The Development of an Information Literacy Indicator for Incoming College Freshmen

by

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We hereby certify that this dissertation, submitted by Ron Critchfield, conforms to acceptable standards and is fully adequate in scope and quality to fulfill the dissertation requirements for the degree of Doctor of Philosophy.

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This study developed a comprehensive information literacy instrument based on the ACRL (2000) *Information Literacy Competency Standards for Higher Education*. Instrument items were composed for the initial instrument (version 1). Instrument version 1 items were examined by three experts in the field of information literacy to determine content validity. The instrument was then administered to 78 college freshmen at Warner Southern College. Scale reliability was determined for the items of instrument version 1 by calculating Cronbach alpha values for each construct. The results were positive and described the study instrument as a reliable indicator of information literacy skills. The major scales for ACRL standards two, three, and five all achieved an alpha value above .90. The reliability of the major scale for ACRL standard one was near the upper end of the moderate-to-high range with an alpha value of .89. The major scale for ACRL standard four achieved an alpha value of .75. This value was within the statistical range of a reliable scale. To triangulate the data, interviews were conducted with 14 randomly selected freshmen volunteers. The interviews also confirmed the reliability of the instrument.

Instrument version 1 items not as consistent as others in the scale were eliminated to produce the final instrument (version 2). As a confirmatory test, instrument version 2 was administered to a second group of 81 college students from Warner Southern College. The instrument analysis again resulted in Cronbach alpha values indicating a reliable instrument. All major scales were comparable between the two trials except for major scale 5—yet the result for major scale 5 was within the statistical range of reliability. The conclusion of the study was that the development and testing of the information literacy indicator proved to be valid and reliable for indicating information literacy skills across all five ACRL information literacy standards.
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Chapter 1

Introduction

Information professionals in institutions of higher education understand the need for implementation of information literacy programs in the current environment of rapid technological advances and proliferating information resources. The Association of College and Research Libraries (ACRL, 2000) defined information literacy as “an intellectual framework for understanding, finding, evaluating, and using information—activities which may be accomplished in part by fluency with information technology, in part by sound investigative methods, but most important, through critical discernment and reasoning” (p. 4). Such an understanding of information literacy stresses its immediate importance in the context of college performance as well as its importance to lifelong learning.

Information literacy can refer to the skills-set of one who has learned, or to an educational process through which a person learns to use information effectively and efficiently in an environment of increasing information abundance and complexity. Information literacy is largely a combination of the information seeking process with the evaluation of information. The user first learns to discern when there is a need for information. Then the user learns to scan the available information environment(s) to discern the best source(s) for fulfilling the information need and how to develop a
successful search strategy. Next, the user learns to examine and evaluate the retrieved information. The user makes evaluative considerations about the information based on its perceived usefulness for the task, its authority, its credibility, and its appropriate nature—scholarly or otherwise. Finally, the user learns to synthesize and organize ideas to solve a problem and express the solution through a desired information product—whether in the form of cognitive reassurance, a research paper, or another result.

The institutional context for this study was Warner Southern College—a small, four-year private liberal arts college. In order to provide a basic information literacy orientation for incoming college freshman, the library administration at the institution scheduled three times within one week to conduct library training for freshmen. These sessions focused on lower-order information literacy skills, such as training in the layout of the library, source differentiation, and overviews of print and electronic resources found in the library. Critical thinking skills associated with higher-order characteristics of information literacy were not covered, such as how to evaluate the authority, credibility, and relevance of a source along with adequately defining need and synthesizing information for effective use. Therefore, the library did not provide a critical component of information literacy training. The instruction provided by the library could be considered as primarily bibliographic instruction, lower-order information literacy training.
Problem Statement and Goal

The Problem

Information professionals at the college could not adequately educate students in the area of information literacy within available training sessions. While there continues to be a faculty-wide discussion of information literacy and its role at the institution, the information professionals must work within the existing instructional context. In order to provide the best possible assistance to students there was a need to identify the information literacy strengths and weaknesses of incoming college freshmen prior to information literacy instruction. This would allow information professionals to redesign training sessions in the future to improve the instruction offered to students.

The problem extended its local expression into a problem for all institutions of higher education. There was a need for a comprehensive instrument to measure the information literacy competencies of students based on accepted information literacy standards. O'Connor, Radcliff, and Gedeon (2001) observed from the literature that while tools existed to test student knowledge of specific library databases and “for determining affective responses to library instruction (e.g., degree of confidence felt by students), there is not yet a standardized method for measuring information literacy that is easily administered and applied across institutions” (p. 163). Whitehead and Quinlan (2003) agreed that a hindrance to the influence of information literacy in higher education was that “there is little information about the skill levels of incoming students, and generally feedback forms are gathered immediately after instruction” (p. 23). Research was needed to develop an information literacy instrument, independent from specific training.
programs, to indicate student competencies based on accepted information literacy standards. This was the research emphasis behind the goal of the study.

The Goal

The goal of the study was to develop and test the reliability of an instrument designed to indicate the level of information literacy of incoming college freshmen based on the Information Literacy Competency Standards for Higher Education developed by the Task Force on Information Literacy Standards of the Association of College and Research Libraries (ACRL) (2000). A valid and reliable instrument to measure information literacy competency levels would enable information professionals to address the ACRL standards while also using the results to redesign available training sessions in the future. After confirming the ACRL standards as an accepted benchmark in the field, and discerning the benefits of the goal, the primary research question that guided the study was: Could a reliable instrument be developed to indicate the information literacy competencies of students based on accepted standards? The goal was achieved. The instrument proved to be a valid and reliable indicator of information literacy skills. While the goal was narrow in its focus, the relevance, significance, and opportunities for future research have broad implications.

Relevance and Significance

ACRL Standards as a Tangible Benchmark

The ACRL information literacy standards were the benchmark for higher education information literacy competencies in current research within the field of library and
information science. The current literature on information literacy in higher education recognized the ACRL (2000) *Information Literacy Competency Standards for Higher Education* as a major contribution to information literacy instruction and assessment. Merz and Mark (2002) introduced their study with the assertion that with these standards “the profession has been provided a benchmark for assessment” (p. 1). Seamans (2001) recently completed a dissertation that illustrated the value of these standards in framing interview questions to understand how students perceived information literacy concepts. In a survey of recent trends in information literacy instruction, Arp and Woodward (2002) noted the ACRL information literacy standards to be “by far one of the most influential documents in impact on both librarians and the higher education community” (p. 125). Prior to these studies, Breivik (2000) discussed how the list of ACRL competencies was a widely accepted standard endorsed by the American Association for Higher Education. The instrument for this study utilized this currently relevant and accepted standard.

*Recognition of Information Literacy by Accrediting Associations*

The development of information literacy skills is an important part of the college experience and must be a primary focus of information professionals in the academic library setting. This point was illustrated through Gratch-Lindauer's (2002) comparison of accreditation standards among the six regional accrediting associations of higher education in the United States, along with the two commissions of two of these regional associations that accredit junior and community colleges. Gratch-Lindauer reported that each of the regional accrediting associations indicated student outcomes in the area of
information literacy. The eligibility requirements related to information literacy by the Western Association of Schools and Colleges Commission for Senior Colleges and Universities illustrated the essential role of information literacy in the college experience. It was noted that this accrediting association “has eligibility requirements that specify having programs for student training and instruction in information literacy and that institutions ‘must also be able to demonstrate that library use is a fundamental part of curricula’” (Gratch-Lindauer, p. 15). In addition to this, Gratch-Lindauer explained that the higher education accrediting associations recognized and emphasized the teaching role of librarians in the area of information literacy. Gratch-Lindauer stated that “this is evidenced by the fact that all but one (North Central) of the documents refers to the teaching role of libraries via their information literacy or library instruction or training programs” (p. 16).\(^1\)

The fact that information literacy was part of the standards and expected outcomes among the majority of accreditation associations indicated their recognition of information literacy instruction as strengthening the quality of higher education. Tuñón (2003), a librarian at Nova Southeastern University, agreed that “by formalizing the mandate for library training, SACS [Southern Association of Colleges and Schools] and the other regional accrediting agencies are playing an integral role in promoting information literacy in academic institutions” (p. 11). Tuñón concluded that accrediting

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\(^1\) Another accrediting association could be grouped with North Central depending upon interpretation. For the Northwest Association of Schools and of Colleges and Universities, Gratch-Lindauer (2002) understood the required competencies of “critical analysis and logical thinking” and “literacy in the discourse or technology appropriate to the program of study” to be indicative of information literacy competency (cf. pp. 16, 22). The Northwest requirement that “faculty, in partnership with library and information resources personnel, ensure that the use of library and information resources is integrated into the learning process” would also support Gratch-Lindauer’s interpretation (Northwest Association of Schools and of Colleges and Universities, 1999, Standard 2.A.8).
agencies were essentially helping information professionals further their efforts to emphasize the need for the infusion of information literacy into the curriculum at every level (p. 14). The instrument developed for this study can be used as a tool to assist institutions of higher education in their efforts to pursue and report aspects of information literacy instruction to accrediting agencies, as well as to faculty and administrators. In addition, future research using the dissertation instrument will potentially add to the important discussion in the literature on the topic of information literacy and accreditation standards—a topic that Arp and Woodward (2002) “believe will be the ‘big one’ of the next decade” (p. 128).

Teaching Critical Thinking Skills through Information Literacy Instruction

The teaching role of information professionals must address critical thinking and reasoning skills as the key component of information literacy (cf. Rice-Lively & Raccine, 1997). Critical discernment of sources remains an important behavior to teach since “nearly three-quarters (73%) of college students say they use the Internet more than the library, while only 9% said they use the library more than the Internet for information searching” (Jones, 2002, p. 12). In this recent Pew Foundation study, Jones reported the following observation:

Students in computer labs and classrooms were heard by observers to say that it is easier to find resources using the Internet, an observation echoed by educators and librarians who worry that students are less adept at recognizing credible, academic sources when conducting research. While few universities
require college students to take courses on information seeking, many include a session on it during freshman orientation meetings. (p. 13)

This scenario illustrated the need to improve information literacy training efforts in order to teach incoming college freshmen to think critically during the information seeking process.

