292). She finds that the electronic 'voices' are "more inquisitive, risk-taking, and expressive than either their talking or writing voices" (p. 292).

Though Dewald's article (1996) does not delve deeply beyond the mechanics of providing computer-mediated communications (CMC) in a library course, she does report that students seemed to feel more compelled to read email sent as part of the class than had they been asked to read a textbook.

Walther (1994) finds that students using CMC have different expectations of electronic interactions than of for face-to-face exchanges. In addition, he reports increasing evidence that CMC has shifted from being perceived of as impersonal and is now viewed as "hyperpersonal," and even exceeding face-to-face encounters in terms of personal communications (Walther, 1996, p.3).

Markham's Life online (1998) provides a wide-ranging look at what takes place when one becomes immersed in an electronic community. She raises the ethical question of whether observation of online interchanges is right unless one also participates in those

interchanges – is a "lurking" researcher acceptable? – and concludes that the researcher's active participation is necessary. Markham describes cyberspace as "an evolving cultural context of immense magnitude and complex scope" (p. 25) and determines that she needs to be part of it to effectively understand it. As she tries to set up interviews with people she meets online she determines, as they fail to show up as scheduled, that commitment is not a widespread characteristic of the anonymous people in online communities.

Once Markham begins to participate she comments that she isn't sure "what the point of chatting there is, except to show how adroit you are with your keyboard" (p. 41). "The norm in most chatrooms is to create short, snappy sound bytes that will draw attention to yourself" (p. 41). She observes "people seem more emotionally expressive than in face-to-face conversation…" (p. 48) and wonders if the need to write out the emotion "may make participants more aware of emotional expression as part of every conversation and as part of the presentation of self" (p. 48).

As the interviews progress, Markham discovers that it is necessary to wait longer for replies: "[W]hen she would stop responding, I would charge on with another question, only to see her next words were in response to a previous question" (p. 53).

She also comments that "[w]e frequently and commonly make the error of conflating *information transmission* with *communication*, and believe that because information gets transferred instantaneously between people, or their computers, communication speeds up as well (or that communication *happens*, at least). That is not always the case" (p. 64).

She talks about her misperceptions regarding the ease of doing online research, commenting, "I thought that the entire data-collection process would be expedited through online communication" (p. 64). She then proceeds to explain the factors that contraindicated such an assumption, resulting in a much longer period of data collection than the three weeks initially scheduled. She comments "online interviewing is a singular, frustrating, and exciting experience. Two specific issues are worth commenting on in further detail: First, online I only see the text – not the nonverbals, the paralanguage, the general mannerisms or demeanor of the participant. Second, because writing takes much longer than talking, being a good interviewer means being patient" (p. 70). She explains some of the problems with conducting online interviews – such things as trying to decide

whether or not to "risk disrupting their thoughts to let them know I was listening and was engaged in the conversation" (p. 71). She comments on an interviewee whose responses were brusque and monosyllabic, of trying to determine whether the person was shy or rude, and of the difficulty of coming to a conclusion with nothing but text on which to base her decision. She says that she "was frustrated by the lack of face-to-face cues" (p. 72). This leads to a realization, as she reviews the process with her adviser, that she was still "accomplishing a vital part of any interview by allowing the participants to relax, encouraging a conversational mode, and letting the conversation guide the questions rather than the other way around. Whether it was small talk, comic relief, or a new conversational direction, we came to realize all interviews have these elements; they are just less noticeable in face-to-face contexts – and less time-consuming" (p. 75). One benefit, however, is that she had time to think of good follow-up questions: "I could see the story unfolding, or the response developing…I could reread what the participant had just sent, and…think of possible follow-up questions" (p. 76).

Problems Markham encountered also included the changing nature of the interview protocol as she concentrates more on the conversations and less on the protocol. She also worries about how many interviews are enough and at what point she should move on to analysis and interpretation. She offers no definitive answers, discusses the changing nature of her research, but finally comments that "the questions of how we represent others in our research are paramount" (p. 83).

Looking at some of the literature from the area of writing and composition it is possible to get another view of computer-mediated communication. Writing in 1994, Maynor indicates that there was research on the "linguistic implications of electronic mail" as early as the mid-1980s, but that "linguistic research on the topic of e-mail is still in its infancy" (p. 48). Her research reveals that the most obvious characteristics of email writing "are probably the lack of capital letters, the simplified spellings, the clippings, and the icons" (p. 49). She points out that this makes email communication more like speech. Maynor used a style-check program on her own writing. She discovered that her formal letters were written at a college-grade level and her email communications at a junior-high-school level. Her preliminary conclusions regarding "e-style" writing are that

it merges the immediacy of speech with some of the characteristics of writing, that “it resembles transcribed speech, with facial gestures added” (p. 53).

As stated previously this information helped me decide to use email as one of my methods for data collection. In addition, it provided a framework for me when using electronic means for data collection – that the tool for communication could color how information is shared. As a result, I viewed electronic communication more as conversation than as formal writing and evaluated data collected in this way in that informal context.

THE RESEARCH PROBLEM AND RESEARCH QUESTIONS

The research problem for this study is focused on the need to know how students acquire and use information. Knowing this will allow me to make identify changes that could be made that would improve library instruction at Virginia Tech as well as the design of library-instruction modules. Though ultimately based on the charge to me made by Virginia Tech's University Library Committee, it also has as its underpinning the literature that points out a lack of understanding of what students know about information and how they use information.

In general, the questions to be answered, based on the format suggested by Nespor (class notes, Spring 1999), are centered on freshman students' uses and perceptions of information:

1. How do freshman students acquire information?
2. How is information used by freshman students?
3. How do freshman students make sense of the information that plays a key role in their academic lives?
4. What happens to the student processing of information when they are exposed to questions about the role of information in their lives?
5. How does exposure to an instructional module on evaluating Internet resources change the students' understanding of the need for reliable information sources?

This study will consist of a review of those few assessments taking place in libraries that address the question of information literacy for students in an attempt to understand how students perceive their uses of information. In addition, using questions that were included on the *Annual Freshman Survey – 2000*, questions previously asked in data collection regarding information literacy (Bruce, 1997), plus other questions framed in the Information Literacy Competency Standards for Higher Education (Appendix A), data were gathered during fall semester 2000 from freshman students at Virginia Tech. The broad assumption by librarians is that student understanding of how to use information effectively is minimal and that they have but a shallow understanding of the importance of information in their lives. This study will determine the accuracy of the assumption.

These questions are important and get at processes that seem, from the review of literature, to be important to understand. I will place these questions in the context of both the available literature and of a charge to "ensure that students are provided with opportunities to acquire the information management skills needed to support their learning needs at Virginia Tech and those they will encounter afterwards as they participate in their professional, social, and cultural environments" (Virginia Tech, 1999, p. 59). The results of this study will provide an insight into how students acquire and use information, and will be used as a foundation for the design of future library instruction for freshman students.

Chapter 2 - Methodology

INTRODUCTION

This study investigated information-literacy concepts in freshman students in an effort to better understand how students acquire and use information. Purposive sampling, drawing on questions that were previously used in collecting data on library use and information literacy (Bruce, 1997), plus other questions formulated from the framework provided by the Information Literacy Competency Standards for Higher Education (Appendix A), were used to collect data during fall semester 2000 from freshman students at Virginia Tech.

The Information Literacy Competency Standards for Higher Education (Appendix A) consist of five standards. Attached to these five standards are twenty-two performance indicators, and attached to these are a number of outcomes, all intended to identify a student as information-literate. For example, standard one refers to a student's determining "the nature and extent of the information needed." One performance indicator under that standard is: "The information literate student identifies a variety of types and formats of potential sources of information." An outcome for that performance indicator is that a student "[i]dentifies the value and differences of potential resources in a variety of formats (e.g., multimedia, database, website, dataset, audio/visual, book)."

To attempt to better understand how students acquire and use information, I developed questions, based on the performance indicators and outcomes statements of the Information Literacy Competency Standards for Higher Education (Appendix A), that provided the student participants with the opportunity to reflect on specific questions. For example, how does he or she find information for course projects, including use of general search engines and online databases – Yahoo searches vs. ERIC database searches, for example – and how does the student evaluate the materials available via these different resources? The foundation for this questioning was the performance indicators and outcomes statements of the Information Literacy Competency Standards for Higher Education (Appendix A). In asking questions about specific uses of information resources, I hoped to better understand the more far-reaching issue of a student's determining "the nature and extent of the information needed."

This study was a hybrid study, including components normally found in descriptive, case-study and qualitative research. Knupfer and McLellan (1996) say that descriptive research serves the purpose of pointing out "what is" (p. 1196), a concept that fits well the purpose of the

proposed research. They further point out that "[d]escriptive research can be either quantitative or qualitative" (p. 1197), thus opening the process to a hybrid approach. The research included quantitative methodologies in that an open-ended survey was used as an entry point for data collection.

The research included a qualitative component intended to develop better understanding of how students perceive and use information, based on the performance indicators and outcomes statements of the Information Literacy Competency Standards for Higher Education (Appendix A). Qualitative research can be defined as "research devoted to developing an understanding of human systems" (Savenye & Robinson, 1996, p. 1172). Looking specifically at research into library use, Mellon (1990) states that naturalistic principles of inquiry allow researchers "to understand why people in a library setting behave as they do" and suggests that "naturalistic inquiry is particularly relevant to librarianship" in an age of increasing automation in which librarians need to be reminded "that theirs in a profession aimed at bringing information to *people*." She cautions that "[w]ithout some understanding of the people we purport to serve, libraries will become no more than static information warehouses" (p. 3).

In addition, short-term case-study components were included in the research design. In a detailed examination of what constitutes a case study, Merriam (1998) suggests that what ultimately defines the case study are the boundaries of the case. Her method of determining whether a design is a case-study design includes determining how finite the data collection can be, either in terms of the number of people or in the amount of time allowed. The proposed research was finite both in terms of time and people involved and thus meets the case-study criteria.

The design of this study allowed me to acquire narrative descriptions of participants' reflections of their experience in acquiring information and their understanding of their information needs. The focus was on the student experience of needing information and the process of their acquiring it.

This study also provided a rich descriptive complement to the data that was collected during the freshman orientation of summer 2000 by Virginia Tech's Academic Assessment Program using the *Annual Freshman Survey*, published by Cooperative Institutional Research Program of the Higher Education Research Institute at the University of California - Los Angeles (UCLA). The University Libraries was given the opportunity to include questions on this survey

regarding student use of library resources. Though these questions only peripherally looked at information literacy concerns, it was possible to use those questions as a basis for the introductory contact with student participants. This resulted in narrative data that provided a depth of information unavailable via the *Annual Freshman Survey*.

PARTICIPANTS

Participants were students enrolled in a section of English 1105 that was using components of Virginia Tech's IDLE Program (Integrating Diverse Learning Environments: Writing and Critical Thinking in Traditional and Digital Domains). A colleague in Virginia Tech's English department helped me to identify a faculty member who was willing to have one section of students participate in this study and who was also willing to participate in the study through an interview.

PHASES OF INQUIRY

The steps of the inquiry did to some extent emerge as the study proceeded. However, there were three general phases that are identifiable. (See Figure One.)

Phase One: Orientation and Overview

During this phase I was introduced to the participants and the nature and methods of inquiry were outlined. The library-related questions that were included on the *Annual Freshman Survey* had been reviewed and formatted into an open-ended design and were distributed to participants via email. These short-answer questions focused on the students' experiences using library resources prior to arriving at Virginia Tech. This initial focus provided the descriptive data that was collected during this study.

All of this data was tabulated where possible, and coded for future analysis. This process of tabulation and coding was done in an attempt to begin to discover themes that might develop throughout the remainder of the study; to begin to identify students who would be willing to be interviewed in more depth; and to begin to understand what kinds of perceptions of information freshman students bring with them when they begin their higher education careers. This coding and tabulation was based on the performance indicators and outcomes statements of the Information Literacy Competency Standards for Higher Education (Appendix A). Included were descriptions of the student participants. This email data provided a significant amount of foundation information that was used to support the next phase of the research.

Phase Two: Electronic Dialogue

Phase Two built on the answers provided in Phase One and consisted of an electronic dialogue between the student participants and me, expanding on ideas introduced in response to the survey questions. Answers to the open-ended questions asked in Phase One served as the starting point for this dialog and provided me with greater detail regarding student library experiences. This phase served to a large extent as a follow-up to Phase One. Analysis of the data collected in Phase One allowed me to identify areas where there was an opportunity to pursue a concept or theme, allowing the student participants to expand on their previous comments. This phase resulted in an electronic dialogue, as opposed to Phase One, which was more of a question and answer session.

(During the course of this electronic dialogue, I had hoped that students would be completing the Web-based module, Evaluating Internet Resources, as part of their English 1105 coursework. However, this did not happen and as a result I asked for their reactions to the module in a separate email sent to all of the participants during the last few weeks of the fall 2000 semester. The student participants' responses to the module were beneficial and helped to provide me with a better understanding of how students perceive and use information.)

Phase Three: Information Literacy Interviews

I had planned to select students for interviews from a large group, identifying a minimum of six and a maximum of twelve students to include in Phase Three of the study. These were to be students who appeared to be at both extremes of an information-use continuum and who had demonstrated an ability and willingness to discuss their views with me. However, at this point in the study there were a total of nine students who continued to display interest in my research and I resolved to interview all of them.

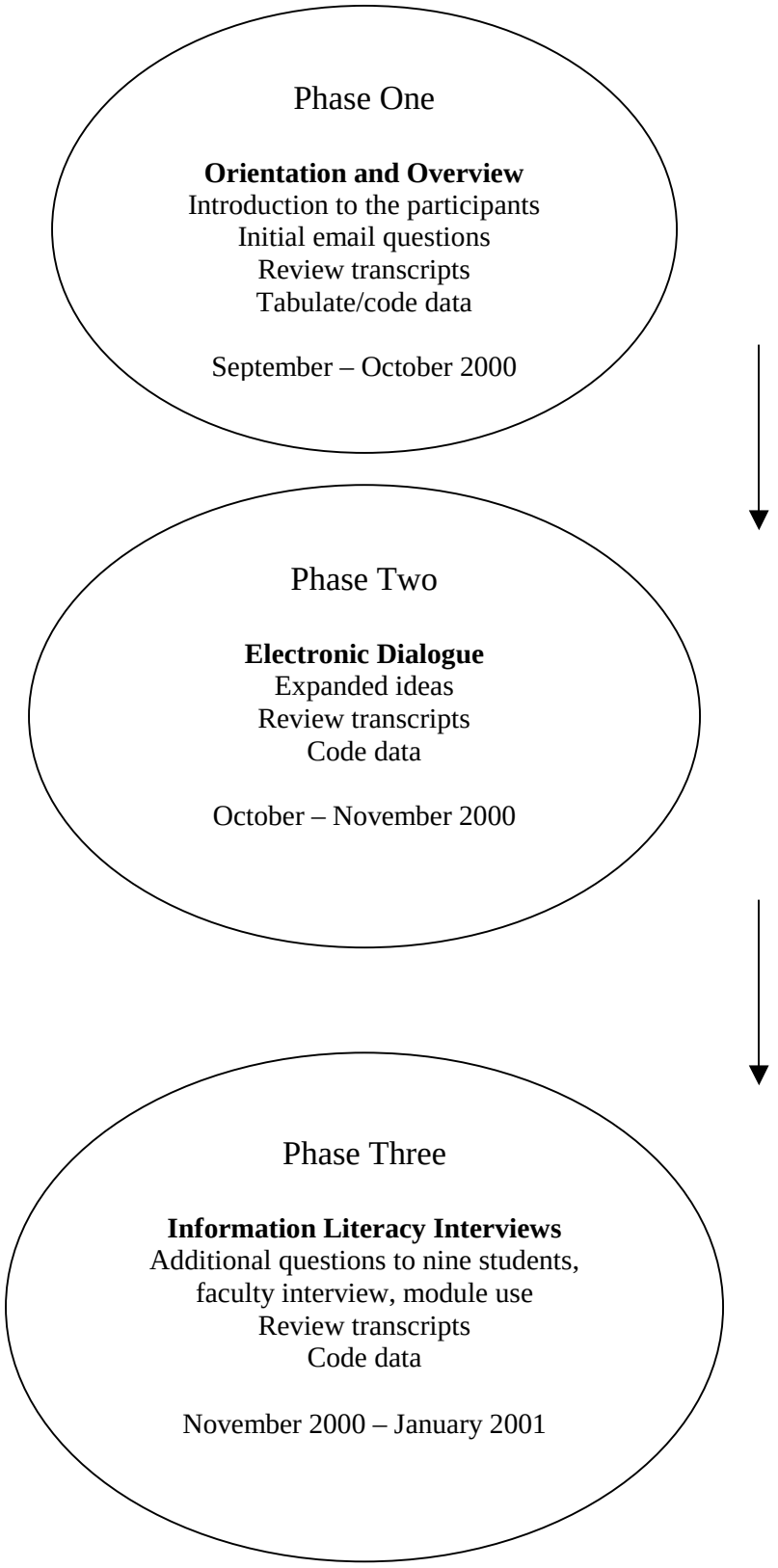
During this phase participants were asked, via face-to-face interviews, to expand further on the information they had provided me via the Phase One and Two exchanges, but with additional information literacy questions included. They were asked about their uses of information with the questions asked being framed by their understanding of what it means to be an information literate person. These questions evolved to some extent during the interactions, building on what had preceded, but were also based on questions I had developed using the Information Literacy Competency Standards for Higher Education (Appendix A). The

participants appeared to provide me with information in the interview that they were unwilling to type in their emails. This period also provided me with the opportunity to follow up with the student participants and obtain clarifications to any responses that were unclear to me. All of this interview data was transcribed and coded for analysis.

A component of this phase was a face-to-face interview with the faculty member to determine her awareness of the students' understanding of information and its uses. She was asked to comment on the perceived impact of the Web-based module (Evaluating Internet Resources) on student assignments. This interview focused, in general terms, on the faculty member's understanding of and observations about student perceptions of information literacy concepts. This interview, plus interviews with the student participants, were all transcribed and all of the data was coded for analysis.

Though these phases have been identified as discrete, there was some movement back and forth between the three phases as new questions arose from the context of the answers provided. This allowed me to pursue contradictions or similarities that became evident throughout the process.

Figure One: Phases of the study of information literacy concepts in freshman students



INSTRUMENT

The primary instrument of this study was me as the researcher. Lincoln and Guba (1985) suggest that the researcher is the best instrument "because it would be virtually impossible to devise *a priori* a nonhuman instrument with sufficient adaptability to encompass and adjust to the variety of realities that will be encountered" (p. 39).

This requires the researcher to identify personal biases and to acknowledge the influence of those biases on the collection of data and resulting analysis of the data. I am a librarian with more than twenty-five years of professional library experience. I am currently working extensively with other librarians at Virginia Tech who are providing instruction in both information literacy and in the use of library resources. I have worked as a reference librarian for more than fifteen years and did provide some reference services during the time that this study took place. This resulted in some contact with the student participants outside of the study setting and on two occasions I provided them with reference assistance.

Questions asked during Phase One were revised, open-ended versions of the questions that were asked on the *Annual Freshman Survey*. There were nine questions that were approved and accepted by the Academic Assessment Program, questions that asked students about their use of library facilities and resources during the year prior to their arrival at Virginia Tech. These nine questions were revised by me into an open-ended format and then pilot-tested by students and adjusted to reflect changes recommended by these students during this test period. The testing took place during Summer 2000 and was done by student employees at Virginia Tech's University Libraries.

During Phase Two of the study, the questions asked were ones that evolved from answers given by the student participants in their responses during Phase One.

The questions used during the face-to-face interviews in Phase Three of the study were developed by me and were based on the performance indicators and outcomes statements of the Information Literacy Competency Standards for Higher Education (Appendix A).

DATA COLLECTION

There were three kinds of data collected during this study. The first kind of data resulted from the initial email interviews that took place during Phase One. These were answers provided in response to the open-ended survey questions that were emailed to the student participants.

During Phase Two there was the data collected as a result of the interaction between the student participants and me. I had a dynamic interchange with the student participants via email that elicited rich detail from the students about their experiences with libraries prior to coming to Virginia Tech and about their experiences in acquiring and using information during the beginning of their first semester at the University.

From Phase Three came the third kind of data, resulting from the face-to-face interviews with the smaller group of students and with the faculty member. These interviews provided me with valuable information that expanded and built on the initial survey answers and the interactive questioning between the student participants and me.

Because of the use of electronic means for two of the types of data collection, it was necessary for me to keep in mind some of the constraints and concerns associated with use of this medium, including such things as the lack of visual cues and the tendency toward informal writing, as identified in the section on Digital Discourse in Chapter One.

DATA ANALYSIS

Answers to the open-ended survey questions were transcribed and quantified to the degree allowed by the data collected. Transcripts of both the electronic dialogue and the face-to-face interviews were coded and analyzed. I used NUD*IST software (from Qualitative Solutions and Research Pty. Ltd) as a component of this process. The analysis looked for common points or threads – themes – in the words of the participants and my final report in Chapter Three relies heavily on these narratives. My intent was to seek regular patterns of human behavior in data, … sifting, coding, and sorting data as they are collected, and following up analyses with ongoing observations and interviews to refine these patterns…" (Savenye & Robinson, 1996, p. 1185).

Coding categories were suggested by the data. Once these patterns began to become obvious, the data was sorted according to these categories. Bogdan and Biklen (1998, p.171-177) suggested possible coding categories to include:

- setting/context codes;
- definition of the situation codes;
- perspectives held by subjects;
- subject's ways of thinking about people, objects;
- process codes;
- activity codes;

- event codes;
- strategy codes;
- relationship and social structure codes; and
- method codes.

Most of these proved useful in the context of this study, providing me with a starting point for the kinds of coding that eventually took place. In addition, other arrangements were suggested during this process resulting in additional codes being included.

There was no strict delineation between data analysis and the commencement of writing up the research report as there was much overlap in this process.

TRUSTWORTHINESS

Lincoln and Guba (1985) argue that rigor in naturalistic research is provided through the trustworthiness of the data and its subsequent analysis. The techniques they recommend for ensuring trustworthiness are credibility, dependability, confirmability and transferability.

The data I collected and analyzed provides much of the credibility, dependability and confirmability of the study. Three kinds of data were collected and analyzed, which in itself provides a means for determining the trustworthiness of the data. In addition, data was collected from both the student participants and the faculty member, thus providing the participants with several opportunities for supporting the credibility, dependability and confirmability of the study.

In addition, I used peer debriefing to assist me in keeping focused on both the process and the research questions. Dr. Rebecca C. Clark, a 1996 graduate of Virginia Tech's Instructional Technology program, served in this role and I met with her or talked with her at least bi-weekly. I also recorded what I thought would be the answers of the student participants to the nine questions that I asked during Phase One of the study (Appendix F) and used that information as a check against my biases, so that they did not determine the results of the study. In addition, I used a log of my interactions with the participants to record my perceptions and to use as an additional check against my biases.

Though no claims of transferability are made as a result of this study, there are some general statements that can be made about the nature of understanding of information among college freshman. In any event, the processes used will allow future researchers to ask the same kinds of questions in a different setting and thus perhaps allow for future determination of the reliability of the study. The ultimate goal of this study was to describe certain activities that took

place during a specific time and to derive meaning from those activities. The notions of transferability will be left to others.

DATA PRESENTATION

In Chapter Three I have gone into greater detail regarding data collection, have analyzed the data, and have presented my research as answers to the research problems and questions outlined in Chapter One. An additional framework for the data is the performance indicators and outcomes statements of the Information Literacy Competency Standards for Higher Education (Appendix A). I have used the words of the student participants to try to better understand how information is acquired and used by freshman students; how they make sense of the information that plays a key role in their academic lives; what happens to the students as they process the information they are exposed to and how they understand the role of information in their lives; and how exposure to an instructional module on evaluating Internet resources may change their understanding of the need for reliable information sources. A component of the data presentation will be information on what the implications of this study are for Virginia Tech's University Libraries, including what might be changed in order to improve library instruction for students, as well as in designing future library instructional modules.

Chapter 3 - Data Collection, Analysis, Conclusions

FOCUS OF THE STUDY

The focus of this study is the freshman college-student experience of needing information and the process of acquiring information. This study looks at how students get the information they need for their coursework and for meeting their general information needs, and how they use the information they find. It investigates information-literacy concepts in freshman students in an effort to better understand how students acquire and use information and in an effort to develop library programs that better serve students' information needs. Purposive sampling, drawing on questions formulated from the framework provided by the Information Literacy Competency Standards for Higher Education (Appendix A), was used to collect data during fall semester 2000 from freshman students at Virginia Tech.

In Chapter 1 of this study, I identified five questions that I would try to answer:

1. How do freshman students acquire information?
2. How is information used by freshman students?
3. How do freshman students make sense of the information that plays a key role in their academic lives?
4. What happens to the student processing of information when they are exposed to questions about the role of information in their lives?
5. How does exposure to an instructional module on evaluating Internet resources change the students' understanding of the need for reliable information sources?

Though I had mixed success in answering these questions, I will use them as the framework for presenting the information obtained for this study. The results of this study will provide an insight into how students acquire and use information, and will provide information on what the implications of this are for Virginia Tech's University Libraries, including what might be changed in order to improve library instruction for students.

THE SETTING

This study took place at Virginia Tech, a public, land-grant university classified as a Carnegie/Doctoral Research University – Extensive institution. Virginia Tech has an enrollment of approximately 25,000 undergraduate and graduate students, and is located in the southwestern corner of Virginia. Study participants were students enrolled in an English class, English 1105, plus the faculty member who was teaching the class. English 1105 is the first semester of a two-

semester course, traditionally taken during the first year at Virginia Tech. A colleague in the English Department identified for me a faculty member, Professor Robbins (a pseudonym), who was willing to have one section of students participate in this study and who was also willing to participate in the study by being interviewed. Though not all undergraduate students take this class, at the time of this study it was the class most likely to be taken by the largest number of first-year students, as it is required of all students who did not place out of freshman English.

THREE PHASES OF INQUIRY

As planned and outlined in Chapter Two, this study consisted of three phases. The first phase was an orientation and overview phase. I introduced myself to the prospective participants and explained to them what I was planning and what I hoped to accomplish with this study. I then distributed a questionnaire (Appendix B) to them via email, asking them about their experiences using library resources prior to arriving at Virginia Tech. The second phase built on answers to the questions asked in Phase One and consisted of an electronic dialogue between the student participants and me, and allowed them to expand on ideas introduced in response to the survey questions. The third phase of the study consisted of face-to-face interviews with the student participants. I asked them to expand further on the information they provided in the Phase One and Two exchanges. I also asked questions about information-literacy skills. During this phase, I also had a face-to-face interview with Professor Robbins and asked her about her awareness of her students' understanding of information and its uses. A component of this phase was a review, completed by all of the student participants, of a Web-based module on evaluating Internet resources.

SOURCES OF QUESTIONS

In Chapter One and again at the beginning of this chapter, I listed five underlying research questions that I indicated I would try to answer in this study. To acquire the data for getting at answers to these underlying questions, I used two other sets of questions. In the Phase One (email) exchanges with student participants, I used nine questions derived from questions asked of entering Virginia Tech freshmen on the *Annual Freshman Survey* during the summer of 2000; these questions appear in Appendix B. In Phase Three (interviews), I used questions derived from the Information Literacy Competency Standards for Higher Education (Appendix A). From these standards I developed 27 questions to use as the foundation for face-to-face interviews. These 27 questions are listed in the text of this chapter.

PRELIMINARY ARRANGEMENTS FOR DATA COLLECTION

Questions asked during Phase One were revised and open-ended versions of the nine questions asked on the *Annual Freshman Survey*, administered to all students who attended Freshman Orientation during summer 2000 (Appendix B). Students were asked about their use of library facilities and resources during the year prior to their arrival at Virginia Tech. These questions on the *Annual Freshman Surve*y were developed by librarians from Virginia Tech during spring semester 2000 and were pilot-tested by students employed by the University Libraries. These are the questions that I then revised into an open-ended format and that I used as my questionnaire in the first phase of my study. The questions on the *Annual Freshman Surve*y were designed to be answered using a form that could be computer-scanned. My revised questions required more than one- or two-word answers; student participants were asked to reflect on why they were providing an answer and, when possible, to provide me with examples.

In early summer 2000, the prototype of the revised questionnaire was pilot-tested by students and adjusted to reflect their recommended changes. During July 2000, 29 student employees at Virginia Tech's University Libraries were given the nine newly formatted questions and asked to review them for clarity. They were not asked to answer the questions, but rather to make comments and suggestions that would help make the questions as understandable as possible. Eighteen students submitted comments. Of those 18, five said everything appeared clear and comprehensible. Thirteen students suggested clarifications. Those suggestions were considered in creating the final version of the questions used in Phase One of data collection. The questionnaire was distributed to all members of my Research Advisory Committee on August 21, 2000. Comments were received from one member of my Research Advisory Committee.

Personnel from Virginia Tech's Academic Assessment Program also reviewed the revised nine questions. Suggestions from this source were also considered in reviewing the questions and creating the instrument used during Phase One of the data collection.

At the same time the instrument was being tested, arrangements were made to gain access to students enrolled in English 1105. Working through a colleague who had been part of Virginia Tech's IDLE (Integrating Diverse Learning Environments) Project and who, as a result, had worked with personnel from the University Libraries to develop an online module on evaluating

Internet resources, I was put in touch with Professor Robbins who agreed to make students in her English 1105 class available to me.

Also at the same time, permission was being obtained from Virginia Tech's Institutional Review Board (IRB) to conduct the research (Appendix C). Unfortunately, this process took significantly longer than anticipated and, as a result, initial contact was made with the students in late September rather than in late August as had been originally planned.

DATA COLLECTION

The initial contact with the students took place on Thursday, September 21, 2000, when I met for approximately 15 minutes with the 22 students who were enrolled in Professor Robbins' English 1105 class. Fourteen of the 22 students indicated interest in participating in the research project. The 14 signed two consent forms indicating they were willing to complete the email survey and to be interviewed by me. All were subsequently contacted by email, confirming their addresses, and indicated again their willingness to participate in the study.

An email version of the instrument (Appendix B) was sent via email to these 14 students on Monday, September 25, 2000. Answers were received over the following week and varied from very short responses to each question to detailed explanations of how the students had approached information gathering during their high school years. Included in this phase of information gathering was demographic data about the students, including age, gender, residence and academic major (Appendix D).

This early data was tabulated and preliminary coding begun to identify themes to be pursued during the second phase of the inquiry. The coding was based on categories that I identified using the performance indicators and outcomes statements of the Information Literacy Competency Standards for Higher Education (Appendix A). There are five standards, and I attempted to group the replies into five categories that reflected the five standards. For example, answers that seemed to be about class discussions or focusing a topic would be grouped together as they seemed to address the outcomes identified in Standard One of the Information Literacy Competency Standards for Higher Education. (Standard One states, "The information literate student determines the nature and extent of the information needed." One of the outcomes of this standard is that the student "[c]onfers with instructors and participates in class discussions, peer workgroups, and electronic discussions to identify a research topic, or other information need.")

Coding of the data was begun early during the first phase as a mechanism for organizing the information I was receiving. According to Savenye and Robinson (1996), codes "enable the researcher to manage data by labeling, storing, and retrieving it according to codes…. Codes created depend on the study, setting, participants, and research questions, because the codes are the researcher's way of beginning to get at the meaning of the data" (p. 1186-1187).

With this information as a foundation, I began an electronic dialogue with the 14 students, asking them to expand on answers provided on the survey and to give examples of the general information they had provided. During this phase, five of the original 14 students stopped replying to email queries and were ultimately dropped from the list of participants, leaving nine students who participated in this phase. Again, the results of this dialogue were coded, with the results of the coding helping to shape the questions that were asked during the face-to-face interviews.

Phase Three of the inquiry, consisting of information-literacy interviews with nine students, was begun on Thursday, November 2, and was concluded on Tuesday, December 5, 2000. Initially I intended to select a minimum of six and a maximum of twelve students to be interviewed. My intent was to identify students who appeared to be at both extremes of an information-use continuum and who had demonstrated an ability and willingness to discuss their views with me. I had anticipated that this would allow me to focus my study on the extremes among the student participants while also working with participants who were articulate about their mechanisms for acquiring and using information. However, when there were only nine students who had indicated a continuing interest in the project I resolved to interview all of them.

Interviews averaged about 60 minutes and were conducted in my office in Torgersen Hall on the Virginia Tech campus. I offered to meet the students at places more convenient to them but all chose to come to Torgersen Hall. Questions for the interviews came both from the answers to the questions initially distributed to the students and the subsequent electronic discussion, and from topics drawn from the five Information Literacy Competency Standards for Higher Education (Appendix A). I developed general questions based on these standards, drawing from the information I had received and coded during the first two phases of my study, but also trying to select ideas that seemed most appropriate for first-year students (e.g., questions about knowing when they needed information, information-seeking strategies, sources of and costs for information). The questions also evolved to some extent throughout the interviews, as

there was variation among the students as to their understanding of the components of the standards. For example, some students had used electronic resources extensively during high school while others had only a general understanding of how to use the Internet to find information. As a result, my dialogue with the students varied, depending on how they answered the questions.

In addition, the structure of the interviews was such that the student participants determined the way the interviews developed and so determined the amount of time spent on any given topic. For example, one student wanted to spend time talking about plagiarism; rather than cut him off and move to a new question, I allowed him to pursue that topic for as long as he wanted.

Following the interviews, each student was asked via email to look at the Web-based module on evaluating Internet resources (that had been developed by personnel at the University Libraries) and to comment on the module. They were asked whether the module provided any new information to them and if so, to comment on what that information was. All nine students reviewed the module and sent comments to me.

(Professor Robbins had agreed to schedule this review as part of the students' coursework. She had intended to assign it to all of her students in this section of English 1105 late in the fall semester. However, she had to take personal leave during the last part of the semester and so never did assign this to her students. I therefore asked the nine student participants to review this module independent of any assignment in English 1105.)

On Friday, November 3, 2000, I interviewed Professor Robbins, in her office, for slightly more than an hour. I included in this interview discussion of some of the data collected from the students during the survey and the electronic dialogue. I read to her statements students had made about their information use and asked her to react and respond to them. I also read her some of the questions that I was using in my face-to-face interviews with the students and asked her to comment. In addition, she discussed her understanding of and observations about student perceptions of information-literacy concepts.