The emphasis on information literacy transcends arguments for or against the future of libraries and/or librarians. The emphasis on information literacy transcends location. No matter where a student uses information, the critical thinking and reasoning skills developed through information literacy training will apply. As Winkler (2001) concluded, Information in the new millennium is an extension of traditional basic literacy and is a requirement for the educated citizen. The current shortage of knowledge-based workers makes it urgent for adults in the United States to be information literate. (p. 29)

The Liberal Arts College and its Emphasis on the Academic Library

Another recent survey by the Digital Library Federation and the Council on Library and Information Resources confirmed the findings reported by Jones (2002). There was a noticeable shift to the use of Internet resources as opposed to traditional library resources (Friedlander, 2002). However, Friedlander reported along with this that there was an overall satisfaction with library resources and services among the respondents. An interesting finding was the particularly strong allegiance to library resources and services by respondents from liberal arts colleges. Friedlander reported 86.5% of the respondents
as satisfied with library resources and services. Friedlander provided the following analysis of this finding:

Liberal arts colleges, where the teaching mission is particularly important, also seem to be institutions in which there is consistently greater reliance on the library and where the library has a greater presence in supporting the curriculum. Undergraduates, far more than graduate students and faculty, ask librarians for help in their coursework, adding to the function of the librarian as teacher as well as editor, selector, and guide. Thus, integrating librarians' functions and services into the undergraduate learning experience may prove a fertile area for future growth. (Observations and Implications, para. 5)

These findings were consistent with the experience of the author as an information professional at a liberal arts college. A motivating factor behind this study was the expectation of information professionals in this context to provide quality teaching in the area of information skills.

The Study as Beneficial to Academic Libraries

A recent survey by Merz and Mark (2002) offered a glimpse of possible benefits of this study to academic libraries. The survey illustrated a pattern of limited information literacy training sessions among academic libraries in the United States. Nevertheless, it confirmed the advantage larger institutions have in terms of resources to provide more types of information literacy training.

Merz and Mark (2002) surveyed 158 college and university libraries in order to gain insight into the types of information literacy programs and assessment being conducted in
academic libraries. Among the respondents, 14 libraries served less than 1,000 students, 88 libraries served between 1,001 and 3,000 students, 30 libraries served 3,001 to 5,000 students, and 26 libraries served over 5,000 students. While the Merz and Mark study did not take into account institutions that may have campus-wide, curriculum-based information literacy programs, it provided a portrait of what individual libraries were doing in the area of information literacy training. A limitation of their study was that the only variable compared was size and no consideration was given to cultural or other possible reasons for differences.

The four primary instructional methods for the libraries surveyed were

the so-called 'one-shot' course-related lecture (150 libraries, or 95%); the orientation/tour (117 libraries, or 74%); the multiple (2-3) session instruction offering (108 libraries or 68%); and the instruction session that lasts less than a full class period (101 libraries or 64%). (Merz & Mark, 2002, p. 4)

Each method, by itself, provided limited interaction between the students and library instructors. The Merz and Mark survey went further to indicate that while these were the primary modes of information literacy instruction among libraries, the larger libraries, serving a constituency larger than 3,000, provided more of these services than the smaller academic libraries. Merz and Mark concluded from their survey how “it is clear, at the very least, that larger institutions offered more variety in types of instruction tailored to a range of circumstances” (p. 5). An instrument to indicate information literacy levels will enable more efficient and effective response to student needs within each of the four primary modes of instruction. In addition, this study will contribute to the professional literature by providing a comprehensive, evaluative tool that reliably indicates
information literacy levels based on the ACRL information literacy standards for two test groups. Scholars and information professionals may use the instrument, analyze the process, replicate the study, and/or otherwise examine the study in order to further the academic process.

**Barriers and Issues**

The study has many practical applications as noted in the relevance and significance section. The study created an information literacy indicator that showed promise as a screening tool based on the ACRL standards for information literacy. The study also served as a pilot study after which future studies, using the instrument, may be conducted to further its development and application.

There was initial concern about the possibility of discovering a similar type of instrument. After an extended literature review, articles were discovered that reported pre-tests and post-tests associated with specific library instruction programs that largely assessed lower-order information literacy issues (technological literacy) without examining the higher-order component of information literacy. In addition, one dissertation discussed the development and implementation of a qualitative survey concerning the perceived level of learning after completing an information literacy program (Seamans, 2001). Only one other project was found with similar goals to develop an information literacy instrument to measure the general level of student information literacy skills independent from specific library instruction programs—Project SAILS (Standardized Assessment of Information Literacy Skills) (O'Connor, et al., 2002).
Early in the research process, the question arose, “If a similar instrument existed would it then negate the research of this study”? The conclusion was there would be sufficient room in the field for two or more related research projects. Multiple voices on a topic have furthered scientific inquiry. An example from another discipline would be the many personality inventories in existence, such as the Myers-Briggs Type Indicator and the Keirsey Temperament Sorter. These inventory instruments shared a similar task of highlighting aspects of personality. Both instruments enhanced the field of study yet were different in nature and approach. The example can be applied to this multiple information literacy instrument scenario. This study and Project SAILS were different in nature and approach. Lisa O’Connor (personal communication, February 23, 2005), one of the primary researchers of Project SAILS, recently reviewed the construct-item relationship of the study instrument and found the work to be excellent (see Methodology for O’Connor’s review).

The present study focused on the ACRL benchmark for information literacy competency to develop an instrument for future use in providing input for redesigning limited library training. Rather than measuring productivity of existing information literacy training, this study provided information professionals with an instrument that yields data to facilitate forthcoming training utilizing the ACRL information literacy standards. In addition, the information literacy instrument developed for this study was broad in scope in that it encompassed all five ACRL information literacy standards. This study was the first to develop an instrument intricately tied to all five of the ACRL information literacy standards.
One expected barrier when the project began was the statistical analysis necessary to produce a reliable instrument. While the information science aspect of the dissertation was an area in which the author was competent, statistical analysis was not. Nevertheless, the author built upon knowledge developed in previous research methods coursework and learned that which was necessary for the completion of the project. The author believed strongly in the need for such research and in the potential benefits of its results. The author developed a level of statistical proficiency through additional research in psychometric theory and educational research methods in order to conduct the statistical analysis of the instrument.

**Limitations and Delimitations of the Study**

*The Language Contained in the Instrument*

The instrument was not necessarily intended to be an assessment of what one learned through any specific training program. The information literacy instrument for the study indicated what one knew concerning information literacy based on the ACRL standards. Yet, the instrument was developed in the context of library science and therefore contains library specific terminology. This was a limitation of the study.

As in any discipline, one may understand a concept devoid of its technical jargon, yet when given only the jargon may be unable to identify the known concept veiled in the language. This did not mean research-related jargon was unimportant to information literacy training. It meant that essential jargon must be defined during training sessions in order to communicate as well as possible (Hutcherson, 2004, p. 354). Given this limit, parenthetical notes were added to items where language might pose a barrier to
understanding item concepts. The intention was to reduce any language limitations associated with information literacy concept recognition.

An Instrument based only on the ACRL Information Literacy Standards

A delimitation of the study was an instrument based solely on the ACRL (2000) Information Literacy Competency Standards for Higher Education. The ACRL standards were chosen as the accepted benchmark for information literacy competencies as noted in the study. In addition, the ACRL standards are relevant for all aspects of higher education: the American Association for Higher Education endorses them.

The Size of the Instrument

One potential constraint to the usability of the instrument was its size. The initial instrument contained 145 items and the final instrument contained 129 items. There was a concern that test subjects might fail to provide considered responses as they progressed through the instrument. While this did occur in some cases, the analysis of variance between the two tests of the instrument indicated a strong reliability for the instrument. Early in the research process, the author was reminded of the two personality instruments mentioned above. The Keirsey Temperament Sorter and the Myers-Briggs Type Indicator (MBTI) each contained a large number of items, yet both were successful and important instruments in their field. The Keirsey Temperament Sorter included 70 items (AdvisorTeam, 2004). The shorter version of the MBTI contained 93 items and the longer version included 144 items (CPP, Inc., 2004).
Summary

Library instruction at the author’s institution did not provide comprehensive information literacy training to incoming college freshmen within the allotted instructional sessions. There was a need to identify information literacy strengths and weaknesses in order to improve student instruction in the area of information literacy. The application of a comprehensive instrument to identify information literacy competencies extended its local need into one for all information professionals in the academic library setting.

The goal of this study was to develop a comprehensive information literacy instrument based on the accepted benchmark of the ACRL information literacy standards. Support for this goal came from increased emphasis on information literacy by higher education accrediting agencies and the need for increased efforts to teach critical thinking skills. The involvement of the academic library, and its information professionals, in this teaching mission appears to be more acute in liberal arts colleges—the contextual setting of the author. The instrument developed in this study proved to be a valid and reliable indicator of information literacy skills. Finally, the constraints of language, focus only on the ACRL standards, and the size of the instrument were noted.
Chapter 2

Review of the Literature

The first section of this literature review examines the historical context of information literacy instruction. A discussion of research concerning information literacy assessment follows. It must be noted that there are a limited number of studies in the literature with research specific to the topic. While information literacy assessment literature is increasing in volume, it only represents approximately 10 percent of the current literature regarding information literacy (Johnson, 2003, p. 385). Within this small percentage, few studies focus on assessment independent from instruction programs. The majority of articles on information literacy assessment are associated with existing training programs. As O'Connor et al. (2002) observed in their review of the assessment literature, a “characteristic of current assessment programs is that they emphasize measuring the efficacy of individual components of instruction in order to plan for improvement...” (p. 529). A review of information literacy assessment literature, independent from information literacy instruction, is discussed immediately following the examination of historical context. Then a brief discussion is presented describing relevant studies that associate assessment with components of information literacy instruction. The literature review concludes with a survey of secondary school information literacy standards and expected levels of information literacy for high school students.
Historical Context for Information Literacy Instruction

For the modern information professional in the academic library, information literacy training is an integral part of the profession. Information professionals manage and provide information as well as teach critical skills involved in its use. However, the focus on library instruction as a model of service for the librarian did not become a common practice in the United States academic library until the latter part of the 19th century. The practice lost momentum in the early 20th century and did not reemerge as a movement until the 1960s. Only in the late 1980s-early 1990s did the modern concept of information literacy training arise.

Library historian Michael Harris (1984) explained that “college libraries before 1850 were generally small and unimpressive collections of books—poorly housed, little used, and strictly guarded” (p. 232). After 1850, however, Harris cited the increased wealth of the United States, changes in U.S. educational perspectives towards the significance of a research orientation, and professional advances in librarianship as factors that revolutionized the nature and role of the academic library (p. 232). Thomas (1999) described this trend by reporting how “in a very real sense, the transformation of the librarian from archivist to educator facilitated and was facilitated by the transformation of the university library from literary sanctum to intellectual workshop” (p. 6).

Thomas (1999) explained that the idea of the academic library as an intellectual workshop was, in part, due to the professional contributions of such individuals as Justin Winsor (1831-1897) of Harvard and Melvil Dewey (1851-1931) of Columbia College. Winsor envisioned the centrality of the library in the educational process and provided book lists in relation to student assignments as well as offering a reference service in
which users posted notes with information queries to be answered by others (Thomas, p. 6). Dewey established individual assistance as an integral aspect of the teaching role of the library (Thomas, p. 7). Thomas described Dewey's expectations of this service:

In addition to organizing and cataloging library materials and providing reference resources, librarians were obliged to furnish “discriminating counsel” and “direct training” so that students would not only have knowledge of the best library resources but be able to “use them intelligently” and in the proper order. (p. 7)

Harris (1984) agreed that Dewey and Winsor helped to articulate “the growing consensus relating to the library's new significance to the educational effort and provided effective professional leadership in the development of library services and collections” (p. 233).

While the late 19th century and early 20th century saw both the origins and initial implementation of the idea of the librarian as teacher and the benefits of library instruction, a consensus regarding such issues of instruction developed at a much slower pace across academic institutions in the United States than one might have expected. Lorenzen (2001) explained that there was a dormant period for academic library instruction from the late 1930s until the early 1960s (p. 10). It was not until the 1960s that a renewed interest in bibliographic instruction began to emerge among academic libraries in the United States (cf. Thomas, 1999, p. 7).

Two bibliographic instruction projects of the 1960s were frequently cited as the foundation of library instruction models serving as examples for the subsequent bibliographic instruction movement during the decade. The first was a project developed by Patricia B. Knapp at Monteith College of Wayne State University in Detroit,
Michigan. The second was a project developed by Evan Ira Farber, Thomas B. Kirk, and James R. Kennedy at Earlham College in Richmond, Indiana.

Knapp, in keeping with the ideals of Winsor and Dewey, considered the academic library as the center of the college experience. Knapp sought to illustrate the value of library training to the faculty by integrating library instruction into a number of courses (Thomas, 1999, p. 10). Knapp provided problem-solving activities related to specific course work in order to add value to library instruction. Lorenzen (2001) explained how Knapp found library competence to be a liberal art “that is systematically ignored by subject specialists intent on imparting content rather than competence” (p. 11). Intense integration of library instruction into the curriculum was an effort by Knapp to counter this finding and intervene to teach critical library competency skills.

Earlham College also initiated an early model of integrating bibliographic instruction into the curriculum. Thomas (1999) described the Earlham bibliographic instruction experience as cooperative interaction between teaching faculty and librarians (p. 11). Library instruction was integrated into the courses in which students most often used library resources. Within these courses, librarians demonstrated search strategies and provided relevant handouts such as annotated bibliographies. An interesting feature of this model was the built-in gradation of training to ensure a sequence of training over the span of a student's four years at the college (Thomas, p. 12). As Grassian and Kaplowitz (2001) summarized the Earlham experience: “class by class, teaching faculty and librarians develop syllabi and assignments together in a synchronized, sequential approach to library instruction, beginning with 'placement tests' and continuing through increasingly more complex instruction” (p. 17).
The Earlham College model and Knapp's Monteith College experiment renewed the focus on bibliographic instruction in academic libraries in the United States and sparked the modern-day library instruction movement. Evidence of the renewed focus on bibliographic instruction among academic libraries in the United States during this time could be seen in the increased number of publications on the topic and from the creation of professional focus groups and projects on the topic. Rader (2002) noted the steady growth of articles in the professional literature concerning library user instruction from the early to mid-1970s (p. 243). From 1977 through the 1980s the professional literature had well over 100 articles each year on the topic, with many years peaking near 150 articles—239 articles were published in 1984 (Rader, p. 243).

Following the Monteith College and Earlham College practices, the formation of professional groups in the 1970s indicated further evidence in the growth of interest in the area of library instruction. Thomas (1999) explained that the first tangible evidence of a professional group concerned with library instruction came with the creation of an Ad Hoc Committee on Bibliographic Instruction within the Association of College and Research Libraries (ACRL) followed by the establishment of the Bibliographic Instruction Section of ACRL in 1977 (p. 12). The Library Orientation and Exchange (LOEX) project also began in the early 1970s as a conference at Eastern Michigan University. The goal of LOEX was to develop an organization to provide outreach in library instruction. Grassian and Kaplowitz (2001) explained that its function was to serve as a national depository and clearinghouse for library instruction materials to assist instruction librarians (p. 27).
In the 1980s and 1990s professional groups on library instruction emerged regionally in the United States, nationally, and internationally (cf. Grassian & Kaplowitz, 2001, pp. 25-30). In addition, the proliferation of professional literature on the topic resulted in an average of over 200 published articles per year in the decade of the 1990s with over 300 articles on library and information literacy instruction published in both 2001 and 2002 (Rader, 2002, p. 243).

The proliferation of information technology from the mid-1980s to the present brought about a set of complexities forcing the academic library community, and, indeed, society, to focus on dealing with advances in information technology and the resulting proliferation of information. Reeves (1996) explained that “the overuse of the term information is a telltale sign of the Age of Complexity: the age of multiple choices and endless data” (p. 11). There is an overabundance of information from which to choose and greater speed of communication that provides more opportunities to choose. Reeves noted that information doubled every 4.3 years and 1000 books were published each day (p. 6). Reeves contended that information overload due to improved telecommunications and exponential growth of the volume of information were leading to a new understanding of knowledge and learning. The solution to managing the complexity of information was a model of learning based on critical thinking about and selective filtering of information.

It was this model of critical thinking and selective filtering amidst information complexity that refocused the library instruction movement towards information literacy instruction. While one might argue that the basic ideas of information literacy have persisted throughout the modern library instruction movement, the increased complexity
of information and information technology have focused the attention of administrators, educators and students on the “importance of being competent, literate, and, ultimately, fluent in information identification, location and use” (Grassian & Kaplowitz, 2001, p. 13). It took the rise of the so-called information age to bring about such an overwhelming exposure to information sources that resulted in a demand for mechanisms to cope.

One way the academic library coped with the information age was by training its constituency to be information literate. The next section of the literature review examines a selection of information literacy instruction studies focusing on information literacy assessment issues. The first part includes studies concerning assessment independent from specific information literacy instruction programs. The second section focuses on relevant studies that associate assessment with components of information literacy instruction programs for incoming college freshmen.

**Information Literacy Assessment**

*Assessment Independent from Information Literacy Instruction*

One concurrent research project was found with similar concerns for developing an information literacy instrument using ACRL standards. The research project was similar in that it also sought to measure the general level of student information literacy skills independent from pre-test and post-test assessment associated with specific library instruction programs. In a project currently in the testing phase, O'Connor et al. (2002) reported the development of an instrument to measure the information literacy skills of students from admission to graduation. Their project was called the Project for the
Standardized Assessment of Information Literacy Skills (SAILS). Project SAILS began around the same time as this study.

A primary goal of Project SAILS was to serve in longitudinal testing of students throughout their academic careers in order to determine the relationship of information literacy skills improvement with academic achievement by comparing instrument data with academic records (O'Connor, et al., 2001, p. 173; O'Connor, et al., 2002, p. 529). O'Connor et al. (2001) explained that

at a time when universities and colleges are being held to high levels of fiscal responsibility and as libraries increasingly funnel funds and staff resources into information literacy programs, there is a pressing need to answer the question “are these programs making a difference?” (p. 163)

This claim was unsubstantiated and must be categorized as anecdotal. Nevertheless, it was presented as part of the context of Project SAILS as the researchers sought to develop a valid and reliable means to assess how information literacy programs impact the institution and its students over a period of time.

The researchers for Project SAILS utilized a systems approach model to develop the instrument in five phases. In the first phase, they determined the instructional goal of what the researcher wanted the learner to be able to accomplish after instruction (O'Connor, et al., 2002, p. 531). Phase two analyzed the instructional goals by determining the necessary behavior needed to achieve the determined goals. Phase three involved analyzing learners and contexts in order to understand the learning environment. Phase four involved writing performance objectives. O'Connor et al. stated, “these objectives are specific statements that identify and describe skills to be attained,
conditions under which they must be performed, and criteria for successful performance” (p. 531). The researchers created phase four objectives by drawing on their expertise as academically trained information professionals, experienced in the profession, along with utilizing information literacy standards from the American Association of School Librarians (AASL) and the Association of College and Research Libraries.

The fifth phase in the development of Project SAILS was the creation of the assessment instrument. This phase flowed naturally from the phase four objectives based on expertise and information literacy standards. However, the researchers indicated it was not an easy task. In writing the instrument elements, O'Connor et al. (2002) had to determine “how the learner's ability to perform in the manner already described can be measured” (p. 532). The researchers chose to use item response theory (IRT) as a measurement model. In this model, items of varying difficulty were created for the objectives and IRT measured the different ability levels of the participants.

The instrument for Project SAILS did not cover all of the AASL or ACRL information literacy standards. O'Connor et al. (2001) stated that they “focused on two standards, dealing with efficiently and effectively accessing information (AASL standard number 1; ACRL standard number 2), and evaluating information critically and competently (AASL standard number 2; ACRL standard number 3)” (p. 168). The information literacy instrument developed for this dissertation study was broader in scope concerning the use of standards—it encompassed all five ACRL information literacy standards.

In a series of question revisions O'Connor et al. (2002) tested questions with students at their institution, Kent State University. The series of revisions followed a one-on-one
testing of six students, then a small group test of 20 students, and finally field trials that included 554 students in various classroom settings. Statistical analysis of the results showed that the instrument provided a moderate level of reliability in measuring varying levels of information literacy skills. Problem items from the field trials were then revised and a final instrument produced. O'Connor et al. tested the final instrument with a group of freshmen at Kent State University, and have initiated testing of the instrument with other colleges and universities. No further results were reported. It was also mentioned that, in addition to this initial instrument, O'Connor et al. (2001) intended to create a second instrument to evaluate alternative methods of library instruction (p. 164).

Bell (2003) recently reported that the Libraries and Media Services department of Kent State University received a $250,000 National Leadership grant from the Institute of Museum and Library Services (IMLS) to support Project SAILS and that the project was also endorsed by the Association of Research Libraries (ARL). The IMLS grant provided monetary resources enabling Project SAILS to begin three testing phases of the instrument. Bell reported that, “phase one will include participants from 10 institutions; phase two will include 30 participating institutions; and phase three culminates in the testing of students from 100 institutions” (para. 10). Blixrod (2003) reported that the final phase of testing would be conducted in the Fall 2004 and Spring 2005 (p. 19).