These 10 interviews (nine with student participants and one with Professor Robbins) were transcribed between December 5, 2000, and January 5, 2001. All the students and Professor Robbins were provided with notes from the interviews and asked to comment, though only one chose to respond. This was intended as a means for validating the information I had collected. In

several cases, as a result of reviewing the transcriptions of the interviews, I followed up with additional questions via email and received answers from student participants that clarified previous answers.

DEMOGRAPHIC INFORMATION

All nine of the student participants were 18 years old when I made initial contact with them. Eight are from Virginia (though one of the eight had grown up in Europe), one is from Maryland. Six are male and three are female. Four students listed University Studies as their major, one of whom had already decided to switch to computer science. The remaining five listed psychology, international studies, clothing and textiles, engineering, and biology as their majors. I have used pseudonyms in quoting and referring to specific students.

CODING THE DATA

All the data collected was text-based and in the form of questions I asked and answers provided by the nine student participants and Professor Robbins; there were approximately 200 pages of single-spaced text. As explained previously, coding of the data began in September during the first phase of the data collection, when the first email surveys were returned, and was an ongoing process throughout the time data was being collected. The initial coding was intended to help shape the direction of the electronic dialogue and the face-to-face interviews in Phases Two and Three of the study. This initial coding consisted of a fairly quick pass through the data and the creation of very broad categories or themes, e.g., searching strategies, computer literacy, evaluation, and legal/ethical issues.

More detailed and focused coding began in early January 2001, building on the coding done throughout the data-collection period. At this point new coding categories were added so I could sort the data into increasingly specific groups. This was an iterative process, where new coding added to one interview would result in my revisiting interviews I had previously reviewed in order to look at the data using the newly added categories of codes. For example, in the initial coding I had grouped some responses generally in the category of legal/ethical issues; when I went into more detailed and focused coding of the data, I realized some comments could be categorized as focusing on copyright issues and some on plagiarism issues. I added new codes to reflect this. All interviews were reviewed at least twice; ultimately 36 general coding categories (Appendix E) were used with this data. The student interviews plus the interview with Professor Robbins were coded together; however, it was always possible to examine individual interviews

and coding separately, and to identify individual interviewees' comments about any given topic. I used NUD*IST software (from Qualitative Solutions and Research Pty. Ltd) to assist me in the coding process.

As I reviewed the codes, general themes began to evolve. These were topics that came up repeatedly as I worked with the data, the result being that I had a high number of references to these themes. As I worked with the data, I tried to determine intersections, patterns, consistencies and inconsistencies. Some coding categories appeared to be much more significant than others, as the student participants discussed them more frequently. In addition, some of the less significant categories appeared to be components of larger categories; for example there was discussion of general legal and ethical issues related to information use, but there was also specific discussion of plagiarism. The result was a general hierarchy of themes, developed from the topics that the students seemed most interested in.

In addition, themes began to emerge that appeared important to Professor Robbins or to me, but not to the student participants. For example, Professor Robbins talked a great deal about cognitive development, but nothing in what the students said was related to this theme. I was interested in information-literacy topics such as the costs of various kinds of information, but was unable to generate much interest in this topic among the student participants.

SUMMARY OF FINDINGS

Five standards make up the Information Literacy Competency Standards for Higher Education (Appendix A). Attached to each standard are performance indicators and outcomes. From these I derived questions asked of all 10 participants. In the third phase of the study I did not ask these questions verbatim of each participant, but instead tried to tie the questions to answers that they had given during the previous two phases of the study. In addition, I sometimes skipped questions or modified them, based on what I had previously heard from each student participant. In some cases, the student participant made the transition to another question without prompting from me. However, the questions below will provide a general idea of what I asked of the student participants. In addition, I used these questions in my interview with Professor Robbins, asking her to comment on her students in the context of these questions. Also, I asked all interviewees for ideas about the kinds of services the library should provide to students during their first semester at Virginia Tech.

Standard One: The information literate student determines the nature and extent of the information needed.

1. Do you talk with instructors, participate in class or electronic discussions to identify a research topic, or any other information need?
2. Do you explore general information sources like encyclopedias to become more familiar with a topic?
3. How do you go about coming up with a manageable focus for a question or research paper?
4. When you look at resources, how to you go about identifying the purpose and audience of potential resources (e.g., popular vs. scholarly, current vs. historical)?
5. Do you know the difference between primary and secondary sources?
6. How do figure out when you have enough information and when you need to get more? And if you need more, do you have processes and mechanisms for getting it (e.g., interlibrary loan; using resources at other locations; obtaining images, videos, text, or sound)?

Standard Two: The information literate student accesses needed information effectively and efficiently.

7. When you're using an information retrieval system (library database, Yahoo, InfoSeek), have you given any though to how it's organized, the best way to get information from it?
8. How do you search? Do you use key words? Controlled vocabulary? Boolean operators? Proximity searching? Truncation?
9. Do you use different formats of information? How do you get it?
10. Do you use different resources to get information (e.g., interlibrary loan/document delivery, professional associations, institutional research offices, community resources, experts and practitioners)?
11. When you can't find information, what do you do? Do you take a different approach and try again, refine your strategy? Refocus? Figure out ways to fill in gaps? Do it all again?
12. Do you consider yourself a computer-literate person? Do you know how to use computer functions pretty well? Other technologies?
13. How do you organize the information you use?

14. Are you comfortable citing different kinds of information?

Standard Three: The information literate student evaluates information and its sources critically and incorporates selected information into his or her knowledge base and value system.

15. How do you pick out the important parts of what you find and read in order to find the parts useful for you? How do you decide when to paraphrase things and when to quote things – do you have any rule of thumb?
16. I asked this in one of the emails, but I'll ask again. Do you evaluate information you're going to use? What criteria do you use? Do you look for bias, prejudice?
17. Do you ever question the accuracy of the information you're finding? Ever compare information from different sources to see whether one makes more sense than the other?
18. Have you ever tried to contact an "expert" to validate information you're finding?

Standard Four: The information literate student, individually or as a member of a group, uses information effectively to accomplish a specific purpose.

19. Do you do outlines when you're writing something – organize the information you're using in some way?
20. In doing a paper or a project – have you ever kept a journal or log of activities about how you got or evaluated information and then written up what you found?
21. Have you ever considered that a written report is not the best way to convey information – that video or something else might provide a better way to convey information?

Standard Five: The information literate student understands many of the economic, legal, and social issues surrounding the use of information and accesses and uses information ethically and legally.

22. Have you given any thought to privacy and security issues in the electronic environment?
23. How about the idea of information that costs money vs. information that is free?
24. How about copyright issues? Do you use Napster?
25. Are you familiar with Virginia Tech's acceptable-use policy for technology resources?
26. Would you use software that you know has been illegally copied?

27. How about plagiarism – are you confident that you know enough to avoid it?

OVERARCHING THEMES ACROSS ALL QUESTIONS

There were some general themes that have implications for all the questions. For example, though I did not intend to focus on the electronic use of information resources, generally I ended up doing so because of the way the student participants were using information during their first semester at Virginia Tech. They all reported they had little need for any information resources not provided by their faculty members during their first semester, and what they did need they were able to acquire electronically, usually using general search engines. Kathleen, one of the students, commented, “I haven't really done any extra work for any classes. It's basically all … either in my textbook or it's in my notes. I haven't really had to look up anything.”

There was less variation in views and understanding and use of information than my experiences as a librarian would have led me to expect. Most of the student participants seemed to have a similar grasp of how to use electronic resources and similar skills in using information. Their previous instruction in using libraries and information resources was more varied than I had expected, as was their use of libraries during their high school education. Drawing on the literature as well as my library experience, I had expected a certain amount of consistency in how the student participants were introduced to research methodologies. My thinking that they would all have done research or prepared a bibliography and thus have used some basic library resources (encyclopedias, indexes) to do their research was reinforced by the data. However, I was unprepared for the amount of research they reported they had done using the Internet, and how much endorsement they reported receiving from their high school teachers for that method of acquiring information; they all had used the Internet for at least some aspect of information gathering, with encouragement from teachers. All reported little use of indexes and databases and said they found them difficult to use.

There was some waffling on whether they thought everything they needed was available on the Internet; most initially agreed with the idea and then stepped back from the concept, while a smaller number were initially uncomfortable with the idea and then, in a later interaction, more readily embraced the idea. They were split on the idea of needing to evaluate information resources, but those who did so were relatively sophisticated in the approaches they took.

In a fortunate coincidence, all interview subjects had spent class time discussing Napster and its use; that coincidence had implications for my questions about legal and ethical uses of information. (Founded in 1999, Napster was at the time of this study “the world's leading file sharing community. Napster's software application enables users to locate and share media files from one convenient, easy-to-use interface” (Napster, 2001, ¶ 1). Controversy arose because the sharing of the media files was frequently done without permission of the creators of the source materials. Napster’s focus has been on sharing music files, leading to litigation against Napster by the music-recording industry (Band, 2001).) Shortly before my interviews with the student participants began, the topic of Napster had come up in their English class; the resulting discussion was, from all reports, quite animated. For me, that meant I could introduce the idea of legal and ethical uses of information by asking about Napster. Without exception, all the students as well as Professor Robbins had thought enough about the topic to talk at some length about it. I used the opportunity to extend the conversation into discussion of more general legal and ethical issues related to information access, retrieval and use.

RESEARCH QUESTIONS

The clearest way to report the findings of this study is to revisit the five underlying research questions listed in Chapter One and under each question to group relevant themes arising from the data. Discussed under each theme are (a) information about the questions asked of the study participants related to that theme, (b) participant replies and my comments, and (c) the implications suggested for Virginia Tech's University Libraries. The themes addressed in the following pages are:

1. How do freshman students acquire information?
    - Consulting with others
    - Using alternative forms of information
    - Searching strategies
    - Using technology
2. How is information used by freshman students?
    - Search engines
    - Focusing the information
3. How do freshman students make sense of the information that plays a key role in their academic lives?
    - Organizing information
    - Legal and ethical issues (including privacy issues, copyright, plagiarism)
4. What happens to the student processing of information when they are exposed to questions about the role of information in their lives?
    - Prior skills information
    - Changes in how they used information
    - Cognitive development
5. How does exposure to instructional module on evaluating Internet resources change the students' understanding of the need for reliable information sources?
    - Evaluating information
    - Response to module on Evaluating Internet Resources

1. HOW DO FRESHMAN STUDENTS ACQUIRE INFORMATION?

The questions (Appendix B) that I used in Phase One of data collection asked the student participants to reflect on their high school experiences; thus, the initial data I received referred to past rather than current experiences. As the study progressed, I was surprised to discover, as I indicated previously, that there appeared to be little need for students to acquire information to support their academic pursuits during their first semester at Virginia Tech. Therefore, in an effort to have them discuss any way in which they used information, I attempted to introduce the idea of general information needs, asking them to reflect on things like deciding to attend a college, purchasing a car, obtaining information about the presidential election or planning a spring-break trip.

Within the answer to this question, several themes developed as I coded the data, evolving both from the general comments of the student participants and from the Phase Three questions I developed from the Information Literacy Competency Standards for Higher Education (Appendix A). One was how the student participants consult others when they have identified a need for information. Another was the way in which they use alternative forms of information. A third theme developed around the strategies employed by the student participants to find information and to focus on the information that was needed. As noted earlier, the class discussion of Napster resulted in rich dialogue on legal and ethical issues related to information seeking. An additional theme was how students use technology in their acquisition of information.

Consulting with others

Questions

One question I asked in the interviews was whom the student participants consulted when they need information. This question was derived from Standard One of the Information Literacy Competency Standards for Higher Education that states: “The information literate student determines the nature and extent of the information needed.” One performance indicator for this standard is: “The information literate student defines and articulates the need for information.” An outcome for this is: “Confers with instructors and participates in class discussions, peer workgroups, and electronic discussions to identify a research topic, or other information need.” The questions I asked included “Do you talk with instructors, participate in class or electronic

discussions to identify a research topic, or any other information need?" and "Have you ever tried to contact an 'expert' to validate information that you're finding?" All the student participants indicated that they did consult with others regarding their information needs, though only two seemed comfortable with the idea of contacting an "expert" to validate information they were finding.

Replies, Comments and Implications

Damien put it most succinctly when he said he consulted "[r]oommates, classmates, friends, my parents, teachers," and all said they frequently discussed their information needs with others. Greta said her primary source of information was her parents and even her roommate used Greta's father as a resource:

> "That's just the easiest. They know, I guess they know what's best and [what] I'm exactly looking for, like... I just bought a car right before I came to school, and they were, they were the ones who helped me through that process. That was really confusing. And I did start on the Internet for that, trying to find exactly what I wanted, who had the best deals, whether it was safe to buy from private or from a dealer. And actually, my roommate is taking philosophy and she's been having a hard time, and my Dad has emailed her pages and pages of information and explanations."

Peers were Sydney's first source when looking for information. She said, "Usually I talk to some of my friends in the class, and we kind of go on the Internet together and figure out where the information is."

I asked whether they talked to so-called experts when they needed information, either in person or via email. Usually when they had gone to an expert, it was because they had been told to do so as part of a class assignment. Kathleen had interviewed a couple whose daughter had been killed by a drunken driver for a paper she had written during her junior year in high school. Mark had written a paper in high school on Title IX funding for student athletes, but when I asked whether he had considered trying to locate someone who was familiar with this kind of funding, he said it was too much work for a paper.

Eric was the only student who said he frequently contacted so-called experts he had located on the Internet: "I have to ask them about more specific things about the topic, [tell] them that I have seen their Web page, can I take parts for a project, and then if there is some other

information from them." He indicated that "pretty much everyone" whom he had contacted had replied to his email queries. The rest of the student participants indicated a reluctance to contact Web-page authors, though they all said that they would do it if it were part of an assignment. Additionally, all but Eric seemed surprised by the idea of contacting someone that they had located via the Internet. Damien was the only student who seemed intrigued by the idea and willing to entertain the notion of contacting someone even if there were no assignment: "If I really had a problem with something, or I had a question about something, I just could not get it off my mind, [that] kind of thing, then I would. It would be kind of an exciting thing!"

Though all of the student participants reported that they consulted with others when acquiring information, none seemed to include library personnel among those they consulted. This suggests that library personnel need to work at being identified by students as part of the student support group for information, since this omission suggests that students are ignoring or are unaware of library resources as they look for information. Professor Robbins talked about this in the context of the traditional library tour. She also talked about students being "very afraid of the library…," an idea confirmed by Greta who confirmed that students are intimidated by the library: "It's just bigger than any one I've ever been in. It's kind of overwhelming."

Herrington (1998) has posited a library instruction model of the future that would encourage a certain level of self-sufficiency among library users. However, that model will be difficult to achieve if students are not even considering the library as a component of their information-support network, and indeed find it overwhelming and intimidating.

It will require effort on the part of the University Libraries to be viewed by students as part of their information-support network. Library personnel need to make this effort by being included in university-wide orientation activities and tours, and by providing students with information about resources and access that encourages students to view the University Libraries as a part of their information-support network, rather than a place to go only when assigned.

Such involvement would support several performance indicators of the Information Literacy Competency Standards for Higher Education (Appendix A), including "The information literate student defines and articulates the need for information," "The information literate student re-evaluates the nature and extent of the information need," and "The information literate student constructs and implements effectively-designed search strategies." In addition, a number of outcomes of the Information Literacy Competency Standards for Higher Education would be

addressed by having the University Libraries more integrated into the orientation activities of the University.

Using alternative forms of information

Questions

Drawing from the Information Literacy Competency Standards for Higher Education (Appendix A), I asked the student participants if they ever used non-written forms of information such as video or audio. This question was derived from Standard One of the Information Literacy Competency Standards for Higher Education, which states, "The information literate student determines the nature and extent of the information needed." One of the performance indicators for this standard is: "The information literate student identifies a variety of types and formats of potential sources for information." An outcome for this is: "Identifies the value and differences of potential resources in a variety of formats (e.g., multimedia, database, Website, data set, audio/visual, book)." Questions I asked included "How do you figure out when you have enough information and when you need to get more? And if you need more, do you have processes, mechanisms for getting it (e.g., interlibrary loan; using resources at other locations; obtaining images, videos, text, or sound)?" and "Do you use different formats of information? How do you get it?" The idea of using information derived from video and audio to meet information needs seemed to puzzle all but two of the students. All indicated they were comfortable with using alternative forms of information, but only two seemed comfortable with the idea that these formats could possibly be used as support material for a research assignment.

Replies, Comments and Implications

Mark replied quite pithily, "A picture is worth a thousand words. That's all I have to say about that." However, he then went on to say that he couldn't imagine how one would actually use a picture in a research project, though he seemed to find the idea interesting. Kathleen recalled a video project she had done in middle school, but said that the only reason she'd used video was because she thought it would be easy to do, even though, "…in reality, it was probably the hardest way!" Greta said she had used tapes of news shows on occasion:

> "…I watch the news a lot, like Peter Jennings or Tom Brokaw or something like that – and 20-20, basic stories on anything. And you can actually… I've ordered tapes through

> the Internet…or you can call into the television station, and be like, 'I want that. Can you send me the tape of that edition, such and such?' And it's not too bad. And they send you the tape. So I've done that a couple of times."