The recognition of the need for improved assessment in information literacy was a shared concern of both this study and Project SAILS. The momentum behind Project SAILS validated the purpose and meaning of this study. As stated previously, there was a need in the field of information science to produce valid and reliable measures of information literacy among students. Project SAILS further illustrates this need and some
of the work being done to meet the need. However, the vision of this study was different from Project SAILS.

The literature of the discipline will be served by more than one research project in the area of developing an information literacy instrument that is independent from assessment associated with specific library instruction programs. In addition, this study was the first to develop a reliable instrument intricately tied to all five of the ACRL information literacy standards.

In a recent dissertation, Seamans (2001) developed a qualitative survey based on the ACRL information literacy standards for the last phase of the research project. Initially, Seamans composed a series of questions to ask of nine college freshmen in order to learn how freshmen acquire and use information. This descriptive assessment project was independent from any specific instruction program. Seamans produced qualitative results from three phases of a study that illustrated information seeking behavior of freshmen and their understanding of information literacy concepts. The first phase involved sending an e-mail questionnaire with nine open-ended questions based on an annual freshman survey from Seamans’ institution, Virginia Tech. The second phase was an e-mail follow-up to expand on the ideas gathered in phase one. The third phase was a personal interview by Seamans with each participant in the study. This interview consisted of an expansion of ideas from phases one and two along with 27 additional questions based on the ACRL (2000) *Information Literacy Competency Standards for Higher Education*.

All of Seamans’ (2001) questions were within the framework of five general questions concerning freshman use and perception 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 student's understanding of the need for reliable information sources? (p. 40)

Seamans also reported the study results within the framework of the above questions.

Seamans’ (2001) results for question one included the general agreement among participants that they consult others when defining an information need. However, library personnel were not among those persons consulted (Seamans, p. 67). Another result concluded general agreement on understanding keyword searching but indicated little ability to move beyond keyword searching (Seamans, p. 70). In addition, when using computers to acquire information, all students perceived themselves as knowledgeable enough to use computers to complete course work but only half the participants classified themselves as computer literate.

Seamans’ (2001) results for question two showed a major preference for using information gathered from Internet search engines. Another result for question two was that seven of the nine participants began information seeking with a broad focus and then used the retrieved information to narrow their searches. The results for question three included the absence of organization of electronic information by four of the participants.
and general agreement among participants about knowledge of plagiarism and copyright issues—yet many seemed to rationalize the use of file sharing systems such as Napster (prior to its dissolution and reinstatement as a legal download source). The results for question four indicated that all but one student did not perceive changes in information seeking or use after a semester of college and exposure to questions about information retrieval and use. The results for question five indicated that four participants claimed always to evaluate the credibility of Internet sites; two noted that they never evaluate sites for credibility and three participants said that they sometimes evaluate Internet sites. After exposure to an instructional module on evaluating Internet resources, all of the participants acknowledged new appreciation and understanding concerning the need to evaluate such resources.

Seamans’ (2001) dissertation provided anecdotal reporting to narrate a portrait of the information landscape within the limited context of her study. It did not provide a quantitative tool to measure information literacy competency as did Project SAILS. O’Hanlon (2002) also provided a quantitative tool to evaluate information skills of incoming freshman prior to higher educational training. However, the skills indicated were Internet skills only, without encompassing the full range of information literacy competencies.

O' Hasanlon (2002) reported the results from an Internet skills proficiency test given to freshmen at Ohio State University. The literature review of O’Hanlon’s study focused largely on computer literacy. One section of the report dealt with the related aspects of computer literacy and information literacy. O'Hanlon noted that an assessment of information literacy must take into account the computing and Internet skills of the
student (p. 58). As a result, O'Hanlon's study focused on computer and Internet skills rather than all aspects of information literacy. In addition, O'Hanlon did not address the ACRL information literacy standards.

The Internet skills proficiency test developed by O'Hanlon (2002) consisted of three sections, namely, Internet tools (part one), search skills (part two), and research techniques (part three) (p. 59). Fifty questions were asked with an assigned value of two points per question. Part one included six Web browser questions, six e-mail questions, and four online discussion group questions (newsgroups, mailing lists, Web forums). Part two included three database questions, eight search technique questions, and six Web search tools questions. Part three included eight questions on evaluating Web sources, four questions on source selection and research strategy, and five questions on citing sources (O'Hanlon, p. 59).

Three groups were administered the test for O’Hanlon’s (2002) study—21 freshmen honor students in art, 22 freshmen prospective art students without honors arts, and an independent group of 14 persons consisting of staff, students of other OSU colleges, and persons not affiliated with OSU (O'Hanlon, p. 59). The independent group scored highest on each part of the test. The two freshmen groups scored progressively lower on each part of test (i.e., part three lower than part two, and part two lower than part one). O'Hanlon concluded, “college administrators must not assume that new students arrive with acceptable computing and research skills simply because students tell us that they are competent. Rather, they should assess entry-level skills and provide appropriate instruction in a variety of modes...” (p. 63).
Assessment Associated with Information Literacy Instruction

The majority of information literacy assessment literature deals with measuring the degree to which students participating in information literacy instruction programs demonstrate the expected learning outcomes. In this body of literature, assessment was directly associated with instruction programs. The literature reviewed in this section included studies with either a primary use of the ACRL information literacy standards in assessment or an emphasis on assessing incoming college freshmen. In the first subsection, three studies that directly emphasize ACRL information literacy standards in assessment associated with instruction programs are reviewed. In the second subsection, three studies that emphasize assessment of freshmen associated with instruction programs are reviewed.

Emphasis on ACRL Information Literacy Standards

Flaspohler (2003) described an information literacy program at Concordia College, a small liberal arts school in Moorhead, Minnesota, which compared a new program based on the ACRL (2000) *Information Literacy Competency Standards for Higher Education* with an older program utilized by the college. Flaspohler explained this new study was the first time information professionals at Concordia were involved in composition courses, called “Discourse” courses, “beyond a cursory one-shot library instruction session with individual Discourse sections” (p. 132). A pilot group was implemented to receive ongoing instruction across three library sessions based on the ACRL Information Literacy Standards. The control group received the one-shot library instruction—a one-time training session as opposed to multiple training sessions.
The assessment for Flaspohler’s (2003) study included three means: an information competencies survey developed in 1999 by UCLA; an examination of the final project bibliographies for students in the Discourse sections; and an anecdotal accounting of what the students would now start doing and stop doing in the area of research as a result of what was learned—the start/stop exercise (p. 133). The pilot group scored better on every information competency question than the control group. As for the examination of the bibliographies, Flaspohler found that the control group had 51% “less than stellar” sources while the pilot group had 33% “less than stellar” sources (p. 137). Finally, some students among the pilot group were given the start/stop exercise that provided little in the way of assessment but reported two notable changes in student perception. The changes were that many students reduced their reliance on the Internet and many students commented on their emotional improvement concerning library use (Flaspohler, p. 138).

Davidson, McMillen, and Maughan (2002) also utilized the ACRL information literacy standards to conduct a self-study of their library instruction practices. This process created opportunity to promote information literacy among faculty at their institution, Oregon State University (OSU). Davidson et al. explained that the program they evaluated “consisted largely of individual sessions requested by faculty for discipline-based classes at all levels, from freshmen to graduate students” (p. 99).

Librarians who taught library instruction sessions at OSU completed a survey instrument based on the ACRL information literacy standards. Davidson et al. (2002) shaped the ACRL standards to their instructional methods as they “reordered them based on a more logical research strategy, dropped some which seemed inappropriate for [their] situation, and integrated some of [their] own competencies which had been developed
during revision of [their] online tutorial” (p. 100). Twenty-seven surveys were analyzed and Davidson et al. learned that the librarians “felt the competencies and outcomes included in the survey are ideally introduced to students at the lower division undergraduate level” (p. 101). Yet the authors noted much of their instruction occurred at the upper-division and graduate levels (Davidson, et al., p. 101). Davidson et al. reported from the survey that the top eight priorities among ACRL competencies, across all levels of students, were as follows:

1. 1.1.e. Identifies key concepts and terms that describe the information need.
2. 2.3.a. Uses various search systems to retrieve information in a variety of formats.
3. 2.1.c. Investigates the scope, content and organization of information retrieval systems.
4. 2.2.b. Identifies key words, synonyms and related terms for the information needed.
5. 2.2.d. Constructs a search strategy using appropriate commands for the information retrieval system selected.
6. 2.3.c. Uses specialized online or in person services available at the institution to retrieve information needed.
7. 1.2.c. Identifies the value and differences of potential resources in a variety of formats.
8. 1.1.c. Explores general information sources to increase familiarity with the topic. (p. 101)
In another study that emphasized the ACRL information literacy standards, Mark and Boruff-Jones (2003) utilized the National Survey of Student Engagement (NSSE)\(^2\) to demonstrate the extent to which institutional curriculum incorporated information literacy experiences. The researchers selected one of the five NSSE benchmarks, the Active and Collaborative Learning benchmark, with which to associate ACRL information literacy standards and performance indicators. Mark and Boruff-Jones explained that five of the seven questions from the selected benchmark were used to correlate the NSSE results with the ACRL information literacy standards (p. 485).

The selected NSSE questions were correlated with the ACRL standards, performance indicators, and outcomes along with Bloom’s Taxonomy. The answers given on the NSSE by first-year and senior-year students were analyzed and presented with a mean score for both groups. Mark and Boruff-Jones (2003) sought to associate the NSSE benchmarks with the ACRL standards to identify strengths and weaknesses on an institutional level (p. 490). The helpfulness of the results was not explicitly clear. The table that illustrated the mean scores showed higher scores for seniors in all but one instance and that instance was not statistically significant. One would expect seniors to score higher than freshmen. The statement that seemed to conclude the discussion of results was, “The NSSE scores for first-year students and seniors differ, and assignments created for information literacy instruction at different academic levels should reflect the development in information literacy sophistication from freshman year to senior year” (Mark & Boruff-Jones, p. 489). Mark and Boruff-Jones concluded their report with an

\(^2\) The NSSE is a survey instrument that indicates student perceptions of educational and personal development as a result of attending a college or university. The data provide an individual institutional portrait of these perceptions as well as a comparison among sets of similar participating institutions.
imperative call for library research to continue striving for information literacy measures (p. 491). This dissertation study developed one such measure by producing a reliable instrument for indicating information literacy levels.

*Emphasis on Assessment of Freshmen*

Cameron and Feind (2001) described an Information-Seeking Skills Test (ISST) administered to freshmen after information literacy instruction was provided. The ISST consisted of 53 items within four sub-tests covering reference sources, database searching, Internet searching, and ethics. The vast majority of students passed the test with 81% passing on the first attempt; 22% of the students scored as “advanced” by correctly answering within the 48-53 range. While Cameron and Feind did not discuss all of the questions on the ISST, they did list the topics for the most often-missed test questions. These were (a) locating a journal article, (b) using Boolean operators, (c) understanding the difference between keyword and subject searching, (c) developing effective search statements, and (d) identifying different types of citations (Cameron & Feind, p. 217).

In another study of college freshmen assessment, Lawson (1999) described a pre-test and post-test assessment of information literacy among students enrolled in an information resources course. Lawson administered a 15 question test at the beginning and end of the course for two groups—one in the fall and one in the spring. There were three types of questions on the questionnaire. Lawson explained that “four questions were Internet related, six questions dealt with general information literacy, and five questions had to do with specific information resources…” (p. 76).
Lawson (1999) reported the quantitative results that indicated an improvement from pre-test to post-test for both groups with a 7.33524 mean score on the pre-test and a 11.5282 on the post-test showing “an average gain of 4.19296” (p. 76). The range of correct responses increased from 25 to 89 percent on the pre-test to 31 to 99 percent on the post-test (Lawson, p. 76). The assessment was considered as proof of increased information literacy among those participants in the information resources course.

Confronted with freshmen who turn to the Internet first, Walker and Engel (2003) reported a freshman instruction and assessment program developed to face this growing culture among college students of downloading information from the Internet with little or no evaluative process. Walker and Engel sought to develop an information literacy program that would not seem irrelevant to students so accustomed to the use of the Internet. They created a series of exercises to develop information literacy skills during the process of the equivalent of a first-year English course. Walker and Engel wanted to meet students where they are, expose deficiencies in their current knowledge through first-hand experience, provide information literacy instruction to address those deficiencies in a practical way, link research strategies to general and ongoing needs rather than compartmentalized courses, and incorporate practice with rules of academic honesty. (p. 136)

The exercises were developed so students would be engaged in various topics of information literacy at various times in the learning process. An exercise on gathering sources was provided and then, over multiple class sessions, assessment feedback and training were provided in source evaluation and information seeking. Following this, a second exercise was presented to the students. Then a more detailed assignment was
given and extended assessment feedback on information literacy was provided at the next course meeting. A third assignment was completed and assessment feedback was provided in the form of written comments only. Walker and Engel (2003) concluded that their study illustrated a successful faculty-librarian collaboration to involve students in learning by doing with specific guidance along the way—producing a model adaptable to courses in every subject (p. 147).

**Secondary School Information Literacy**

As the academic library copes with the information age through information literacy training, what might information professionals expect to encounter in terms of information literacy skills of high school graduates entering college? This section of the literature review first examines professional information literacy standards for secondary schools and then discusses expectations of information literacy levels among high school students.

**Secondary School Information Literacy Standards**

In their review of state-by-state certification requirements for school librarians, Thomas and Perritt (2003) discovered “one of the most crucial developments in the last few years is that more states recognize the importance of teaching information-literacy skills” (p. 53). A growing trend bases school librarian certification competencies, in part, on the material found in *Information Power: Building Partnerships for Learning* (Thomas & Perritt, p. 53). *Information Power: Building Partnerships for Learning* (1998) was a set of guidelines for improving school media library programs prepared by the
AASL and the Association for Educational Communications and Technology (AECT). Within this volume, the AASL and AECT included the *Information Literacy Standards for Student Learning*. The AASL and AECT information literacy standards provided a conceptual framework of learning outcomes for school library training programs.

The AASL and AECT (1998) presented nine information literacy standards within three categories. Each standard had a number of indicators. Each indicator had three examples of proficiency levels—basic, proficient, and exemplary. The first category was entitled, *Information Literacy*, and contained the first three standards. Standard one focused on efficient and effective access to information. Standard two focused on critical evaluation of information. Standard three concerned the accurate and creative use of information. The second category was entitled, *Independent Learning Standards*, and contained standards four, five, and six. Standard four indicated that an independent learner “is information literate and pursues information related to personal interests” (AASL, & AECT, p. 23). Standard five built upon the fourth standard by describing an information literate, independent learner as one who appreciates literature and creative presentation of information. Standard six indicated that such a person would strive for excellence in the pursuit of information and the development of knowledge. The third category was entitled, *Social Responsibility Standards*, and consisted of the last three standards. Standard seven was concerned with recognizing the importance of information to a democratic society and of contributing to society and the learning community. Standard eight dealt with the acknowledgment of the need for ethical use of information and technology. Standard nine indicated that the information literate in society would effectively pursue the generation of information within groups.
Cahoy (2002) supported the growing expectation that school librarians should know and follow the AASL/AECT information literacy standards. While training students based on the ASSL/AECT standards, Cahoy argued the school librarian should first become familiar with the ACRL information literacy standards so they might “keep an eye toward what…students will be expected to do when they enter college” (p. 14). Therefore, Cahoy viewed the ACRL information literacy standards as an extension of the AASL/AECT standards. When secondary students entered college, they would not have the training in all aspects of information literacy as defined by the ACRL standards but should have a foundation based on the AASL/AECT standards. However, as discussed in the next section, if a high school was without a librarian or without a librarian with advanced training, then student familiarity with information literacy concepts would be less than if a school librarian with advanced training was involved with students.

*Expectations of Information Literacy Levels among High School Students*

In a professional journal targeting high school principals, Champlin and Loertscher (2003) asserted that library media specialists are “charged by their professional associations with teaching information literacy” (p. 68). In theory, library media specialists were called to facilitate the development of such information literacy skills in high school students from among such standards as discussed in the previous section. While this was the charge, what might one realistically expect of the information literacy levels of high school graduates?

This question must simply be answered by stating that expected levels of information literacy will vary depending upon a number of factors. Lance (2001) conducted statewide
studies in Pennsylvania, Colorado, and Oregon to investigate the quality of primary and secondary library media programs and their affects on academic achievement. As one would expect, Lance reported that library media programs with better funding and better staffing produced higher academic achievement in all three states (p. 18).

In addition to decreased funding as indicative of lower levels of information literacy, Harris (2003) included the issues of media specialists without advanced training and aging collections as factors leading to lower information literacy levels (p. 218). Other limiting factors noted by Harris were the facts that not all media specialists followed professional standards and not all media specialists were required to have a standardized level of training—accreditation standards for school library media specialists were stratified among states (p. 217).

Smalley (2004) studied the progress of 506 college students enrolled in an introductory information research course. The students came from one of three school districts in Santa Cruz County, California. Two of the school districts did not have high school library media specialists while the other school district did. Smalley reported that 66% of the students from the school district with librarians earned an A in the course (p. 196). Only 43% in one group and 37% in the other group of the students from the two school districts without librarians earned an A in the course (p. 196). Smalley concluded the evidence illustrated that students from high schools with librarians were more familiar with library concepts and basic information access and retrieval methods than students from high schools without librarians (p. 197). Baumbach (2003) reported similar results in Florida. Where there was a strong library media program there was a correlation with higher standardized testing scores and achievement (Baumbach, p. 5). The understanding
that high school graduates come to college from a variety of educational backgrounds, with various levels of emphasis on information literacy skills was motivation to develop an instrument that indicated disparate levels of information literacy skills among students in order to focus future training.

Summary

The historical context of information literacy instruction in academic libraries in the United States began in the late 19th century and early 20th century but reemerged in renewal and influence during the 1960s. In the 1960s, Patricia Knapp at Monteith College of Wayne State University and Earlham College librarians rekindled library instruction and sparked the modern-day library instruction movement. The proliferation of information and information technology from the mid-to-late 1980s to the present resulted in the rise of information complexity and information overload. One way academic librarians tried to cope with this overwhelming situation was through information literacy training.

This study focused on indicating information literacy skills of incoming college freshmen by developing a reliable and valid instrument independent from specific information literacy training programs. The literature review showed Project SAILS also wished to develop an instrument to assess information literacy competencies independent from training programs. Other studies illustrated the importance and emphasis of the ACRL information literacy standards associated with information literacy instruction assessment.
The AASL/AECT information literacy standards for school media programs constituted a foundational approach to indicating the skills needed by high school students to move into college. High school students with librarians who earned advanced training in the discipline had a greater chance of receiving information literacy training based on the professional information literacy standards prepared by the AASL and AECT than did students without a librarian or without a librarian with advanced training. Therefore, high school graduates come to college with disparate levels of information literacy skills.

This study will contribute to the body of literature by presenting a comprehensive, evaluative tool that reliably indicates information literacy levels based on the ACRL information literacy standards. It will be of interest to both secondary school and higher education researchers and practitioners in the area of information literacy. Scholars and information professionals may use the instrument, analyze the process, replicate the study, and/or otherwise examine the study in order to further the academic process.
Chapter 3

Methodology

Development of the Information Literacy Indicator

The list of competencies provided by the ACRL (2000) *Information Literacy Competency Standards for Higher Education* served as the basis for the development of the information literacy instrument. The instrument was titled as an information literacy indicator. The use of the word “indicator” stemmed from the purpose of the instrument to indicate student competencies and/or deficiencies according to the ACRL information literacy standards. The Task Force on Information Literacy Standards of the Association of College and Research Libraries compiled five standards for information literacy with performance indicators for each standard, along with outcomes for each performance indicator. Standard One focused on the definition of the information need: “The information literate student determines the nature and extent of the information need” (ACRL, p. 8). Standard Two focused on retrieval of information: “The information literate student accesses needed information effectively and efficiently” (ACRL, p. 9). Standard Three focused on evaluation and synthesis of information: “The information literate student evaluates information and its sources critically and incorporates selected information into his or her knowledge base and value system” (ACRL, p. 11). Standard
Four focused on the presentation of information: “The information literate student, individually or as a member of a group, uses information effectively to accomplish a specific purpose” (ACRL, p. 12). Standard Five focused on the ethical use of information: “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” (ACRL, p. 13; see Appendix A for the complete listing of the ACRL standards, performance indicators, and outcomes).