Jeremiah appeared uncomfortable with the idea of using audio or video to support an argument: "I don't like to use those too much. I'm not that good at them… that's not my strong point at all. Yeah, I usually just fall back on the old written word." However, he seemed to be very comfortable with the idea that his "written word" would come from a Web site. When I asked him about using information from, for example, television, he agreed that he might but went on to say that "…more and more it's going to be the Internet."

Eric, who overall seemed to have the most technological expertise, seemed to have some difficulty in thinking beyond Web sites as the context for his data collection. He had considered using audio and video but apparently only in creating Web pages, so it is in that context that he talked about looking on the Internet for animations to use.

The implication for the library appears to be in helping students think about how information is delivered and in assisting them in locating alternative sources of information that could be useful in supporting an argument or a research project. Karelse (1999) talks about information literacy providing libraries with an opportunity to teach added-value skills and this situation – where students seem to have a limited sense of how to use audio and video resources to address information needs – appears to be just such an added-value situation. This kind of instructional scenario is peripheral to what has traditionally been offered by libraries. However, teaching students how to locate and use these kinds of resources addresses several Performance Indicators of the Information Literacy Competency Standards for Higher Education (Appendix A), including "The information literate student identifies a variety of types and formats of potential sources for information," and "The information literate student extracts, records, and manages the information and its sources."

Searching strategies

Questions

Drawing from the Information Literacy Competency Standards for Higher Education (Appendix A), I asked the student participants how they located information. This question was derived from several standards and several performance indicators for the standards of the

Information Literacy Competency Standards for Higher Education. Outcome for these include: "Defines or modifies the information need to achieve a manageable focus," "Selects efficient and effective approaches for accessing the information needed from the investigative method or information retrieval system," and "Constructs a search strategy using appropriate commands for the information retrieval system selected (e.g., Boolean operators, truncation, and proximity for search engines; internal organizers such as indexes for books)." Questions that I asked included, "When you're using an information retrieval system (library database, Yahoo, InfoSeek), have you given any though to how it's organized, the best way to get information from it?" and "How do you search? Do you use key words? Controlled vocabulary? Boolean operators? Proximity searching? Truncation?" and "When you can't find information what do you do? Do you take a different approach and try again, refine your strategy? Refocus? Figure out ways to fill in gaps? Do it all again?" All the students appeared to have a basic grasp of how to find information, but had trouble thinking beyond keyword searching. Only one student seemed familiar with more advanced ways of seeking information electronically. All seemed to have trouble with the concept of refocusing a search strategy after reviewing information received from an initial search.

Replies, Comments and Implications

The discussion of how the student participants located information – the strategies and tools they used – was particularly fascinating. All seemed to approach information gathering with a predetermined viewpoint they were looking to support, as opposed to having a topic that they were trying to explore broadly. It is difficult for me to know whether this is a function of the kinds of assignments they had encountered during high school and the early part of their first semester in college, or if it was part of their cognitive development to which Professors Robbins referred several times.

For the most part, the student participants used one word to search the Internet, trying to locate arguments that supported their viewpoints. I asked all of them about using more than one word and stringing the words together using AND or OR (in other words, using Boolean operators to create a more targeted or complex search). Though all seemed aware of this way of trying to focus a retrieval, most indicated that they tried, whenever possible, to use just one word, adjusting that one word until they came up with the kind of retrieval they were looking for. They

appeared uneasy with the idea of using the Boolean AND or OR. Hal expressed real reservations about the effectiveness of using AND or NOR (his choice, not mine): “I don't usually use NOR ‘cause if you type in AND or NOR you'll get, like, articles… [that] have AND and NOR and it won't have anything to do with it – with the topic that you're searching for.” Though his was perhaps the most extreme response, the idea of how a search engine would use the Boolean connectors appeared to be a concept with which they were not completely comfortable.

They also appeared to prefer to use one word to find information, stringing words together only when the one did not result in the kind of retrieval they needed. Shortly before we talked, Sydney had been searching the Internet for pictures of volcanoes. She started her search using the word VOLCANOES and was dissatisfied with what she got back. She said she found pictures with inadequate descriptions. She said she had asked a friend to help: “It was kind of like I did VOLCANOES, and then [after consulting with a friend] did VOLCANIC ERUPTIONS, and, um, I just changed the words around… just to see how much information I can get.”

Mark indicated that the idea of using more than one word was something that he was just beginning to experiment with: “Yeah, I just learned about that. So, like, I didn't know about that until this year. It would be much more helpful researching information, because there's a word there and a word over there, that both have to do with my topic….”

Greta was among the student participants who appeared most comfortable with the idea both of putting together words and of using Boolean operators, indicating that she frequently used that strategy for locating information because “if you get more specific in your broad topics, then they [the search engines] tend to get the idea of exactly what you're looking for.” Hal commented that he sometimes used a plus sign between two words when trying to get a more targeted retrieval. Eric and Roy also seemed reasonably comfortable with this approach and additionally talked about using quotes to combine words into a searchable phrase.

One approach I had never encountered was that used by Damien, who used slashes instead of Boolean operators to combine words. “I try not to use ANDs or ORs. I use slashes.” When I asked him to explain why he thought this a good approach he said: “Maybe it's because when I read things I always think that's like HIS OR HER. Like on permission slips? It's like, ‘My daughter has…his SLASH her parents' permission,’ and so I always thought that that was, like... like whichever you can find is good! FERMENTATION or ALCOHOL.”

Discussion of how the student participants identified useful Web sites suggested that, in their eyes, it is largely a process of finding Web sites that agreed with their predetermined viewpoint. In other words, the student participants were not looking for new information but were instead looking for information that supported what they already knew or believed.

Hal was the first student I interviewed and his approach, though interestingly new to me, was subsequently endorsed by the remainder of the student participants. I had asked him how he determined the reliability of a Web site that he intended to use, particularly if it said something completely the opposite of another site he had located. He said, “If that happens I'll just, I'd go to another source, or another Web site.” I asked if this meant that he was now looking at three Web sites and using the information on the two that were in agreement. He replied, “You know, like getting another doctor's opinion, that sort of type thing. I would just, you know, if another one compared with the other one, the third source compared with the first and second, and I would go with that one.” Kathleen said much the same thing: “Two makes it right. Two makes it better than one would make it, if one were against the other. If I found, like, five things that said one date, or something… and another said another date, I'd pick the one that said five.” Greta agreed: “I think I'd try to find a third or a fourth [site] or go to another source and see. Um, if they're obviously contradicting each other I… can't go with one or the other. I don't know which one… is true. So I'd definitely go to other sources.” Mark was the only student participant who suggested that he might try to locate original information, or “…go to the source of what you’re looking at.” For the rest of the student participants there was a sense that two Web sites with the same information meant, for them, that the information was true and therefore something they were comfortable using. (Addressed later in this chapter is the question of how they determine the accuracy of the information they are locating.)

Another topic that was raised was why, other than convenience, the student participants were using Internet resources instead of print resources. Damien noted that a paper on the human genome project necessitated using electronic resources because of the issue of currency: “In our English paper [in high school], we used the Internet so much… because it was on, like, genetic engineering, and the human genome project. And with something like that that's… being updated so quickly, it's, like, books being published are out of date before they even get to the shelves.” Jeremiah talked about being careful when using electronic resources for debate statistics: “We often had to research debate topics on the Internet and when it came down to statistics and facts,

the other side would always fight over the authenticity of the information. Sometimes theirs would be more believable than mine, and sometimes the other way around. This is why I started paying more attention to where the pages came from."

When the student participants talked about books, I did wonder whether they were doing so because they thought I expected them to. For example, when I asked him where he looked for information, Jeremiah started by saying that he went to books, but "not lots of books, Internet, um, sometimes I can get stuff out of the newspapers." My sense was that he only said he started with books because he was trying to say what I expected him to say. Eric pondered and said, "Once I had to find a book about an old poet, so I used the index of my school library to find it." Again, I think he was saying what he thought I wanted to hear.

Greta said she always started her information searches with the Internet but "if I can't find it well enough on the Internet I do go to books. Because books… they're straightforward." Damien said something similar: "And looking for something in English, sometimes it is just looking for, like, a needle in a haystack. It is just easier, like, the search engines – it doesn't narrow your search, it doesn't narrow it all down quick enough, or further, far enough for you to find what you're looking for. And sometimes it makes it easier to go to the library and look up a book that you know, like on a general subject that you know is going to be there, and you're going to find your information." But all of the student participants indicated that the majority of their information needs could be met using the Internet.

The implication for the library appears to be to provide instructional support to students, regardless of their methods or means of locating information. The "cereal syndrome" discussed by Oberman (1995) supports the idea that vast amounts of information (like the extensive variety in choices of cereals) leave students floundering in their quest for information. She and Gibson (1995) both talk about the critical-thinking skills that students need to develop. This is an instructional issue for library personnel who must accept the idea that students are looking for information in a variety of ways, using a variety of resources. This approach to information acquisition on the part of students requires that library personnel include in instructional sessions information about how to get to a variety of resources, including those that may not be quality-filtered and may not be provided by the University Libraries. This instructional support could be provided either in classroom sessions or via web-based modules.

This kind of instructional session would help to address several performance indicators in the Information Literacy Competency Standards for Higher Education (Appendix A), including "The information literate student selects the most appropriate investigative methods or information retrieval systems for accessing the needed information," and "The information literate student constructs and implements effectively-designed search strategies."

Using technology

Questions

Drawing from the Information Literacy Competency Standards for Higher Education (Appendix A), I asked the student participants about their uses of technology. This question was derived from the third standard of the Information Literacy Competency Standards for Higher Education, "The information literate student evaluates information and its sources critically and incorporates selected information into his or her knowledge base and value system." Two outcomes for this standard are: "Participates in class-sponsored electronic communication forums designed to encourage discourse on the topic (e.g., email, bulletin boards, chat rooms)" and "Selects among various technologies the most appropriate one for the task of extracting the needed information (e.g., copy/paste software functions, photocopier, scanner, audio/visual equipment, or exploratory instruments)." In general, I was trying to understand the level of computer skills of the student participants and the questions that I asked were "Do you consider yourself a computer literate person?" and "Do you know how to use computer functions pretty well? How about other technologies?" Half the students considered themselves computer-literate and could, in the interviews, talk about computer functions in a way that seemed to support this. However, all the students had enough technology skills and experiences to do all of the computing that was required of them as part of their course work.

Replies, Comments and Implications

Professor Robbins referred to her students in general as "pretty computer savvy" and all of my interactions with them reinforced that on a basic level. In questioning them about their computer skills, only Sydney was quick to say unequivocally that she was not computer-literate, but as we talked she indicated that her problems were usually with fixing things that went wrong rather than managing basic functions: "[S]ome of my friends come in when my computer goes

wrong and open all these windows and fix all the programs and my mouth kind of drops. I don't know. There's so much that you can do on a computer that I have no idea." Her perspective was probably colored also by the set-up problems she had had with her new computer. (When I asked her what kind of computer she had purchased she replied, "The wrong one," and went on to talk about her problems getting the machine to work, referring to it as "the worst computer.")

Mark talked about *sometimes* being computer-literate: "Depends on if the computer likes me! It gets upset sometimes." But he conceded that he does consider himself fairly adept at using his computer. Damien talked about technology use in a similar way: "I can use everything on my computer. But when I get on someone else's computer I am just so lost!" Jeremiah talked about his dislike of computers in one of his emails to me, but in following up with him it turned out that what he was particularly dissatisfied with was using computers to learn math. As I emailed back and forth and then talked with him and the others, most were uncomfortable with the math classes using computers, though what they referred to most frequently was having to do the class work with limited formal structure. Eric seemed most confident of the student participants, talking about disassembling computers and about part-time jobs he had held working with computer technology: "I've had different jobs for the last year. But computer stuff and everything – I know pretty much everything about it." My general impression was that all the student participants had good basic skills and were reasonably comfortable doing what they had to do with their computers, and that several were in the process of exploring what more was possible.

In her discussion of the changing nature of library instructional services, Dupuis (1998) looks at how "children's lives and activities are juxtaposed with technology" (p. 13). The student participants in this study talk about that juxtaposition when they discuss the ways that they're using the technology available to them. For the University Libraries, this provides an opportunity to work with students on using technology more efficiently, which may then translate into an ability to use library resources, particularly those that are electronically delivered, more efficiently. The University Libraries could address this need by offering a series of short classes on such topics as using and managing email, and learning to use technology efficiently. Students would improve the ways in which they use technology available to them. An added benefit to the library could be realized in making a connection in the sessions between the session content and its relationship to quality-filtered resources provided by the University Libraries.

This kind of instructional offering would help address several of the performance indicators identified in the Information Literacy Competency Standards for Higher Education (Appendix A), including “The information literate student retrieves information online or in person using a variety of methods,” “The information literate student articulates and applies initial criteria for evaluating both the information and its sources,” “The information literate student understands many of the ethical, legal and socio-economic issues surrounding information and information technology,” and “The information literate student extracts, records, and manages the information and its sources.”

2. HOW IS INFORMATION USED BY FRESHMAN STUDENTS?

This study was intended to help me design library instruction for students who are new to Virginia Tech. As a result, one of my research questions was how students use information to support their academic pursuits during their first semester at the university. As indicated previously, it appears that there is little need for students to acquire information to support their academic pursuits during their first semester at Virginia Tech. All the student participants indicated that they had little need to look at information outside of what they were provided by the faculty members in their assorted courses. Even when there was an assignment that required the preparation of what Roy called a research paper, he went on to say, "My TA provided us with a couple of good Web sites to search for material…." This lack of need for information related to their courses led me to introduce the idea of general information needs.

Several themes developed as I coded the data: using information found by using search engines, the role of computer literacy in using information, and how the students go about focusing on the topic of a search for information.

Search Engines

Questions

Using questions derived from the Information Literacy Competency Standards for Higher Education (Appendix A) I asked the student participants about their uses of Internet search engines. This question was derived from the second standard of the Information Literacy Competency Standards for Higher Education, "The information literate student accesses needed information effectively and efficiently." An outcome for this standard is: "Implements the search strategy in various information retrieval systems using different user interfaces and search engines, with different command languages, protocols, and search parameters" In general, I was trying to understand how the students use search engines to find information; the question I used to try to get at this was, "How do you search? Do you use key words? Controlled vocabulary? Boolean operators? Proximity searching? Truncation?" The searching *strategies* used have been covered previously; this section looks only at the search engines used. Though I initially thought that all the students were using Yahoo for their searches, the interviews revealed that they generally used several different search engines.

Replies, Comments and Implications

Sydney, Kathleen, Greta, Mark and Damien all said that they were Yahoo users. Hal said that he usually used either Yahoo or InfoSeek. Jeremiah usually used Dogpile, Eric usually used MetaCrawler, and Roy said he used MetaCrawler, AltaVista and AskJeeves.

Of the Yahoo users, two came up with explanations of why Yahoo was their search engine of choice. Greta said: "I had another email account through Yahoo. And when you open up your Yahoo mail it goes right to a search key. And you can, like, you know, you can go right to searching for different topics and stuff. So I just had the key there...and it was really easy." She also went on to say, "I understand how it [Yahoo] works the best." Kathleen's explanation was similar, referring back to her high school experiences: "When I did use the Internet I mainly went through the search engine, Yahoo. I used this search engine because it was the easiest for me to use and remember."

Jeremiah offered an explanation of why he used Dogpile. "It's dogpile.com. And you go on it and it's, it gets the top 10 results from 15 search engines. [I]t will search the search engines and it'll get you the top 10 from 15 search engines. I like to use that a lot."

I asked Eric about whether he had given any thought to the way MetaCrawler is organized. He replied that he had "talked to the owners of MetaCrawler" about exactly that. When I asked him why, he replied that he had wanted people to be able to find *his* Web pages using MetaCrawler, so he had contacted them to find out how they organized their search engine.

Roy was the only student who said he regularly used more than one search engine. "I use different search engines. I've found that, like, MetaCrawler, that one's pretty good. And Alta Vista – I like that one. And then I like, also use, the AskJeeves.com - I like that. So if I use all of those, it helps me find [information] more specifically. Because they give the more specific ones first...." When we talked about why he used AskJeeves, he replied, "Cause I can form it in a question and Jeeves will answer the question and then it gives some results, like some Web pages with things coming in...." I then asked about MetaCrawler and he replied, "MetaCrawler, I know, it searches a bunch of different search engines, which, like, I know gets results from a bunch of different places."

Professor Robbins also talked about search engines in my interview with her:

I think most of them start by putting in subject searches into someplace like Yahoo. [M]ostly they start off with…things that we see on television now – msnbc.com, and

> stuff like that. I think they start off that way, which is fine! That's a real huge general way to start. [T]here's a couple of vocabulary words in their head that they can try elsewhere too. They start there and then they'll come back with question, typically to me, or also then start over to the library.

Professor Robbins' comments crystallize what this means for the libraries. A connection needs to be made between starting to look for information using search engines and then taking that quest to quality-filtered resources, such as those provided by the University Libraries. Dupuis (1998) talks about the need to "tune into our students' culture, interests, and experiences" (p. 11) in thinking about the instructional services that libraries are providing. The student participants in this study reinforce that idea when they explain the ways that the find information, since many of their strategies do not follow ways that librarians think about finding information. Strategies to improve an information retrieval from general Web sites using generic search engines need to be conveyed to students.