After confirming the ACRL standards as the accepted benchmark upon which to base the instrument items, the question remained: Could a reliable instrument be developed to indicate the information literacy competencies of students based on the ACRL information literacy standards? As a means towards accomplishing the goal of the study, a method was developed to use the ACRL standards in the instrument design based on the logical structure of the standards. The design focused on the five ACRL standards and the performance indicators for each standard. Each ACRL standard served as one of five major constructs, or major scales, for the instrument. The performance indicators delineated by ACRL (2000) served as the sub-constructs, or subscales, for each standard (see Appendix B for a list that associated each instrument item with corresponding ACRL standards, major scales, and performance indicators, subscales). Instrument items were created for each sub-construct based on listed outcomes and guided by published objectives for information literacy instruction based on the ACRL standards (ACRL, 2001). Each major scale was comprised of all the items in its subscales. The initial instrument (version 1) was composed from these items with a closed-ended Likert-type scale for responses (see Appendix C for instrument version 1).
Resources

The subjects for the study were volunteers from Warner Southern College in Lake Wales, Florida (see WSC permission notification in Appendix D and NSU Institutional Research Board approval in Appendix E). Warner Southern College is a four-year liberal arts college affiliated with the Church of God Reformation Movement, Anderson, Indiana. The college awards the Associate, Bachelor, and Master in Business Administration degrees. The Commission on Colleges of the Southern Association of Colleges and Schools accredits Warner Southern College. There are over 20 undergraduate majors with the greatest concentration of students in the Business, Bible and Church Ministries, and Teacher Education departments. Its student body is a diverse group of approximately 1000 students—80% of whom are Florida residents.

The initial instrument was administered to a group of 78 college freshmen at Warner Southern College. Research and statistics literature revealed that the determination of sample size was a subjective decision for a study such as this one. As authorities in educational research, Fraenkel and Wallen (1996) suggested a sample size of at least 100 for this type of project (p. 111). The author tried to recruit 100 volunteers but received only 78 acceptable instruments returned from participants. A limitation to the study was the unknown variable of how many persons would, in fact, volunteer. However, Wiens (personal communication, July 20, 2004) noted that it would not adversely affect the study if volunteer rates were slightly higher or lower than 100 for the sample groups.3

Since the primary goal of the study was to develop a reliable information literacy instrument, a second iteration of the instrument was developed and administered to 81

3 Dr. Gregory A. Wiens earned an Ed.D. in Psychometrics from the University of Central Florida. Dr. Wiens’ research interest is the field of educational testing and human performance.
volunteers from among the student body at Warner Southern College. This implementation was a confirmatory testing of the instrument and provided additional data on reliability. Using a second group of volunteers avoided the risk of a testing threat to the internal validity of the study (cf. Fraenkel & Wallen, 1996, pp. 246f.). If the second iteration of the instrument was tested on the same group there would be a threat of the first version either teaching the subject or inspiring the subject to learn more about the topic—thereby threatening the internal validity of the study (Fraenkel & Wallen, p. 247).

In addition, given the goal of the study to develop a sound instrument to facilitate future research, rather than provide freshmen data to freshmen data comparison, the second version of the instrument was tested with volunteers from among other classes in order to provide further data on reliability (Wiens, personal communication, July 20, 2004).

**Procedures for Instrument Implementation and Analysis of Validity and Reliability**

*Expert Review of Content Validity*

The initial instrument was submitted to three named experts in the field of information literacy. The experts evaluated content validity by judging whether the content of the instrument directly pertained to the constructs being examined. The experts were not informed of the context of the study so their review would not be biased. In addition to the examination of item-construct relationships, the experts were given freedom to make any comments they wished concerning the work.

The three expert reviewers who evaluated the instrument were Dr. Lisa O’Connor, Anna Marie Johnson, and Dr. Nancy Seamans. Dr. O’Connor was an Assistant Professor at the School of Library and Information Science at the University of Kentucky and a
primary researcher for Project SAILS. In her review of the instrument, O’Connor (personal communication, February 23, 2005) stated, “I have evaluated the item and construct relationships for your instrument and believe that the statements logically correspond to their respective constructs.” The endorsement by O’Connor that the instrument items corresponded with the constructs they seek to describe lends credibility to the study and supports the validity of the item-construct relationship in the instrument.

Anna Marie Johnson was the Team Leader of the Information Literacy Team at the University of Louisville. Johnson also wrote a yearly review of library instruction and information literacy literature for *Reference Services Review*. Johnson (personal communication, March 11, 2005) only questioned the validity of eight instrument statements. In addition to these eight recommendations, Johnson’s review also included suggestions on issues such as wording and defining terminology.

Three items were removed, based on the recommendations of Johnson (personal communication, March 11, 2005). The first item removed was “I will seek needed sources outside my library by visiting another library that has the needed material.” Johnson explained, “I found this one a little problematic. What if a student considers the costs and benefits of acquiring information and decides it isn’t worth it? Does that make them less information literate?” The second and third items removed involved redundancy. The statement “When looking for information for a research paper I realize I will also need to seek appropriate audio-visual material if a presentation is required” was removed since its concept was implied in another item—“When searching for information to do a research paper I decide ahead of time what types of information I need such as books, articles, images, or other types.” The statement “I learn about the
subjects covered by various information retrieval systems available to me in order to find
the best resources to use” was removed since its primary focus was repeated in another
item—“I look for periodical indexes and other subject-specific information retrieval
systems that are appropriate to my topic.”

Five items were reworded in response to the critique by Johnson (personal
communication, March 11, 2005). The first changed item was the following: “I realize a
*written* primary source is a source that provides words of the witnesses or the first
recorders of an event or work of literature” (the italicized word indicated the change). In
reviewing the original statement, Johnson explained that “a primary source can also be
dirt if you are a geologist.” Johnson went further to assert that, “this seems like a fairly
limited definition of a primary source from a historical perspective.” In response to
Johnson, the change to “a written primary source” specified the context for the definition
in order to reduce the limitation presented in the original form of the item. Two items that
dealt with the ability to save information to a computer disk where changed by adding the
phrase “or e-mail it to myself.” Johnson recommended this change by explaining, “most
students do it that way rather than save things to a disk in my experience.” Johnson did
not understand what the author was looking for in the following statement: “When
presenting my research information the feedback from the teacher indicates satisfaction
with the information covered in my presentation.” This item was indeed wordy and
difficult to understand. For this item, the author sought to elicit a response dealing with
previous perceptions of feedback indicative of effective presentation of information.
Therefore, the statement was changed to read, “When presenting my research information
I receive feedback from the teacher indicating satisfaction in my effective presentation of
the information.” Finally, the statement “When using information resources provided by my institution, I do not intentionally change anything on the computer systems or in the physical facility itself” was reworded because of Johnson’s questioning of the meaning of “physical facility.” The construct was intended to discern rules and regulations and the item would remain meaningful with the omission of “or the physical facility itself.” As a result, the omission was made.

The review of the instrument by Johnson (personal communication, March 11, 2005) questioned less than 1% of the item-construct relationship of the instrument. The review by Johnson supported the overall validity of the item-construct relationship in the instrument. In addition to this, Johnson helped to strengthen the instrument by providing the impetus for rewording five existing items and removing three items invalid for the study.

Dr. Nancy Seamans was the Director of Research and Instructional Services at the University of Iowa. Seamans was an ACRL information literacy expert and published author in the area of information literacy. Seamans (personal communication, March 15, 2005) expressed an evaluation similar to O’Connor: “I do think that the instrument statements correspond with the constructs they seek to describe.” Yet, like Johnson, Seamans (personal communication, February 19, 2005) provided further critique in the area of wording and language. In wording, Seamans asked for careful consideration of the usages of “search” and “research.” The advice was followed and all occasions of the words were reviewed to ensure consistency. In addition, Seamans noted the library-centric language of the instrument and suggested further definition be provided—possibly as a glossary of terms for non-library persons. Seamans’ discussion of this topic helped to
improve the instrument by prompting further review of the instrument in light of this limitation.

*The First Testing*

After the changes following the expert review of the instrument, the initial instrument containing 145 items was administered in April 2005, to a group of 78 Warner Southern College freshmen. The first test group initially consisted of respondents to an e-mail request for volunteers sent by the researcher. The e-mail was sent to approximately 120 freshmen at Warner Southern College. As an incentive, it was noted that a drawing for $100.00 would take place one week following the review of the completed instruments—incomplete forms disqualified volunteers from the $100.00 drawing.

The e-mail request provided a hypertext link to the online version of the informed consent and volunteer request forms written in Hypertext Markup Language (HTML) and Active Server Page (ASP) scripting language (see Appendix F and Appendix G respectively; see the online versions at http://www.warner.edu/critchfield/). When a volunteer completed the online form to acknowledge her or his intent to participate, an e-mail response was sent providing a participant with a subject ID and a link to the online version of the information literacy indicator (see http://www.warner.edu/critchfield/survey/). The online version of the information literacy indicator was also written in HTML and ASP scripting language. Each volunteer was asked to complete the questionnaire within three days.

Unfortunately, two days into the process of recruitment the college e-mail server crashed. Given the loss of this communication medium and the fact that implementation
of the first version of the instrument was during the second to last week of the spring semester, an alternate means of recruiting volunteers was employed. Two professors of English at Warner Southern College distributed hard copies of the instrument to freshmen enrolled in their courses.

The examination of the first iteration of the instrument determined the statistical reliability of the items for each construct as reported in Chapter 4. After the first version of the instrument was implemented, the internal consistency (scale reliability) was examined by calculating Cronbach’s alpha for each construct. Instrument items not as consistent as others in the scale were eliminated

*The Second Testing*

The remaining items then formed the second iteration of the instrument (version 2; see Appendix H for instrument version 2). At this point in the study the statistical analysis of version 1 presented the instrument as a reliable and meaningful indicator of information literacy skills. The second testing of the instrument was conducted as a confirmatory trial. In May 2005, instrument version 2 was administered to 81 Warner Southern College students who did not participate in the first trial. For this sample, all volunteers were successfully recruited through e-mail. The e-mail for volunteers in the second group was sent to approximately 300 students at Warner Southern College. As an incentive, there was a drawing for $100.00 one week following the review of the completed instruments—incomplete forms disqualified volunteers from the $100.00 drawing. The procedure for the volunteers in the second test group followed the online procedures intended for the first group.
After all the subjects completed their questionnaires, Cronbach’s alpha was applied to each construct of the second instrument to assess internal consistency. The statistical results of version 2 were then compared to the results of version 1, as reported in Chapter 4. In order to triangulate the data, interviews were conducted with 14 subjects from a random sample of 35 persons from the freshman test group (instrument version 1; further discussion of this is in Chapter 4). In order to make the interview more attractive and worth the students’ time, each randomly selected student who participated in the interview process received a $5.00 honorarium. The results of the study were then compiled and reported to the committee in May 2005, as the Final Dissertation Report.