The University Libraries should provide instructional support on developing searching strategies that can be used in accessing information from either generic search engines or quality-filtered resources provided by the University Libraries. This support could be provided either in classroom sessions or via web-based modules.

This kind of instructional session would help to address several performance indicators in the Information Literacy Competency Standards for Higher Education (Appendix A), including "The information literate student selects the most appropriate investigative methods or information retrieval systems for accessing the needed information," and "The information literate student constructs and implements effectively-designed search strategies."

Focusing the information

Questions

I asked all student participants to think about how they focused on an information need. This question was derived from Standard One of the Information Literacy Competency Standards for Higher Education that states: "The information literate student determines the nature and extent of the information needed." One of the outcomes for this is: "Reviews the initial information need to clarify, revise, or refine the question." I asked student participants, "When you can't find information what do you do? Do you take a different approach and try

again, refine your strategy? Refocus? Figure out ways to fill in gaps? Do it all again?" With two exceptions, the students indicated that they start with a fairly broad focus in their search for information, and then close in on something much more focused; they used several techniques for focusing.

Replies, Comments and Implications

Sydney and Eric were the two students who talked about having a fairly focused idea of what they were looking for before they began their search for information. Sydney said, "I try and start specific, just like the volcanoes. [W]hen it was too broad it was too hard to find things. But then when I went to really specific I found exactly where I needed to go. I usually make sure I know from the professor or from other students, like, what the assignment is and what we need to do. So, once I start working on I can just go…." Eric's ideas were similar; a high school paper on Hamlet was his example.

The rest of the students talked about always having too much information and then having to narrow the scope of what they were looking for. Kathleen offered an explanation of what she does: "And then just, I guess, you could say, that I looked in the broadest sense of everything that I could consider about it [the topic], and then I wrote my first paper. And my first paper, when I was re-reading it, I realized that it just had so much in it that, like, I would have to break it down and so I broke it. It had three different parts that I was, like, considering for popular culture, and I broke it down to one." I asked her how she had managed to focus her topic and she replied, "I guess I look at what I'm trying to say and what pathways I can take with my thesis, and see which one I'm going to be able to get the most out of what I can get at least, like, in a typical paper, at least three good solid paragraphs that have, like, individual examples for each thing."

Greta's responses were similar: "I tend to start pretty broad and actually, I will end up starting my paper pretty broad and finding my mistakes and having to go back and really narrow it down. Professor Robbins is constantly having to say, 'Narrow your thoughts, narrow your thoughts.' Cause I'm focusing too broadly…." She offered, later in the interview, as we talked about searching strategies, "Well, I think, for me… you type in a subject that you're looking for, you type in pretty broad and see what they [the search engines] come up with, and then you go narrower and narrower until you actually get to the main point that you're trying to find."

Damien had an example that he offered on a paper that he had written on fermentation: “I started really broadly, because fermentation can cover so many different things. And we were doing alcohol, it's like, we're seeing alcohol in wines, natural aged wines, and then, like, manufactured wines.” He went on to report that he eventually focused on why naturally fermented wines cost more, with a starting point of simply fermentation.

Choosing a topic that was of interest seemed also to help the students focus. Mark said, “I try to, like, if I have a paper, on like a broad topic, and I can do anything I want, I'll choose something that I know….” This was a view expressed by several of the student participants – that a topic that interested them made it easier for them to focus.

Professor Robbins also talked about her students and their ability to focus a topic:

> I think that they start to realize, once they start with their research, that there's no end to it – that there's tons and tons of information and what they have to figure out is a focus, and an avenue, of how they're going to pull their information together to best suit that assignment… [W]e talk a lot about ‘the more that you find, the more you realize what you don't know, and the more you find the more you realize there's more out there.’ I've had a lot of students say, ‘Now, I started off with this, you know, five page requirement and its already ten pages because I'm finding so much neat stuff. And where do I stop?’

She offered a view that this process gets easier for the students as they are required to do it more, and that they eventually understand that a required product (e.g., a paper, an assignment) must be focused in order to be deliverable.

Professor Robbins also offered interesting insights into the process of students’ acquiring information:

> [T]hey haven't been required, most of them haven't been required to, to look up stuff on their own. And, you know, it's different when you have a child with asthma and you research asthma as much as possible. So they haven't hit those points of necessity and yet, you'd think that they would all come to school to learn and to know that there's things out there, that they could start, that they would seek out their interests. But, between the idea that you pay for school and therefore school has to give you something back, and you've got a right to it – that idea and also the idea that they're young – I think those two things are keeping them from, you know, feeling like they need to go out and seek information.

> I think it starts to happen a lot more in [English] 1106 – where they realize, wow, this is a resource I can research anything for myself.

One of the most common problems encountered by librarians in public-service positions at the University Libraries is assisting students in focusing a topic to something manageable. The identification of this as problem by library personnel is confirmed by my discussions with the student participants. A solution might be a combination of training for librarians in facilitating this process, as well as collaborative work with faculty members on how to best assist students, resulting in less frustration for both students and librarians.

Several techniques for focusing a topic are offered by Kuhlthau (1994) and by Joyce and Tallman (1997). For example, Kuhlthau discusses how students can "explore several possible choices and… [decide] on the one that seems to promise the most successes" (p. 80). Joyce and Tallman talk about how students "revise their research questions and refine their focus" (p. 33) by developing questions to ask and by identifying key words that will help answer those questions. Assistance with this process could be offered in several different ways. It would be beneficial for library personnel to be aware of these techniques, to learn to use them, and to attempt to include them in instructional sessions, when appropriate. These techniques could also become part of the assistance offered to students at the libraries' public services desks. In addition, library personnel could work more with faculty members as research assignments are designed and suggest ways to include this kind of support in the assignment instructions and design.

3. HOW DO FRESHMAN STUDENTS MAKE SENSE OF THE INFORMATION THAT PLAYS A KEY ROLE IN THEIR ACADEMIC LIVES?

A component of this study is trying to understand how the student participants make sense of information. This was an area that was difficult to get to. As stated earlier, it appears that there is limited need for students to acquire information to support their academic pursuits during their first semester at Virginia Tech. However, we did discuss how they organize information they need and we did review some of the legal and ethical issues related to information, which address this question to some extent.

Organizing information

Questions

I asked all student participants to tell me how they organized the information they used. We emphasized electronic means of organization because, as mentioned previously, they seemed to think almost exclusively in terms of electronic information. This question was derived from Standard Two of the Information Literacy Competency Standards for Higher Education that states: "Standard Two: The information literate student accesses needed information effectively and efficiently." One of the performance indicators for this standard is: "The information literate student extracts, records, and manages the information and its sources." An outcome attached to this standard states that the information literate student "[c]reates a system for organizing the information." The question I asked was, "How do you organize the information that you use?" I usually asked it in the context of information that the student participants were using for class (e.g., Web sites, email, papers written, and other artifacts used for classes). There was a wide continuum in how the student participants organized information on their computers, ranging from no organization whatsoever at one end to fairly sophisticated filtering and filing at the other end.

Replies, Comments and Implications

Four of the students indicated that they did no systematic organizing of the information on their computers. In talking about class-related email, they indicated that they printed anything that was important and kept paper copies. Sydney said that she had no idea how to make folders to sort her email but seemed interested in the concept. Jeremiah said that he had no way that he

systematically organized information for courses, but that he had organized all of the music files he had downloaded. Kathleen kept a floppy disk for each class and sorted her information by disk. Hal and Roy created folders for different classes and purposes. Hal specifically mentioned folders for all his music files. Roy commented, “On the computer… I have, like, a folder for each class. I'll put stuff in. Like English, I have so many different writings, so I have like a new folder for that, for everything else.” Eric was the one student who not only had files for each class but who was also filtering incoming email into separate mailboxes, by class.

A recommendation made by Dupuis (1998) that librarians be more attuned to the environment in which students are operating is reinforced by the discussion of the student participants on how they organize electronic information. If students are most concerned with keeping track of information that is being used for entertainment, then it might be most effective to offer students sessions on using the technology in ways that are relevant to them, including how to use email efficiently and how to organize music files. Technology skills sessions have, in the past, been offered collaboratively by personnel from the University Libraries and from the Computing Center and they provided an overview of how to use general computing resources, including efficient use of email. They were eliminated in fall 2000. However, it appears that there is still some need on the part of students to have better skills in organizing electronic information on their personal computers. Resurrecting these classes might be beneficial for both students and library personnel, particularly if a connection could be made between the session content and its relationship to quality-filtered resources provided by the University Libraries.

This kind of instructional series would help address several of the performance indicators identified in the Information Literacy Competency Standards for Higher Education (Appendix A), including “The information literate student extracts, records, and manages the information and its sources.”

Legal and ethical issues

Questions

As mentioned previously, Napster had been discussed during one of Professor Robbins’ classes and that offered me the opportunity to use Napster as a point of departure when talking about legal and ethical issues in the use of information. Standard Five of the Information Literacy Competency Standards for Higher Education states: “The information literate student

understands many of the economic, legal, and social issues surrounding the use of information and accesses and uses information ethically and legally." Included are performance indicators that address copyright issues, legal issues, plagiarism and privacy issues. Questions that I asked included, "Have you given any thought to privacy, security issues in the electronic environment?" and "How about copyright issues? Do you use Napster?" and "Would you use software that you know has been illegally copied?" and "How about plagiarism – are you confident that you know enough to avoid it?" Because of the in-class Napster discussion I was able to get all the student participants to talk about all of these topics.

Replies, Comments and Implications

Four student participants seemed to have given some thought to privacy issues. A fifth who said initially that she'd never thought about it proved to actually have it given some thought once we began to discuss it. Sydney initially said that privacy and security issues had never crossed her mind, but then went on to talk about her use of Instant Messenger: "Yeah, I never sign off. If I'm doing something I put up *I'm Away* message so I don't miss out." I asked whether she did so even when she wasn't in her room and whether that didn't open up the possibility of others using her computer and representing themselves as her. She replied, "Yeah, that's happened a few times, where I've come back and my friends have been upset with me, and I don't understand why. And they're, like, 'You talked to me like this' cause some of my roommate's friends come in a lot when I'm not there. And they get on my computer. And that doesn't really bother me, but it did bother me when they started going on [the computer under] my name and talking to people just to make them mad. And I came back and figured out what they were doing." I asked if that was going to change the way she used her computer; she replied it wouldn't "[b]ecause they usually figure out that it's not me, because I don't talk like that or that I wouldn't, like, all of sudden be like, 'Hey, I'm not talking to you now.'" The other four students indicated that they had never thought about privacy issues and seemed unconcerned about the implications of information being transmitted in an insecure environment.

The discussion of copyright revolved around the use of Napster, though it didn't focus exclusively on it. I asked all of them whether they used Napster; as they discussed it, all talked about copyright and using illegally copies of software with little prompting from me. They all, in varying degrees, differentiated between using something that was written and using things like

software or music. They all recognized that the written material was covered by copyright and shouldn't be used without permission and/or citation. But there was much more diversity of opinion when it came to using illegally copied software or downloading music using Napster. The "poor student" argument surfaced several times. Damien, when asked whether he would use software he knew had been illegally copied, replied, quickly,

> "Yeah…it makes me seem like a bad person that I answer that so quickly, but it's, if I need something and it's there, then, as long as I feel like it's not, like, really, really bad, you know, if it's – I don't even know how to explain this! [S]omeone had to pay for it, you know, and as long as it was paid for somehow, then, by someone… Like, my roommate, I used his Office 2000 on my computer, and I know that you really shouldn't do that, but, cause, like, I really needed that, I needed to have Excel on my computer and I didn't have that program, and I didn't have the money to go out and buy it, so, and, my roommate was, like, 'Here, you can just use mine.' And so I did…."

Damien also justified his use of Napster by saying that he was a poor college student and couldn't afford CDs. Mark differentiated between illegally copied software that was for recreational purposes and software that he needed for a class, saying that he would buy the recreational software but would use someone else's copy of the required software.

Kathleen was the only student who clearly considered use of Napster an ethical decision, though she originally said she didn't use it because it was too much trouble. As we talked she focused on the ethical concerns: "I know about Napster and I listen to it [on a roommate's computer], but I'm not one to download it onto my computer because there are ethical issues to me, I guess." I asked her about her statement about not wanting to be bothered and she replied, "I don't want to be bothered, but it's also that I don't want to be bothered by the guilt of doing it. I guess I'm making up excuses of not wanting to be bothered by it…."

We also discussed plagiarism and, with one exception, all of the student participants seemed to know what it was and what they needed to do to avoid it, and to have a strong commitment to avoiding it. The primary reason for this seemed to be fear of getting caught. Two of the student participants talked about having been charged with cheating in high school; though both were ultimately cleared, both seemed committed to not ever going through that experience again. Kathleen spoke for most when she said, "I'm too afraid of the consequences of plagiarism! They've been drilled into me for so long! So I wouldn't do it." Hal also spoke for them when he

said, "…I wouldn't do it, just because, there's always the chance of getting caught – it's not worth the risk." Mark was the only student who admitted he'd plagiarized several times, describing what he did as not using quotes and instead presenting ideas as his own. He also said, "I know it's bad, I know you can get kicked out of school, so I'm not going to do it [here]."

Writing in 1985, Breivik talked about legal and ethical issues related to information use only in the context of citizenship – that information literacy skills would serve to support an student's developing role as a good citizen; Doyle (1992) reinforced the notion of information literacy supporting good citizenship. However, it's Marchionini (1999) who brings together several ideas related to information seeking and information literacy and identifies the "responsibilities of citizen's in an information society" to include "giving credit and paying required fees (acknowledging sources, avoiding software and information piracy)" (p. 25).

Though the student participants in my study appear to have a fundamental understanding of legal and ethical behavior as it relates to information use, it would be beneficial for the University Libraries to reinforce that behavior, particularly as an integral component of information literacy skills. Fundamental is teaching how to appropriately cite information. In addition, there seems to be a lack of awareness of the some of the privacy issues related to technology use and both of these topics could be included in library instruction session.

Including a component on legal and ethical uses of information in instructional sessions would help address several of the performance indicators identified in the Information Literacy Competency Standards for Higher Education (Appendix A), including "The information literate student understands many of the ethical, legal and socio-economic issues surrounding information and information technology."

4. WHAT HAPPENS TO THE STUDENT PROCESSING OF INFORMATION WHEN THEY ARE EXPOSED TO QUESTIONS ABOUT THE ROLE OF INFORMATION IN THEIR LIVES?

The answers to this question come to a large extent from the information provided by the student participants as they talked about what they had done in high school and what skills they had brought with them to Virginia Tech. Those answers are complemented by the few instances where they were able to identify patterns that had changed since they had arrived at Virginia Tech, and by Professor Robbins' comments on how students develop their cognitive skills over time.

Prior skills information

Questions

Questions asked during Phase One of the study were revised and open-ended versions of the nine questions asked on the *Annual Freshman Survey*, administered to all students who attended Freshman Orientation during summer 2000 (see Appendix B). Students were asked about their use of library facilities and resources during the year prior to their arrival at Virginia Tech. These questions were designed to determine what students already know about using libraries when they come to the University so that librarians can design better, more targeted instruction for students during their first year at the University. The student participants all indicated a fairly high level of library use during high school, though there was some disparity in their comfort level with various resources and they were fairly evenly divided on whether they had received any library instruction during high school.

Replies, Comments and Implications

Half the student participants said that they had received some formal library-use instruction during high school and half said that they had not. Those who said they had received instruction indicated that it ranged from something very cursory ("about 2 hours worth," according to Sydney) to "a lot of instruction" (according to Kathleen). Those who reported no formal instruction did indicate that extensive support was available for individual projects and reports from both librarians and teachers.

All the students said they had done research papers and prepared bibliographies in high school. In discussing their papers and bibliographies, all indicated that they had used the Internet to acquire data. I also asked about their use of indexes and databases and only one said he had never used an index or database. Jeremiah, when asked about indexes and databases, said, “My library did have their whole library on computer but I never accessed it. I was never given instruction on how to use it and I never ran into an instance where I had to use it.” However, when I asked him where he got information that he needed for research papers and bibliographies he replied, “I perfered [sic] to use the readers reference guides more than anything when I did have to find an article for a project, anything to stay off the computers....” In other words, he was using an index but preferred the paper index to the available computer-based one. Other student participants may have shared his misunderstanding of what constitutes an index or database. Those who said that they had used an index or database seemed to have a fuzzy idea of what one actually was. For example, Mark wrote, “i used a database since i was a child, i am quite familiar with the systems. i never was taught how to use it, but i played around with it as a child so i understand the basic idea.” When I asked for examples, he was able to talk about “a database with old newspaper articles” but included in his reply, “I really cant ellaborate [sic] on this…” leaving me a bit uncertain about what he actually had used. When I asked him about databases again in the interview he was equally vague.

A regrettable development in information literacy has been that guidelines for information literacy in K-12 settings have developed separately from those for higher education. As a result it is difficult for library personnel to know what kind of skills to expect new students at a college or university to bring with them. This disconnect was to some extent reinforced by my conversations with the student participants in this study. A positive, though recent, development is the Blueprint for Collaboration adopted by both the Association of College (ACRL) and Research Libraries and the American Association of School Librarians (AASL) in 1999. An anticipated outcome of this collaboration is “ways and means of affecting closer collaboration between librarians in K-12 and post-secondary education to the benefit of the constituencies they serve” (AASL/ACRL Task Force on the Educational Role of Libraries, 2000, ¶ 1).