**Data Collation and Calculation**

The author collated the data from the testing of both iterations of the instrument. The collated data were placed in Microsoft Excel spreadsheet format (available upon request from the author). Table 1 is an example of the spreadsheet format. After the data were collated, the Microsoft Excel spreadsheet was imported into *Statistical Package for the Social Sciences* (SPSS) from SPSS Inc. The calculation of Cronbach’s alpha was performed in the SPSS software (available upon request from the author). The results were presented in both descriptive and tabular form.

This study created, tested, and presented a valid and reliable instrument to indicate information literacy levels. The reported results focused on the instrument development itself rather than a comparative study of information literacy competencies at the individual, class, institutional, or cross-institutional levels. Future research with the instrument may be used to produce individual, class, and institutional reports necessary
for focused training, personal growth, and institutional comparison. For the current study, if a student wished to receive a score report indicating her or his outcome, the individual report would be presented based on percentages.

**Table 1. Spreadsheet Format for Data Collation**

<table>
<thead>
<tr>
<th>ID NUMBER</th>
<th>Item 1</th>
<th>Item 2</th>
<th>Item 3</th>
<th>Item 4</th>
<th>Etc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>111111111</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>Etc.</td>
</tr>
<tr>
<td>222222222</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>3</td>
<td>Etc.</td>
</tr>
</tbody>
</table>

Etc.

*Note.* Matrix of item numbers by ID numbers within which data values are entered. Values: Always = 4 | Often = 3 | Seldom = 2 | Never = 1 | NA = 0

Table 2 illustrates an example of a score report for the first standard of the indicator. This type of report was created for each of the randomly selected interviewees following the completion of the interview process. In a full report each ACRL information literacy standard would be listed along with a percentage indicating the overall level of competency for the standard—the higher the percentage, the higher the level of competency; the lower the percentage, the lower the level of competency. Each corresponding construct, or performance indicator, for a standard would be listed below the standard along with a percentage to indicate the level of competency. The score report would indicate the overall level of information literacy of an individual for each standard, or major scale, and subsequently illustrate specific strengths and weaknesses within the standard based on each individual construct, or subscale.
The sum of the “Always” values for each possible item response, per construct, produced the total possible value. The sum of the values for each item response provided by the subject per construct produced the actual indicated value. As Table 1 illustrated, the values of responses were: “Always” had a value of 4; “Often” had a value of 3; “Seldom” had a value of 2; “Never” had a value of 1; and “NA” had a value of 0.

Table 2. Example of a Score Report for the First Standard

___________________________________________________________

Information Literacy Indicator : Individual Report

**Standard One: 64%**

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

**56%  Performance indicator one**

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

**78%  Performance indicator two**

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

**70%  Performance indicator three**

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

**50%  Performance indicator four**

The information literate student reevaluates the nature and extent of the information need.
The indicated value of a subject for a construct was divided by the total possible value for the construct to produce the percentage indicated of the total possible value. For example, the first construct in standard one contained nine items with a total possible value of 36. In the example illustrated by Table 2, the subject’s response values for the nine items of the first construct were as follows: 4,3,2,1,0,1,2,3, and 4. The resulting indicated value was the sum of the preceding numbers, which was 20. The indicated value of 20 would then be divided by the total possible value of 36 to produce the percentage indicated of the total possible value for the construct, which was 56%. Standard one as a whole, all items in its subscales, had a total possible value of 116. The example shown in Table 2 presented the subject’s response to all items in standard one with an indicated value of 74. As a result, the percentage indicated of the total possible value for standard one was 64%.

Subject and Data Confidentiality

An informed consent form was obtained from each subject (see Appendix F) insuring that all subjects freely volunteered. The individuals in each test group were identified only by a subject identification number on the subject information sheet (see Appendix G), which corresponded with the subject identification number on the instrument itself. The responses of the randomly selected interviewees remained anonymous. A single researcher, the author of the dissertation project, maintained all research records for this project. The data were stored in the private office of the author and were only accessed by the author.
Attestation of Methodology

Methodology similar to the approach described in this study is frequently represented in research literature. Ellis (2002) tested an initial instrument on 244 subjects. The Likert-type scale of the instrument was used to calculate Cronbach’s alpha for each scale to determine internal consistency of the items with their respective constructs. Inferior items were eliminated. Ellis then tested the revised instrument with a second sample group of 100 subjects in order to calculate cross-validation and reliability statistics.

Richardson, Kitchen, and Livingston (2003) also used two sample groups in the evaluation of their instrument. Cronbach’s alpha was also used to provide information concerning internal consistency. A reliability coefficient was then calculated between both versions of the instrument. After the final testing, Richardson, Kitchen, and Livingston then submitted the instrument to a panel of experts in order to provide content validity.

Okamoto (2001) used a panel of experts as the first step in instrument testing. The instrument was revised based on expert recommendations. Okamoto then administered the instrument to 248 subjects—the only group used in assessing the instrument. Cronbach’s alpha was calculated for each construct. The most statistically significant items were selected to produce the final instrument.

In the process of instrument development, Parks and Roberton (2000) tested four versions of their instrument to arrive at the final version. The first version was evaluated with a group of 173 subjects and the second version with a group of 156 subjects. These tests provided the researchers with information concerning clarity and length of the instrument. The result was version three. Experts in the discipline then tested the content
validity of this version. The result was version four. Version four was then tested with 298 subjects. Cronbach’s alpha was calculated to determine internal consistency of the items. Items were then eliminated to produce the final version of the instrument.

**Summary**

This study developed, implemented, and statistically analyzed an instrument that indicated information literacy competencies based on the ACRL information literacy standards. The composition of the instrument statements reflected aspects of each performance indicator for each ACRL standard to provide specific construct feedback within each standard. Expert review of the instrument was conducted in order to evaluate its content validity. O’Connor, Johnson, and Seamans provided largely favorable reviews affirming the content validity of the instrument. The reviews provided direction for excluding three items, rewording five items, and focusing attention on library-centric language as a limitation.

The first test of the instrument was administered in April 2005. Statistical reliability was determined for items in each construct. Statistical analysis was conducted with SPSS software to calculate the internal consistency of the items using Cronbach’s Alpha. Instrument items not as consistent as others in the scale were eliminated. A second test was conducted with the remaining items and the same statistical process was followed. The data of the first testing were triangulated with 14 personal interviews. The analysis of version 1 was compared to version 2. The data were then compiled and reported.
Chapter 4

Results

This chapter presents both the quantitative and qualitative results gathered from the implementation of the methodology. The results illustrate the achievement of the goal for the study. A valid and reliable information literacy instrument was developed, independent from specific training programs, to indicate student competencies based on accepted information literacy standards.

Sample Size and Volunteer Recruitment

Eighty-eight freshmen from Warner Southern College volunteered to participate in the testing of the initial version of the instrument (version 1). Ten persons submitted incomplete instruments and were eliminated from the sample leaving 78 subjects. This sample size comprised 65% of the approximately 120 freshman at Warner Southern College during spring semester, 2005. In the first sample, 29 volunteers were female and 49 were male.

The recruitment of freshman volunteers began via e-mail. As described in Chapter 3, two days into the process of recruitment the college e-mail server crashed. Given the loss of this communication medium and that implementation of the first version of the instrument was during the second to last week of the semester, an alternate means of
recruiting volunteers was employed. Two professors of English at Warner Southern College, Ms. Linda Mishael and Dr. Paul Sheneman, agreed to distribute hard copies of the instrument to freshmen enrolled in their courses.

The second sample was drawn from a pool of approximately 300 randomly selected Warner Southern College students to whom an e-mail message was sent requesting participation in the study. This pool consisted of students who were not part of the first testing—since its implementation served as a confirmatory test of the instrument. There were 87 volunteers for the second testing of the instrument (version 2). From these volunteers, 81 persons submitted completed instruments. While this sample size was only 26% of the approximately 300 persons contacted, it was three persons more than the total number of participants in the sample for version 1. The second sample consisted of 64 female volunteers and 17 male volunteers. Among these participants were 40 seniors, 18 juniors, 19 sophomores, and 4 freshmen.

Data Analysis

Discussion of Internal Consistency

The five ACRL standards of information literacy served as the major constructs for the creation of the information literacy indicator. All instrument items written to describe a standard, or major construct, comprised a major scale. Four of the five major scales contained subscales—standard four contained only the major scale. The subscales within four of the major scales were items that described performance indicators, or sub-constructs. Since a scale seeks to measure a particular construct, its items must be
identified as describing the same thing. Therefore, scales must have internal consistency in order to produce a reliable instrument.

The calculation of internal consistency among the items in each scale was conducted using SPSS software. Scale reliability was assessed using the Cronbach Coefficient Alpha. Peterson (1994) stated that by either scholarly praise or volume of citation, Cronbach’s alpha “has effectively become the measure of choice for estimating the reliability of a multi-item scale” (p. 382). In general, the calculation of Cronbach’s alpha for each scale computed the variance among each set of responses and compared the variances between each individual set of responses among the entire sample to determine consistency (Bland, 1997, p. 572). The equation used to calculate the Cronbach Coefficient Alpha was as follows:

\[
\alpha = \left( \frac{k}{k-1} \right) \left( 1 - \sum_{i=1}^{k} \frac{\sigma_i^2}{\sigma_s^2} \right)
\]

The \( \alpha \) value was the Cronbach alpha result showing the degree of internal consistency among the items in the scale. The \( k \) indicated the number of items in the scale, \( \sigma_i^2 \) was the variance of item \( i \), and \( \sigma_s^2 \) was the variance of the scale (Peterson, p. 382). The value showing a number between zero and one represented the level of internal consistency among items in the scale—the closer the number was to one (the point where all variance is consistent), the more reliable. In an example of how to interpret a Cronbach alpha value, Brown (2002) explained that if “a set of scores turns out to be .90, you can interpret that as meaning that the test is 90% reliable, and by extension that it is 10% unreliable” (para. 6).
While each scale must be reliable to have practical utility, there was not a scholarly consensus on exactly what value indicated the minimum level of scale reliability. According to Peterson (1994), the work of Nunnally was most widely cited in reference to interpreting the reliability coefficient (p. 381). Henson (2001) explained that Nunnally changed reliability recommendations for preliminary instrument development from .60 or .50 as sufficient in 1967 to .70 as the minimum acceptable level of scale reliability in 1978 (p. 181). Peterson also discussed other scholarly interpretations of Cronbach’s alpha. Peterson showed that the 1982 work of Kaplan and Succuzzo interpreted good reliability for Cronbach alpha values between .70 and .80 for basic research and .95 for applied research. In 1988 Murphy and Davidshofer asserted that any Cronbach alpha value below .60 was unacceptable; the value of .70 indicated a low level of reliability, a value between .80 and .90 indicated a moderate to high level, and .90 and above indicated the highest level of reliability (Peterson, p. 382).