It would be beneficial for Virginia Tech library personnel to review what is being included in first-year instructional sessions. There is certainly a need to reinforce what has

previously been taught, and, since the Virginia Tech University Libraries are probably significantly larger with many more resources than most students have previously encountered, to offer suggestions to students on how to efficiently use a collection of resources that is larger than what most of them have previously encountered. However, library personnel need to continue to collect information on what information-seeking skills students bring with them to Virginia Tech. In addition, it would be immediately beneficial for library personnel to rethink some of the traditional processes for information seeking and use, and to adapt services appropriately.

This rethinking of library services would help address several of the performance indicators of the Information Literacy Competency Standards for Higher Education (Appendix A) including, "The information literate student identifies a variety of types and formats of potential sources for information," "The information literate student reevaluates the nature and extent of the information need," "The information literate student selects the most appropriate investigative methods or information retrieval systems for accessing the needed information" and "The information literate student refines the search strategy if necessary."

Changes in how students use information

Questions

As a follow-up to the questions I asked during the first phase of the study, and during the interviews with the student participants, I tried to include a query about what had changed in information-seeking patterns during the brief time they had been at Virginia Tech. Only one specifically recognized that anything had changed in the way that she looked for or used information, though several students alluded to changes in their information-seeking patterns.

Replies, Comments and Implications

Sydney was one of the students whom I initially characterized as somewhat overwhelmed by the technology that she was trying to use. Though she had used computer technology in high school, she appeared to be a bit negative about the experience. When asked if she considered herself a computer-literate person, she very quickly and emphatically replied that she was not. We talked about how little she had used the Internet as a high school student. When I asked her whether her information seeking had changed since she had arrived at Virginia Tech, she replied,

"Since I've been here I think it's changed. Um, when I'm writing papers or I need a lot of information, ah, I tend to go on the Internet and search stuff." However, she was the only student who, when we talked, seemed to acknowledge changes in how she approached the information-gathering process.

Once again, the Blueprint for Collaboration (AASL/ACRL Task Force on the Educational Role of Libraries, 2000) suggests mechanisms for library personnel at Virginia Tech to identify ways in which to be better attuned to what students have already learned in high school and so to better identify how to better serve these students when they arrive at the university as freshman. A recommendation from the Task Force is that there be a "seamless continuation" between the information literacy standards developed separately by ACRL and AASL (¶ I-C). A way of immediately addressing this situation might be to include in any first-semester instructional sessions a mention of how to do things differently at a library that supports a major research institution, drawing parallels between the resources and processes used in high school libraries as opposed to those used at the library of a major research university. The student participants in this study reported a relatively high level of previous formal library instruction, further indicating that instruction to reinforce previous instruction may be more appropriate than assuming little knowledge as the foundation for instruction.

Cognitive development

Questions

I asked no questions directly related to the idea of cognitive development though I did try to get at this idea with the student participants by asking questions about changes in their information-seeking patterns, as referenced previously. Professor Robbins introduced this topic and though I tried to determine whether any of the students recognized that their cognitive processes were undergoing a change, I really didn't expect them confirm this – nor did they. The topic came up with Professor Robbins when I was asking her if she had any sense of whether her students talked with other people about their information needs.

Replies, Comments and Implications

Professor Robbins raised the issue of cognitive development, offering the view that students in the first semester of their first year at college hadn't yet developed the skills necessary to ask the right questions or to know when they needed information.

> First though, let me say that I think that part of the idea of understanding when and how to get information might be a cognitive step of learning, because it seems to me that so many students are kind of blank, blank, blank – and then something happens that clicks! And they realize, 'There's tons of information out there at my disposal and I don't need to wait for a teacher to tell me when and how to go get it. I can find out on my own.' I think it might be a … developmental stage of the brain … because I can talk until I'm blue in the face about an idea to a student and then get an email three years later saying, 'You know, it just occurred to me – you talked about this in class and I didn't understand it, but now, WOW!'

Personnel at the University Libraries need to be more cognizant of the changes taking place with student processes for finding information, and be more tolerant of the vagueness and confusion that frequently accompanies a first-year student's initial attempt to locate information in the library, as evidenced by the words of the student participants in this study. Dewald (1999b) addresses this issue when she talks about the need to have sound pedagogical foundation when designing library instruction. Her references are specifically targeted toward the web-based instruction that so many libraries are developing, and she provides an overview of the various educational theories that need to be considered when designing instruction. There is also appears to be an unsurpassed opportunity to provide point-of-need individualized instruction to a student who has an assignment and is trying to figure out how to acquire the information needed to support that assignment. Library personnel need to keep in mind Dewald's suggestions regarding the design of instruction and use those suggestions to create interactive and engaging instruction that is built on a sound pedagogical foundation.

5. HOW DOES EXPOSURE TO AN INSTRUCTIONAL MODULE ON EVALUATING INTERNET RESOURCES CHANGE THE STUDENTS' UNDERSTANDING OF THE NEED FOR RELIABLE INFORMATION SOURCES?

All the student participants were asked about evaluating Internet resources during the several phases of the study. Standard Three of the Information Literacy Competency Standards for Higher Education (Appendix A) states: "The information literate student evaluates information and its sources critically and incorporates selected information into his or her knowledge base and value system." One outcome for this standard is "Examines and compares information from various sources in order to evaluate reliability, validity, accuracy, authority, timeliness, and point of view or bias."

Evaluating information

Questions

During Phase One of this study I asked, "A step in using Web-based materials for research is to examine the Web page for information about its author's qualifications and affiliation. Is this a step you include in your research? What do you look for when you're examining a Web page and deciding whether or not to use it for research?" Four student participants said they always evaluated Web sites, two said they never included this step and three said they sometimes included evaluation.

This topic was also discussed during the email exchange with student participants as part of Phase Two of the study, and I raised the topic again during the Phase Three interviews. This broader discussion revealed that all in fact did some form of evaluation, though the depth of the evaluation ranged quite widely in their considering whether a Web site was reliable and could be used as a resource for a paper.

Replies, Comments and Implications

When I asked the student participants about evaluating Web sites, even those who said they didn't acknowledged that they should. Hal admitted that he looked critically at a Web site only if he was going to actually quote material from the site: "I only include this step in my research if I have to cite the material." Roy took the same kind of situational approach when

determining how closely to look at the reliability of a Web site: “It really depends on, uh, how desperate I am!”

Greta appeared to have the most clearly developed idea of what she was looking for when looking at Web sites. I asked if this was a step that she included and her reply was: “Absolutely, it is vital to know information about the author's qualifications. The page could have been created by a scholar or all the way down to a 16-year-old English student. When I am using a Web page, I look at how well it is put together, and the appearance. If it is eye-catching and uses details I know that some sort of professional has put it together. I look at the author for clarity on the quality, and I look at how well the information is detailed and written. It isn't hard to see whether the page is formal.” Jeremiah repeated several times that what he looked for were ads: “Ads just usually tell me that someone is out trying to make a buck and they aren't really concerned with the information on the page.”

During the first semester at Virginia Tech, students appear to be fairly uncritical when it comes to using and evaluating Internet resources as evidenced by the comments from the student participants in this study. Kuhlthau (1994) recognizes and addresses this conundrum by offering suggestions to students on how to “predict the sources that will be most useful” and to “test them for accuracy” (p. 111). She also includes guidelines on “keeping track of sources” which can be used by the students in appropriately citing sources of information. Library personnel have also made available guidelines that will help students with this process, and they are available electronically through the University Libraries’ Web site. In addition to electronic access it might be beneficial to also provide these guidelines in a paper format and to then distribute these to all first-year students at Virginia Tech as a component of their initial library instruction.

The provision of these guidelines to students would help to address several performance indicators in the Information Literacy Competency Standards for Higher Education (Appendix A), including “The information literate student reevaluates the nature and extent of the information need,” “The information literate student refines the search strategy if necessary,” and “The information literate student articulates and applies initial criteria for evaluating both the information and its sources.”

Response to module on Evaluating Internet Resources

Questions

I asked the students to complete a library-developed Web-based module on evaluating Internet resources (http://www.lib.vt.edu/research/libinst/idle/evaluating.html) and to comment on anything new they saw in the module. The question I asked was, "Once you've looked at it, could you tell me if the module gives you information that you hadn't thought of – what ideas are new to you, what ideas are different, if it presents anything that you hadn't thought of before?" All of them found something in the module they hadn't previously considered.

Replies, Comments and Implications

The module that I asked the student participants to review suggests various criteria that can be used in evaluating Internet resources, including authority, coverage, objectivity, accuracy and currency. Specifics include such things as the date the site was last updated, what the URL might indicate, and how different search engines come up with a retrieval. All students reported something in the module that they found new to them. Hal talked about time: "Before I didn't look at the time – when an article was written to see if it was out of date or anything like that. I am more aware of that now. I am also more aware of finding out if the information is valid or not." Jeremiah focused on URLs and what they might reveal, writing, "I had no idea about the endings and clues within the addresses!" Mark was struck by the information on how some search engines only search parts of the Internet: "I had no idea that search engines did not search the entire Web and the fact that the [search] engines I used aren't even listed, shows how much information I missed looking in the Internet." Eric thought the site poorly designed but still commented that it was useful and wrote, "…I think it gives good tips about how to surf the net."

The comments from the student participants affirm that the University Libraries should continue to develop mechanisms for putting some library instructional content into stand-alone Web-based modules that can be completed by students at any time, in any place. As addressed in the literature review in Chapter 1, academic libraries are increasingly looking at Web-based instructional modules as a complement to or as a replacement for class-based instruction. This module is one of several available for use by students and faculty, and there is a need to make these better known to both populations so that they can be used more widely. Gutierrez and Trail (1998) have discussed the advantages and disadvantages of electronic delivery of library

instruction and concluded that using technology to deliver instruction on electronic resources provides a bridge between print and electronic resources. Kirk (1998) reinforces this in her observations about tailoring modules to the needs of a specific community of library users. She offers additional support when she discusses the needs of remote users and how they can be met via electronic delivery methods.

The implication of this for the University Libraries is that library personnel need to seriously consider alternative delivery mechanisms for library instruction. The student participants in this study all seemed comfortable with using technology to learn. For the libraries this suggests increasing the number of Web-based modules available to include modules on such topics as using Addison (the University Libraries' online catalog) or using Boolean operators to construct a search statement. These modules could be used by students or assigned by faculty when a need is identified, and would free up limited instructional time to deal with more complex issues or with class-specific assignments. An added benefit would be in providing access to library instruction for students who are not regularly on campus or who do not have an opportunity for face-to-face library instruction.

These kinds of modules could be used to address several of the performance indicators from the Information Literacy Competency Standards for Higher Education (Appendix A), including, "The information literate student extracts, records, and manages the information and its sources," "The information literate student articulates and applies initial criteria for evaluating both the information and its sources," and "The information literate student applies new and prior information to the planning and creation of a particular product or performance."

SUMMARY

I began this study hoping to better understand the student experience of needing and of acquiring information. With assistance from Professor Robbins and nine students enrolled in English 1105, I feel that I do indeed have a better understanding of this experience. I have looked at how students get the information they need for their coursework and for meeting their general information needs, and how they use the information they find. My interactions with the study participants also looked at how they evaluate information, and whether they are aware of some of the legal and ethical issues related to information use.

In addition, I have tried to tie this use of information by students both to the literature that I reviewed in Chapter One of this study and to the Information Literacy Competency Standards for Higher Education (Appendix A). I have also tried to acquire a better understanding of the impact of a Web-based module on evaluating Internet resources has on how students use information. While I do feel that I have been successful in starting to have a better understanding of all of these processes, I have also come to realize that there is much more that can be learned.

This study has looked at how students get the information they need for their coursework and for meeting their general information needs, and how they use the information they find. I have also attempted to understand what implications my student participants' words have for the University Libraries at Virginia Tech. My hope is that this understanding can then be used to help shape the future design of library instruction and to thus better meet the needs of students who are seeking information. In addition, I have looked at how services might be delivered differently and, where appropriate, have suggested areas where additional information is needed before changes can be suggested or implemented. The emphasis of this study is on what might be done to better assist students who are in their first semester at Virginia Tech.

This study will serve Virginia Tech and the University Libraries by providing the foundation for an instructional plan that will help meet the information needs of students – a plan will begin to "ensure that students are provided with opportunities to acquire the information management skills needed to support their learning needs at Virginia Tech and those they will encounter afterwards as they participate in their professional, social, and cultural environments" (Virginia Tech, 1999. p.59).

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Appendix A – Information Literacy Competency Standards

Information Literacy Competency Standards for Higher Education
Standards, Performance Indicators, and Outcomes

Standard One: The information literate student determines the nature and extent of the information needed.

Performance Indicators:

1. The information literate student defines and articulates the need for information.

Outcomes Include:

- a. Confers with instructors and participates in class discussions, peer workgroups, and electronic discussions to identify a research topic, or other information need
- b. Develops a thesis statement and formulates questions based on the information need
- c. Explores general information sources to increase familiarity with the topic
- d. Defines or modifies the information need to achieve a manageable focus
- e. Identifies key concepts and terms that describe the information need
- f. Recognizes that existing information can be combined with original thought, experimentation, and/or analysis to produce new information

2. The information literate student identifies a variety of types and formats of potential sources for information.

Outcomes Include:

- a. Knows how information is formally and informally produced, organized, and disseminated
- b. Recognizes that knowledge can be organized into disciplines that influence the way information is accessed
- c. Identifies the value and differences of potential resources in a variety of formats (e.g., multimedia, database, website, data set, audio/visual, book)
- d. Identifies the purpose and audience of potential resources (e.g., popular vs. scholarly, current vs. historical)
- e. Differentiates between primary and secondary sources, recognizing how their use and importance vary with each discipline
- f. Realizes that information may need to be constructed with raw data from primary sources

3. The information literate student considers the costs and benefits of acquiring the needed information.

Outcomes Include:

- a. Determines the availability of needed information and makes decisions on broadening the information seeking process beyond local resources (e.g., interlibrary loan; using resources at other locations; obtaining images, videos, text, or sound)
- b. Considers the feasibility of acquiring a new language or skill (e.g., foreign or discipline-based) in order to gather needed information and to understand its context
- c. Defines a realistic overall plan and timeline to acquire the needed information

4. The information literate student reevaluates the nature and extent of the information need.

Outcomes Include:

a. Reviews the initial information need to clarify, revise, or refine the question
b. Describes criteria used to make information decisions and choices

Standard Two: The information literate student accesses needed information effectively and efficiently.

Performance Indicators:

1. The information literate student selects the most appropriate investigative methods or information retrieval systems for accessing the needed information.

Outcomes Include:

a. Identifies appropriate investigative methods (e.g., laboratory experiment, simulation, fieldwork)
b. Investigates benefits and applicability of various investigative methods
c. Investigates the scope, content, and organization of information retrieval systems
d. Selects efficient and effective approaches for accessing the information needed from the investigative method or information retrieval system

2. The information literate student constructs and implements effectively-designed search strategies.

Outcomes Include:

a. Develops a research plan appropriate to the investigative method
b. Identifies keywords, synonyms and related terms for the information needed
c. Selects controlled vocabulary specific to the discipline or information retrieval source
d. Constructs a search strategy using appropriate commands for the information retrieval system selected (e.g., Boolean operators, truncation, and proximity for search engines; internal organizers such as indexes for books)
e. Implements the search strategy in various information retrieval systems using different user interfaces and search engines, with different command languages, protocols, and search parameters
f. Implements the search using investigative protocols appropriate to the discipline

3. The information literate student retrieves information online or in person using a variety of methods.

Outcomes Include:

a. Uses various search systems to retrieve information in a variety of formats
b. Uses various classification schemes and other systems (e.g., call number systems or indexes) to locate information resources within the library or to identify specific sites for physical exploration
c. Uses specialized online or in person services available at the institution to retrieve information needed (e.g., interlibrary loan/document delivery, professional associations, institutional research offices, community resources, experts and practitioners)
d. Uses surveys, letters, interviews, and other forms of inquiry to retrieve primary information

4. The information literate student refines the search strategy if necessary.

Outcomes Include:

a. Assesses the quantity, quality, and relevance of the search results to determine whether alternative information retrieval systems or investigative methods should be utilized
b. Identifies gaps in the information retrieved and determines if the search strategy should be revised
c. Repeats the search using the revised strategy as necessary

5. The information literate student extracts, records, and manages the information and its sources.

Outcomes Include:

a. Selects among various technologies the most appropriate one for the task of extracting the needed information (e.g., copy/paste software functions, photocopier, scanner, audio/visual equipment, or exploratory instruments)
b. Creates a system for organizing the information
c. Differentiates between the types of sources cited and understands the elements and correct syntax of a citation for a wide range of resources
d. Records all pertinent citation information for future reference
e. Uses various technologies to manage the information selected and organized

Standard Three: The information literate student evaluates information and its sources critically and incorporates selected information into his or her knowledge base and value system.

Performance Indicators:

1. The information literate student summarizes the main ideas to be extracted from the information gathered.

Outcomes Include:

a. Reads the text and selects main ideas
b. Restates textual concepts in his/her own words and selects data accurately
c. Identifies verbatim material that can be then appropriately quoted

2. The information literate student articulates and applies initial criteria for evaluating both the information and its sources.

Outcomes Include:

a. Examines and compares information from various sources in order to evaluate reliability, validity, accuracy, authority, timeliness, and point of view or bias
b. Analyzes the structure and logic of supporting arguments or methods
c. Recognizes prejudice, deception, or manipulation
d. Recognizes the cultural, physical, or other context within which the information was created and understands the impact of context on interpreting the information

3. The information literate student synthesizes main ideas to construct new concepts.

Outcomes Include:

a. Recognizes interrelationships among concepts and combines them into potentially useful primary statements with supporting evidence
b. Extends initial synthesis, when possible, at a higher level of abstraction to construct new hypotheses that may require additional information

c. Utilizes computer and other technologies (e.g. spreadsheets, databases, multimedia, and audio or visual equipment) for studying the interaction of ideas and other phenomena

4. The information literate student compares new knowledge with prior knowledge to determine the value added, contradictions, or other unique characteristics of the information.

Outcomes Include:

a. Determines whether information satisfies the research or other information need
b. Uses consciously selected criteria to determine whether the information contradicts or verifies information used from other sources
c. Draws conclusions based upon information gathered
d. Tests theories with discipline-appropriate techniques (e.g., simulators, experiments)
e. Determines probable accuracy by questioning the source of the data, the limitations of the information gathering tools or strategies, and the reasonableness of the conclusions
f. Integrates new information with previous information or knowledge
g. Selects information that provides evidence for the topic

5. The information literate student determines whether the new knowledge has an impact on the individual's value system and takes steps to reconcile differences.

Outcomes Include:

a. Investigates differing viewpoints encountered in the literature
b. Determines whether to incorporate or reject viewpoints encountered

6. The information literate student validates understanding and interpretation of the information through discourse with other individuals, subject-area experts, and/or practitioners.

Outcomes Include:

a. Participates in classroom and other discussions
b. Participates in class-sponsored electronic communication forums designed to encourage discourse on the topic (e.g., email, bulletin boards, chat rooms)
c. Seeks expert opinion through a variety of mechanisms (e.g., interviews, email, listservs)

7. The information literate student determines whether the initial query should be revised.

Outcomes Include:

a. Determines if original information need has been satisfied or if additional information is needed
b. Reviews search strategy and incorporates additional concepts as necessary
c. Reviews information retrieval sources used and expands to include others as needed

Standard Four: The information literate student, individually or as a member of a group, uses information effectively to accomplish a specific purpose.

Performance Indicators:

1. The information literate student applies new and prior information to the planning and creation of a particular product or performance.

Outcomes Include:

a. Organizes the content in a manner that supports the purposes and format of the product or performance (e.g. outlines, drafts, storyboards)
b. Articulates knowledge and skills transferred from prior experiences to planning and creating the product or performance
c. Integrates the new and prior information, including quotations and paraphrasings, in a manner that supports the purposes of the product or performance
d. Manipulates digital text, images, and data, as needed, transferring them from their original locations and formats to a new context

2. The information literate student revises the development process for the product or performance.

Outcomes Include:

a. Maintains a journal or log of activities related to the information seeking, evaluating, and communicating process
b. Reflects on past successes, failures, and alternative strategies

3. The information literate student communicates the product or performance effectively to others.

Outcomes Include:

a. Chooses a communication medium and format that best supports the purposes of the product or performance and the intended audience
b. Uses a range of information technology applications in creating the product or performance
c. Incorporates principles of design and communication
d. Communicates clearly and with a style that supports the purposes of the intended audience

Standard Five: The information literate student understands many of the economic, legal, and social issues surrounding the use of information and accesses and uses information ethically and legally.

Performance Indicators:

1. The information literate student understands many of the ethical, legal and socio-economic issues surrounding information and information technology.

Outcomes Include:

a. Identifies and discusses issues related to privacy and security in both the print and electronic environments
b. Identifies and discusses issues related to free vs. fee-based access to information
c. Identifies and discusses issues related to censorship and freedom of speech
d. Demonstrates an understanding of intellectual property, copyright, and fair use of copyrighted material

2. The information literate student follows laws, regulations, institutional policies, and etiquette related to the access and use of information resources.

Outcomes Include:

a. Participates in electronic discussions following accepted practices (e.g. "Netiquette")

b. Uses approved passwords and other forms of ID for access to information resources
c. Complies with institutional policies on access to information resources
d. Preserves the integrity of information resources, equipment, systems and facilities
e. Legally obtains, stores, and disseminates text, data, images, or sounds
f. Demonstrates an understanding of what constitutes plagiarism and does not represent work attributable to others as his/her own
g. Demonstrates an understanding of institutional policies related to human subjects research

3. The information literate student acknowledges the use of information sources in communicating the product or performance.

Outcomes Include:

a. Selects an appropriate documentation style and uses it consistently to cite sources
b. Posts permission granted notices, as needed, for copyrighted material

Approved by the Board of Directors of the Association of College and Research Libraries on January 18, 2000.

Association of College and Research Libraries, & American Library Association (2000). Information Literacy Competency Standards for Higher Education. Chicago: Association of College and Research Libraries.

Appendix B – Questions

Questions distributed to student participants via email

1. How much instruction did you receive on how to use your local library or your school's library/media resources center?

2. How often did you use a local library or your school's library/media resources center to use or check out books, articles, or other materials for your classes?

3. Did you do research papers or prepare a bibliography? What kind of library resources did you use for this?

4. Did you use the Internet or World Wide Web to prepare a research paper or bibliography? In what way did you use Internet resources for the paper or bibliography?

5. How often did you use the library as a quiet place to read or study?

6. Were you comfortable asking a librarian, a school library media specialist or a staff member for help in finding information on a topic? Did you often ask for help? Why or why not?

7. How often did you use a computerized index or database (of journal articles or books) to find information on a topic? Did you find it easy or difficult to use? Had you received instruction on how it worked before you tried to use it?

8. Do you think that you can find all of the information you might ever need on the Internet? Why or why not?

9. A step in using web-based materials for research is to examine the web page for information about its author's qualifications and affiliation. Is this a step you include in your research? What do you look for when you're examining a web page and deciding whether or not to use it for research?

Questions that were included on the *Annual Freshman Survey*, Summer 2000

Did you receive instruction on how to use resources from a local library or your school's media resources center?

YES / NO

Did you use a local library or your school's media resources center to check out or retrieve materials to be used in your classes?

NEVER ONCE 2-5 TIMES MORE THAN 5 TIMES DON'T KNOW

Did you use resources in a local library or your school's media resources center to prepare a research paper or bibliography?

NEVER ONCE 2-5 TIMES MORE THAN 5 TIMES DON'T KNOW

Did you use resources on the Internet or World Wide Web to prepare a research paper or bibliography?

NEVER ONCE 2-5 TIMES MORE THAN 5 TIMES DON'T KNOW

Do you agree with the statement, "Everything is on the Web"?

STRONGLY AGREE AGREE DISAGREE STRONGLY DISAGREE

A step in using web-based materials for research is to examine the web page for information about its author's qualifications and affiliation.

STRONGLY AGREE AGREE DISAGREE STRONGLY DISAGREE

Did you use the library as a quiet place to read or study materials you brought with you?

NEVER ONCE 2-5 TIMES MORE THAN 5 TIMES

Did you ask a librarian, a school library media specialist or a staff member for help in finding information on some topic?

NEVER ONCE 2-5 TIMES MORE THAN 5 TIMES

Did you used an index or database (of journal articles or books) to find material on some topic?

NEVER ONCE 2-5 TIMES MORE THAN 5 TIMES

Appendix C – Institutional Review Board (IRB) Information

Included in this appendix:

- Expedited Approval Letter, dated September 29, 2000
- Form – Informed Consent for Faculty
- Form – Informed Consent for Students – Interview
- Form – Informed Consent for Students – Survey

Virginia Tech
VIRGINIA POLYTECHNIC INSTITUTE
AND STATE UNIVERSITY

Institutional Review Board

Dr. David M. Moore
IRB (Human Subjects) Chair
Assistant Vice Provost for Research Compliance and
CVM Phase II - Duckpond Dr., Blacksburg, VA 24061-0442
Office: 540/231-4991; FAX: 540/231-7736
e-mail: moored@vt.edu

MEMORANDUM

TO: Nancy Seamans and Dr. Mike Moore
Teaching and Learning/Instructional Technology 0434

FROM: David M. Moore

DATE: 29 September, 2000

SUBJECT: **Expedited Approval –** "Information literacy Study of Freshman Students' Perceptions, with Recommendations" – IRB #00-286

This memo is regarding the above-mentioned protocol. The proposed research is eligible for expedited review according to the specifications authorized by 45 CFR 46.110 and 21 CFR 56.110. As Chair of the Virginia Tech Institutional Review Board, I have granted approval to the study for a period of (12) months, effective today.

Approval of your research by the IRB provides the appropriate review as required by federal and state laws regarding human subject research. It is your responsibility to report to the IRB any adverse reactions that can be attributed to this study.

To continue the project past the 12-month approval period, a continuing review application must be submitted (30) days prior to the anniversary of the original approval date and a summary of the project to date must be provided. My office will send you a reminder of this (60) days prior to the anniversary date.

cc: file
Jan Nespor

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY
Informed Consent for Faculty

Title of Project: Information Literacy: A Study of Freshman Students' Perceptions, with Recommendations
Investigator(s): Nancy H. Seamans (Dissertation Advisor: Dr. D. M. Moore)

Purpose

The purpose of this research is to better understand how students use information in order to design library instruction that will meet their needs both as students and as life-long learners. Librarians have a hard time designing instruction for incoming freshmen because there is little information about how these students understand information – how they get information and how they use it. This research will address this lack of understanding. I will focus on trying to determine what students know about information and its uses when they arrive at the University.

I will use the information collected and analyzed to make recommendations regarding the future design of library instruction with a goal of better meeting student needs.

The Information Literacy Competency Standards for Higher Education, developed by the Association of College and Research Libraries (ACRL) of the American Library Association (ALA) form the foundation for this research. These five standards state that an information literate student:

- determines the nature and extent of the information needed;
- accesses needed information effectively and efficiently;
- evaluates information and its sources critically and incorporates selected information into his or her knowledge base and value system;
- uses information effectively to accomplish a specific purpose, either individually or as a member of a group; and
- understands many of the economic, legal, and social issues surrounding the use of information and accesses and uses information ethically and legally.

Procedure

I would like to conduct one open-ended interview with you, scheduled at a time and place convenient to you. The interview will deal with the following issues: How students use information in your course and what changes you perceive in their use of information during a semester. And open-ended interview means that although I have a set of written questions, I will also ask follow-up questions (which may lead into new topics not noted above) and give you an opportunity to address issues not covered in the questions. The interview should last more than one hour. Of course, you may stop the interview at any point, or refuse to answer any questions.

The interview will be audiotaped and transcribed. You may review the transcript and make additions or corrections after the fact.

In addition, I may use e-mail to outline preliminaries of the open-ended interviews and to follow up with you after the interview.

Benefits and Risks

It is difficult to predict what kinds of issues you may find sensitive. The interview should deal with public activities (as opposed to personal issues) and should pose no more risk than would arise from discussing them with any colleague. However, some of issues may be more sensitive than others, especially for untenured faculty, in ways that I can't anticipate. Please remember that you control the extent of your participation, and should answer only those questions you wish to answer and discuss those issues you wish to discuss. The benefits of the project will not be to you directly – aside from whatever pleasure you may take in sharing your opinions – but I hope that by studying how students use information there will be a better understanding of how courses might be developed and taught. All participants in the study will be given a $25 gift certificate from the University Bookstore.

Extent of Anonymity

Because these interviews will deal in some detail with your activities in regard to a particular course, as well as with your workplace context, it will be difficult if not impossible to maintain your anonymity. I will destroy or erase the interview tape as soon as it has been transcribed, and I can give you a pseudonym, but it is very likely that anyone associated with this university will be able to determine your identity. Every effort will be made to assure confidentiality but you should be aware that despite every effort to preserve it, anonymity might be compromised.

Freedom to Withdraw

You can refuse to answer any question, and you may withdraw from this research at any time by simply informing me, Nan Seamans, at 540-231-2708 (or nseamans@vt.edu), or by getting in touch with Dr. David Moore, the Chair of Virginia Tech's Institutional Review Board, at 540-231-4991. Agreeing to participate in one interview does not commit you to participation in other interviews.

Your signature below means that you have read this form and agree to its conditions. Please indicate whether or not we may use your proper name on transcripts. You will be offered a copy of this form to keep.

_____	_____	_____
Your signature	E-mail address	Date

Investigators

Nancy H. Seamans (231-2708 or nseamans@vt.edu)
Dr. D. M. Moore, Dissertation Advisor (231-5587 or moorem@vt.edu)
Dr. David Moore, Chair IRB (231-4991 or moored@vt.edu)

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY
Informed Consent for Students - Interview

Title of Project: Information Literacy: A Study of Freshman Students' Perceptions, with Recommendations
Investigator(s): Nancy H. Seamans (Dissertation Advisor: Dr. D. M. Moore)

Purpose

The purpose of this research is to better understand how you use information in order to design library instruction that will meet your needs both as students and as life-long learners. Librarians have a hard time designing instruction for incoming freshmen because there is little information about how these students get information and how they use it. This research will address this lack of understanding. I will focus on trying to determine what you know about information and its uses when you arrived at the University.

I will use the information collected and analyzed to make recommendations regarding the future design of library instruction with a goal of better meeting student needs.

The Information Literacy Competency Standards for Higher Education, developed by the Association of College and Research Libraries (ACRL) of the American Library Association (ALA) form the foundation for this research. These five standards state that an information literate student:

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- accesses needed information effectively and efficiently;
- evaluates information and its sources critically and incorporates selected information into his or her knowledge base and value system;
- uses information effectively to accomplish a specific purpose, either individually or as a member of a group; and
- understands many of the economic, legal, and social issues surrounding the use of information and accesses and uses information ethically and legally.

I will be trying to determine how you understand the components of these five standards as you use information during the first semester of your freshman year.

Procedures

If you choose to participate, you may be asked to participate in a face-to-face interview. This will come after you have completed the e-mail survey and have answered some follow-up questions.

The face-to-face interview will take place at a time convenient to you and will be conducted on the Virginia Tech campus. It should take approximately one hour. The interview will deal with your information-seeking activities – how you know when you need information, how you find it and use it – both for your academic life and in general. The questions will be open-ended which means that you can answer them in as much detail as you like. You can refuse to answer any question you don't want to answer.

Please feel free to question me if you're uncertain about the meaning or purpose of a question. The interviews will be audiotaped and transcribed by me or by a secretary and the material will be kept confidential. I will keep the tapes secure and erase them when the study is finished.

Benefits and Risks

There are no direct benefits to you.

There should be no more than minimal risks to you from participating in this study – that is, no more risk than there would be if you were talking about your information-seeking patterns with a friend. Your professors will not have access to the interview material, and you can refuse to answer any questions that make you uncomfortable. You can also end the interview at any time.

Extent of Anonymity and Confidentiality:

When I transcribe these interviews, I will insert a pseudonym in place of your name, and change other identifying information so that someone reading the transcript would probably not be able to connect it to you. Once the audiotapes have been transcribed and checked, they will be destroyed or erased. In any reports or articles I write using material from your interviews, I will use pseudonyms and make every effort to preserve your confidentiality. In my writing I may quote from your interviews, referring to you with a pseudonym. For example: "Ms./Mr. So-and-so, a first year engineering major, describes his/her information use in this fashion [quote from transcript]." It is very unlikely that anyone besides you or a close friend would be able to guess who Mr./Ms. So-and-so is. Your professors will not have access to the transcripts.

Compensation

All participants in the study will be given a $25 gift certificate from the University Bookstore.

Freedom to Withdraw

You are free to withdraw from participation in this study at any time without penalty (other than not receiving the Bookstore gift certificate as explained above). Your decision to participate or not participate has no connection to your course work, so withdrawing can in no way affect your grade. (Your professor won't even know if you're participating.) You can refuse to answer any questions with no penalty. If you sign now to participate and realize later that you want to withdraw or not do an interview, just inform the interviewer or call one of the others listed at the bottom of this page.

By signing below, you indicate that you have read and understood the informed consent and conditions of this project, that you have had all of your questions answered, and that you give your voluntary consent for participation in this project. You will be offered a copy of this form.

_____	_____	_____
Your signature	E-mail address	Date

Investigators

Nancy H. Seamans (231-2708 or nseamans@vt.edu)
Dr. D. M. Moore, Dissertation Advisor (231-5587 or moorem@vt.edu)
Dr. David Moore, Chair IRB (231-4991 or moored@vt.edu)

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY
Informed Consent for Students - Survey

Title of Project: Information Literacy: A Study of Freshman Students' Perceptions, with Recommendations
Investigator(s): Nancy H. Seamans (Dissertation Advisor: Dr. D. M. Moore)

Purpose

The purpose of this research is to better understand how you use information in order to design library instruction that will meet your needs both as students and as life-long learners. Librarians have a hard time designing instruction for incoming freshmen because there is little information about how these students get information and how they use it. This research will address this lack of understanding. I will focus on trying to determine what you know about information and its uses when you arrived at the University.

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- understands many of the economic, legal, and social issues surrounding the use of information and accesses and uses information ethically and legally.

I will be trying to determine how you understand the components of these five standards as you use information during the first semester of your freshman year.

Procedures

If you choose to participate, I would like to have you answer several survey questions, and then do a follow-up interview. The survey questions will be distributed to you via e-mail and the interview will be conducted via e-mail.

Neither of these exchanges should take more than 45 minutes to an hour of your time. The e-mail survey will be set up so you can answer at any time during a one-week time period. The follow-up to the e-mail survey will also be conducted electronically and at your convenience. The survey and follow-up questions will deal with your information-seeking activities – how you know when you need information, how you find it and use it – both for your academic life and in general. The questions will be open-ended which means that you can answer them in as much detail as you like. You can refuse to answer any question you don't want to answer.

Please feel free to question me if you're uncertain about the meaning or purpose of a question. The interviews will be audiotaped and transcribed by me or by a secretary and the

material will be kept confidential. I will keep the tapes secure and erase them when the study is finished.

Benefits and Risks

There are no direct benefits to you.

There should be no more than minimal risks to you from participating in this study – that is, no more risk than there would be if you were talking about your information-seeking patterns with a friend. Your professors will not have access to the interview material, and you can refuse to answer any questions that make you uncomfortable. You can also end the interview at any time.

Extent of Anonymity and Confidentiality:

When I transcribe these interviews, I will insert a pseudonym in place of your name, and change other identifying information so that someone reading the transcript would probably not be able to connect it to you. Once the audiotapes have been transcribed and checked, they will be destroyed or erased. In any reports or articles I write using material from your interviews, I will use pseudonyms and make every effort to preserve your confidentiality. In my writing I may quote from your interviews, referring to you with a pseudonym. For example: "Ms./Mr. So-and-so, a first year engineering major, describes his/her information use in this fashion [quote from transcript]." It is very unlikely that anyone besides you or a close friend would be able to guess who Mr./Ms. So-and-so is. Your professors will not have access to the transcripts.

Compensation

All participants in the study will be given a $25 gift certificate from the University Bookstore.

Freedom to Withdraw

You are free to withdraw from participation in this study at any time without penalty (other than not receiving the Bookstore gift certificate as explained above). Your decision to participate or not participate has no connection to your course work, so withdrawing can in no way affect your grade. (Your professor won't even know if you're participating.) You can refuse to answer any questions with no penalty. If you sign now to participate and realize later that you want to withdraw or not do an interview, just inform the interviewer or call one of the others listed at the bottom of this page.

By signing below, you indicate that you have read and understood the informed consent and conditions of this project, that you have had all of your questions answered, and that you give your voluntary consent for participation in this project. You will be offered a copy of this form.

_____	_____	_____
Your signature	E-mail address	Date

Investigators

Nancy H. Seamans (231-2708 or nseamans@vt.edu)
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Appendix D – Demographic data

Nine student participants

Residence	Number
Virginia	7
Maryland	1
Europe (Austria)	1 (though now living in Virginia

Sex	Number
Male	6
Female	3

Age of all nine participants at time of study: 18

Major	Number
University Studies*	4
Psychology	1
International Studies	1
Clothing & Textiles	1
Engineering	1
Biology	1

* One had decided to switch to a Computer Science major, but at the time of the study had not yet done so.

Appendix E – Coding Data

Code	Description	Source
Computer literacy	Ability to use technologies	Information Literacy Competency Standards for Higher Education – "Participates in class-sponsored electronic communication forums designed to encourage discourse on the topic (e.g., email, bulletin boards, chat rooms)" & "Selects among various technologies the most appropriate one for the task of extracting the needed information (e.g., copy/paste software functions, photocopier, scanner, audio/visual equipment, or exploratory instruments)"
Searching strategies	How to go about acquiring information	Nine questions (Appendix B) and Information Literacy Competency Standards for Higher Education – Several different Performance Indicators and Outcomes
Organizing information	Organizes information for efficient access	Information Literacy Competency Standards for Higher Education – "Creates a system for organizing the information"
Library Service	Suggestions of what the library should be doing for students during their first semester at Virginia Tech	Chapter One – "the future design of instruction for meeting student needs"
Evaluating information	Using mechanisms to determine the reliability of the information being located, used	Information Literacy Competency Standards for Higher Education – "Examines and compares information from various sources in order to evaluate reliability, validity, accuracy, authority, timeliness, and point of view or bias"
Legal/ethical	General legal and ethical issues related to information use	Information Literacy Competency Standards for Higher Education – "Legally obtains, stores, and disseminates text, data, images, or sounds"

Code	Description	Source
Focusing a topic	Ability to take a broad topic and narrow it to something manageable	Information Literacy Competency Standards for Higher Education – "Reviews the initial information need to clarify, revise, or refine the question"
Asking an expert	Using a person as a source of information	Information Literacy Competency Standards for Higher Education – "Seeks expert opinion through a variety of mechanisms (e.g., interviews, email, listservs)"
Discussing information needs with others	People to whom do students go to get support for ideas	Information Literacy Competency Standards for Higher Education – "Confers with instructors and participates in class discussions, peer workgroups, and electronic discussions to identify a research topic, or other information need"
Using other sources of info	Use of video, audio sources of information	Information Literacy Competency Standards for Higher Education – "Identifies the value and differences of potential resources in a variety of formats (e.g., multimedia, database, website, data set, audio/visual, book)"
Copyright	What it is	Information Literacy Competency Standards for Higher Education – "Demonstrates an understanding of intellectual property, copyright, and fair use of copyrighted material"
Prior skills	Information use skills that students have when they arrive at Virginia Tech as freshmen	Nine questions (Appendix B)
Supporting an argument	Acquiring information to make a case, support an argument	Information Literacy Competency Standards for Higher Education – "Analyzes the structure and logic of supporting arguments or methods"
Search Engines	How search engines are used to acquire information	Information Literacy Competency Standards for Higher Education – "Implements the search strategy in various information retrieval systems using different user interfaces and search engines, with different command languages, protocols, and search parameters"

Code	Description	Source
Citing information	Quoting, paraphrasing	Information Literacy Competency Standards for Higher Education – "Integrates the new and prior information, including quotations and paraphrasings, in a manner that supports the purposes of the product or performance"
Privacy	Privacy issues related to use of electronic resources	Information Literacy Competency Standards for Higher Education – "Identifies and discusses issues related to privacy and security in both the print and electronic environments"
Plagiarism	What it is	Information Literacy Competency Standards for Higher Education – "Demonstrates an understanding of what constitutes plagiarism and does not represent work attributable to others as his/her own"
Questioning reliability	Awareness that not all information is reliable	Information Literacy Competency Standards for Higher Education – "Examines and compares information from various sources in order to evaluate reliability, validity, accuracy, authority, timeliness, and point of view or bias"
How information is organized	Recognizing how different information is organized differently	Information Literacy Competency Standards for Higher Education – "Knows how information is formally and informally produced, organized, and disseminated"
Bias/Prejudice	Recognizing instances of bias or prejudice	Information Literacy Competency Standards for Higher Education – "Examines and compares information from various sources in order to evaluate reliability, validity, accuracy, authority, timeliness, and point of view or bias" & "Recognizes prejudice, deception, or manipulation"
Types of Sources	Questions about different types of available sources (primary vs. secondary sources)	Information Literacy Competency Standards for Higher Education – "Differentiates between primary and secondary sources, recognizing how their use and importance vary with each discipline"

Code	Description	Source
Virginia Tech's Acceptable Use Policy	Awareness of what it is and what it covers	Information Literacy Competency Standards for Higher Education – "Complies with institutional policies on access to information resources"
Internet use	How Internet is used in general by student participants	Nine questions (Appendix B) and Information Literacy Competency Standards for Higher Education – Several different Performance Indicators and Outcomes
Books	Using books and other print-based materials as resources	Information Literacy Competency Standards for Higher Education – "Identifies the value and differences of potential resources in a variety of formats (e.g., multimedia, database, website, data set, audio/visual, book)"
Index/Database	Use of an index or a database	Information Literacy Competency Standards for Higher Education – "Uses various classification schemes and other systems (e.g., call number systems or indexes) to locate information resources within the library or to identify specific sites for physical exploration" & "Utilizes computer and other technologies (e.g. spreadsheets, databases, multimedia, and audio or visual equipment) for studying the interaction of ideas and other phenomena" & Nine questions (Appendix B)
Everything on the Internet	The idea that everything needed is available on the Internet	Nine questions (Appendix B)
Costs of information	Awareness that not all information is free	Information Literacy Competency Standards for Higher Education – "Identifies and discusses issues related to free vs. fee-based access to information"
Quoting information	Identifying when to quote information	Information Literacy Competency Standards for Higher Education – "Identifies verbatim material that can be then appropriately quoted"

Code	Description	Source
Scholarly vs. popular journals	Ability to recognize that there are different kinds of published information	Information Literacy Competency Standards for Higher Education – "Identifies the purpose and audience of potential resources (e.g., popular vs. scholarly, current vs. historical)"
Email use	How email is used as a component of information retrieval, use	Information Literacy Competency Standards for Higher Education – "Participates in class-sponsored electronic communication forums designed to encourage discourse on the topic (e.g., email, bulletin boards, chat rooms)
Module Response	Responses to the module on evaluating Internet resources	Chapter One – "How does exposure to an instructional module on evaluating Internet resources change the students' understanding of the need for reliable information sources?"
Outside information	Using services like interlibrary loan to get information	Information Literacy Competency Standards for Higher Education – "Determines the availability of needed information and makes decisions on broadening the information seeking process beyond local resources (e.g., interlibrary loan; using resources at other locations; obtaining images, videos, text, or sound)
English 1106	Topics that are covered in the second semester in English 1106	Professor Robbins
Alternate methods of delivering information	Awareness of information that is not text based	Information Literacy Competency Standards for Higher Education – "Identifies the value and differences of potential resources in a variety of formats (e.g., multimedia, database, website, data set, audio/visual, book)"
Multi-tasking	Being able to do several things simultaneously	Professor Robbins
Cognitive development	Developmental process that students go through as freshmen	Professor Robbins

Appendix F – Researcher Bias and Checks

I was asked to record what I thought would be the answers of the student participants to the nine questions that I asked during Phase One of the study, to be used as a check against biases that might prevent my finding in the data what I did not expect to find. On September 24, 2000, prior to distributing the email survey to the student participants, I recorded the following expectations:

In general, I believe that there will be a fairly wide spread of views from my 16 students (later reduced to nine students) regarding their understanding and use of information, ranging from limited to extensive use of electronic resources and from poor to excellent skills in using information.

- I think most of them will have received some instruction but that they won't remember much about it.
- I think most of them will have used a library a moderate amount for classes in high school.
- I think most of them will have done research or prepared a bibliography and that they will have used basic library resources (encyclopedias, indexes) to do their research.
- They will have used the WWW for research, most likely using a general search engine to find information
- They will feel intimidated by the idea of asking a librarian for assistance.
- They will have used indexes and databases some, but not often, and will find them difficult to use; they will probably have received instruction but don't remember it well.
- They will think that everything they need is available on the Internet.
- They will say that they evaluate information resources but will have a hard time explaining how they do this and what they look for.

These thoughts were based on my work as a librarian with more than 25 years of professional library experience. I have worked extensively with other librarians at Virginia Tech to provide instruction in both information literacy and in the use of library resources and have also worked for a number of years as a reference librarian.

Though some of my findings do generally reflect what I anticipated finding, I feel there are enough differences to allow my to say that my biases are not reflected in my study. As a group, the student participants had received more library instruction than I had anticipated and most of them remembered more than I had expected. They had used their high school libraries less than anticipated. They all had a fundamental understanding of how to do basic research, which I had anticipated, and they had used the Web to do some of that research. However, their use of general Internet resources was greater than I had expected and was supported by their teachers more than I had expected. None of them seemed intimidated by asking for help from librarians, which surprised me, but did report feeling intimidated by the size of the University Libraries, which also surprised me. They had used indexes and databases less than I had anticipated and generally had only limited recollections of having been taught to use them. They were ultimately more cautious about claiming that all information that they might need could be obtained using the Internet. They generally evaluated information they used less than I had expected.

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Professional experience

1999 – Present University Libraries, Virginia Tech Blacksburg, VA
Director of Instruction, Head of Media Services

1998 – 1999 University Libraries, Virginia Tech Blacksburg, VA
Co-Director of the New Media Center (NMC), Head of Media Services

1985 – 1997 College of Health Sciences Roanoke, VA
Director of the Learning Resource Center (LRC)

1985 Roanoke County Public Library Roanoke, VA
Head Reference Librarian

1980-1984 Hayes, Seay, Mattern & Mattern Roanoke, VA
Corporate Librarian

1978-1979 Roanoke County Public Library Roanoke, VA
Librarian

Education

2001 Virginia Tech Blacksburg, VA
College of Human Resources & Education, Department of Teaching and Learning

- Ph.D. in Curriculum and Instruction (Instructional Technology)
- Dissertation: Information Literacy: A Study of Freshman Students' Perceptior with Recommendations

1978 University of North Carolina Chapel Hill, NC
School of Library and Information Science

- Master of Science in Library Science

1976 Virginia Tech Blacksburg, VA
College of Arts and Sciences

- Bachelor of Arts (Political Science)

1969-1972 Duke University Durham, NC
Woman's College of Duke University

- Enrolled for 2½ years (Political Science major); 102 credits

Publications

Editorial Board, Virginia Libraries, 1996-2001 – Created electronic version of the journal in 1999, available at http://scholar.lib.vt.edu/ejournals/VALib/

Seamans, N. (2001). Confessions of a distance ed student. Virginia Libraries, 47(1), 26-27.

Auer, N. Seamans, N. (2001). It takes work to be an information-literate person. The Roanoke Times, pp. B-4.

Brown, L. B., Brennan-Cox, M., Seamans, N. H. (2000). College librarians: partners in acquisitions and serials management. Against the Grain, 12(5), 28-30.

Wyatt, T. H., Seamans, N.H., & Clark, W.G. (1999). The multimedia power portfolio: creative strategy for core curriculum. Journal of Allied Health, 28(1), 33-35.

Seamans, N. H. (1999). Interview: ILLiad creator Harry Kritz (i.e. Kriz) -- interlibrary loan system at Virginia Polytechnic Institute and State University. Virginia Libraries, 45(4), 4-6.

Seamans, N. H. (1995). Occupational Therapy Assisting. In M. A. Laun (Ed.), Vocational and Technical Resources for community college libraries: Selected material, 1988-1994 (pp. 97-102). Chicago, IL: American Library Association.

Presentations

ETD 2001: The Fourth International Symposium on Electronic Theses and Dissertation, Pasadena, CA, March 22-24, 2001

- Panel (with five other graduate students): ETDs from the Graduate Student Perspective – What others have encountered and what we'll avoid
- Prior Publication? What the publishers say

Learning 2000: Reassessing the Virtual University. Presentation: The Library and the Virtual University – Issues in the Virtual Library, September 2000

9th Annual Conference, Association of College & Research Libraries: April 1999, Detroit, MI - Poster Session Presentation: New Media and the Library: Partners in Progress

Annual Conference of Virginia Educational Media Association and Virginia Library Association: October 1998, Virginia Beach, Virginia - Co-presenter - Teachable Moments in Untenable Spaces: Recipes for Success

New Media Center Annual Conference, June 1998, Boston, MA – Faculty Support Successes and Challenges and Integrating New Media into the Institution: Two Case Histories (both with Ed Schwartz)

What You Should and Should Not Say: Legal and Medical Reference Assistance (including Internet resources), with Gail Warren, Virginia State Law Librarian – October 1996 (Sponsored by the Virginia Library Association and SWING – The SouthWest Information Networking Group) and April 1997 (Sponsored by the Montgomery Floyd Regional Public Library)

Virginia Tech and the University Libraries

Virginia Tech

- 2000, 2001 – Member, Student Computer Requirement Committee

- 2000, 2001 – Member, University Core Curriculum Committee

University Libraries

- Chair, Search Committee for three College Librarian positions, 2000 – 2001
- Travel & Research Education Committee (TREC), 1999 – present
- Library Faculty Association (LFA), Junior Trustee, 2001
- Virginia Tech Commonwealth of Virginia Campaign (CVC), Library Faculty Association representative, 1999
- University Libraries' Publicity Committee, 1999 – present

Professional memberships

American Library Association (ALA), 1976 – present

Virginia Library Association (VLA), 1979 – present

Association for Educational Communications & Technology, 1998 – present

Association of College and Research Libraries (ACRL), 1995 – present

Association for Library and Information Science Education (ALISE), 2000 - present

Roanoke Valley Library Association, 1984 – present (President from 1990-92, Newsletter Editor from 1989-1992)

Honors, Funded Projects

Phi Kappa Phi Honor Society (2001)

IDLE: Integrating Diverse Learning Environments (with Nicole Auer) IDLE 2000 Module: Internet Literacy and Competency

ASPIRES Grant, Early Modern Science: A Collaborative Research and Information Retrieval Proposal (Roger Ariew, Mordechai Feingold, Nancy Seamans) – 1998

As part of the Council of Independent Colleges of Virginia (CICV) received funding in support of electronic resource access from the Teagle Foundation (1997)

Senior Member, Academy of Health Information Professionals of the Medical Library Association, (1993-1997)