**Instrument Version 1**

**Scale Reliability for Instrument Version 1**

Cronbach’s alpha was applied to each of the five major scales as well as to each of the subscales. Table 3 illustrated the results of the calculations for Cronbach’s alpha for each scale in the instrument. The results were positive and depicted the study instrument as a meaningful indicator of information literacy skills. The major scales for ACRL standards two, three, and five all achieved an alpha value above .90. The internal consistency of the items for these standards indicated the highest level of reliability in describing that which they were intended to describe. Major scale 1, representing ACRL
<table>
<thead>
<tr>
<th>Major Scale 1 (Standard One)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The definition of the information need:</strong></td>
<td>( a = .8858 )</td>
</tr>
<tr>
<td>Subscale 1.1 (performance indicator 1):</td>
<td>( a = .7559 )</td>
</tr>
<tr>
<td>Subscale 1.2 (performance indicator 2):</td>
<td>( a = .7768 )</td>
</tr>
<tr>
<td>Subscale 1.3 (performance indicator 3):</td>
<td>( a = .6545 )</td>
</tr>
<tr>
<td>Subscale 1.4 (performance indicator 4):</td>
<td>( a = .7909 )</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Major Scale 2 (Standard Two)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The retrieval of information:</strong></td>
<td>( a = .9513 )</td>
</tr>
<tr>
<td>Subscale 2.1 (performance indicator 1):</td>
<td>( a = .7996 )</td>
</tr>
<tr>
<td>Subscale 2.2 (performance indicator 2):</td>
<td>( a = .8852 )</td>
</tr>
<tr>
<td>Subscale 2.3 (performance indicator 3):</td>
<td>( a = .7950 )</td>
</tr>
<tr>
<td>Subscale 2.4 (performance indicator 4):</td>
<td>( a = .8779 )</td>
</tr>
<tr>
<td>Subscale 2.5 (performance indicator 5):</td>
<td>( a = .8490 )</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Major Scale 3 (Standard Three)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The evaluation and synthesis of information:</strong></td>
<td>( a = .9520 )</td>
</tr>
<tr>
<td>Subscale 3.1 &amp; 3 (performance indicators 1 &amp; 3):</td>
<td>( a = .9045 )</td>
</tr>
<tr>
<td>Subscale 3.2 (performance indicator 2):</td>
<td>( a = .8934 )</td>
</tr>
<tr>
<td>Subscale 3.4 (performance indicator 4):</td>
<td>( a = .8694 )</td>
</tr>
<tr>
<td>Subscale 3.5 (performance indicator 5):</td>
<td>( a = .7795 )</td>
</tr>
<tr>
<td>Subscale 3.6 (performance indicator 6):</td>
<td>( a = .8106 )</td>
</tr>
<tr>
<td>Subscale 3.7 (performance indicator 7):</td>
<td>( a = .7278 )</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Major Scale 4 (Standard Four)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The presentation of information:</strong></td>
<td>( a = .7470 )</td>
</tr>
<tr>
<td>(Performance indicators 1, 2, &amp; 3 compose the one scale for standard four.)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Major Scale 5 (Standard Five)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ethical use of information:</strong></td>
<td>( a = .9222 )</td>
</tr>
<tr>
<td>Subscale 5.1 &amp; 3 (performance indicators 1 &amp; 3):</td>
<td>( a = .7996 )</td>
</tr>
<tr>
<td>Subscale 5.2 (performance indicator 2):</td>
<td>( a = .7917 )</td>
</tr>
</tbody>
</table>
standard one, was near the upper end of the moderate-to-high range of internal consistency with an alpha value of .89. The major scale for ACRL standard four achieved an alpha value of .75. This value was within the statistical guidelines of a reliable and meaningful scale.

The lowest value among subscales was subscale 1.3 with an alpha value of .65. The construct of subscale 1.3 was performance indicator three of ACRL standard one: “The information literate student considers the costs and benefits of acquiring the needed information” (ACRL, 2000, p. 8). If subscale 1.3 were eliminated from the instrument, it would increase the overall alpha value of major scale 1. However, since reliability of major scale 1 was moderately high, subscale 1.3 was kept in the instrument in order to compare these results with the second version test results.

Statistically Eliminated Items

In order to reach maximum alpha values, 16 questions were omitted from the instrument to create instrument version 2. The following items were removed from instrument version 1: 2, 26, 36, 55, 62, 90, 102, 109, 116, 119, 120, 121, 127, 130, 131, and 140. The first statement removed was item 2: “I begin by developing a thesis statement (i.e., a sentence or more about what I want my research to accomplish concerning my topic).” This item proved statistically troublesome even with the addition of an explanation. It may be that there was great disparity between those who develop a thesis statement and those who do not. Analysis indicated that item 2 was inconsistent from the pattern of responses by persons to other items of the same construct.
Another item omitted from the instrument was item 26: “After looking for information for a research paper, I realize I may have to abandon my original topic if limited sources, or no sources, are available.” Many freshman participants had not moved beyond an instructor assigned topic for which information would be easy to find. In such a situation, there would be no need to abandon a topic. This item would be better suited for upper classmen.

As for item 36—“I realize that full-text and bibliographic databases are different”—the score for this item was generally lower than the other items in the construct when compared with all student responses for the construct as a whole and therefore less reliable. It was indeed possible that persons in the sample did not know the difference. It may be that the distinction has become irrelevant in the current information landscape. The previously individual understandings of bibliographic databases and full-text databases may be converging as full-text databases become the expected information resource.

Item 55 was concerned with using the table of contents and/or indexes of a book to access information. The statistical analysis showed that this item had greater inconsistency with the responses provided for other items in the same construct. Even though item 55 was removed from the instrument to achieve a higher alpha, if it were kept the alpha number would be .8850. This item should be reconsidered for inclusion in future versions of the instrument.

Item 62 stated, “I understand how to locate books using call numbers.” One of the reviewers of this study commented that students may know how to locate books using call numbers but it would be unlikely if they knew the numbers on the spine of a book.
were called call numbers. The results provided evidence of such a case as this item proved statistically inferior while item 64 was statistically more reliable. Item 64 presented the student with an actual call number to look at as opposed the simply the name in item 62.

For item 90, concerning analyzing data with spreadsheet and database programs, it was probable that the freshman participants for this study had not moved beyond the basic word-processed assignment. Next, the analysis indicated item 102 to be statistically less reliable than other items of the same construct. This item was a vague statement incompatible with other items in the same construct. Item 102 was, “I determine whether or not an item meets my need for information on the topic.” Similarly, item 121 was too vague and incompatible with other items in the same construct. Item 121 was, “I feel confident in the work I have produced.”

Item 109 was a double-barreled statement due to the fact that more than one concept was imbedded in the statement. Item 109 stated, “I evaluate the sources based on accepted criteria such as authority, accuracy, and timeliness and from this select the most appropriate information to use for my paper.” There were three primary concepts that needed to be separated into three different items. The wording of the item made it difficult for the student to respond and resulted in a less reliable item.

Item 116 referred to confirming understanding through discussion. Item 116 stated, “I seek to confirm my understanding of the topic by participating in classroom discussions or other discussions on the topic.” It may be that there was great disparity between those who discussed and did not discuss. The results showed this item as inconsistent with the pattern of responses by persons to other items in the same construct. The same may be
said for item 140, “When participating in electronic discussions, I follow the accepted practices of the group.”

Item 119 read, “During the process of writing a research paper, I keep a journal or log of my progress so that I will know what I have done and what I need to do.” One reviewer of the instrument commented that the reviewer did not know of anyone who followed what item 119 described. The results provided evidence that this was the case for the sample. Analysis showed this item to be statistically inferior in comparison to other items in the same construct. The same can be said for item 120, “When preparing for writing and/or presentation projects, I refer to past papers and/or presentations to remember past successes and/or failures to help improve the current project.”

The removal of item 127—“I realize that not all information on the Internet is free”—did not significantly change the alpha level. The alpha level was .8988 with this item included in the final scale. Nevertheless, the choice to remove the item was made to improve the internal consistency coefficient. This item should be reconsidered for inclusion in future versions of the instrument.

Item 130 read: “I realize that the terms of subscription to various information retrieval systems limit the use of the products to only the immediate constituency (for example, faculty, staff, and students are the constituents of an academic library).” This item proved statistically less reliable even with the addition of an explanation. It may be that the item was difficult to understand. Analysis indicated this item to be inconsistent with the pattern of responses by persons to other items of the same construct. However, in retrospect, the removal of this item would not significantly change the alpha value. This item should be reconsidered for inclusion in future versions of the instrument. The same
may be said of item 131, “I realize that if I provide another person, who is not part of the library's constituency, with access to subscription based library products then I have committed an illegal act.”

**Triangulating Instrument Data: Interview Analysis**

Chapter 3 reported that the author contacted 35 persons requesting interviews. Both campus mail and e-mail letters were delivered to 35 randomly selected Warner Southern College students who participated in the testing of the first iteration of the instrument. Even with the promise of $5.00 for their time mentioned prominently in each message, only 14 of 35 students responded to schedule an interview time. Unfortunately, the timing of the invitation to interview fell during the last week of semester classes before finals week. With end of the semester due dates for papers and projects, plus the need of time to study for final exams, most of the students had higher priorities than to interview for this study.

The author met with each of the 14 interviewees individually for approximately 15 minutes each. There were nine women and five men. In an effort to maintain objectivity during the interview process, statistical results were not calculated for interviewees until the evening after the interview. This action removed the possibility of preconceived biases underlying interview questions in order to avoid consciously, or subconsciously, asking questions in a way to prove the numbers. With no prior knowledge of the interviewees, the author conducted informal interviews by asking general information literacy questions. The discussion freely flowed according to student responses. Overall, the interviews produced evidence to support the statistical analysis showing the
instrument to be a reliable tool for indicating information literacy skills. Table 4 presented interviewee scores for each instrument scale.

Table 4. Interviewee Scores for Each Instrument Scale

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When asked about ACRL standard one, the definition of the information need, interviewee 1 discussed how encyclopedia articles were important when there was unfamiliarity surrounding the topic. This person also described the use of a procedure for classifying resources with a color code of four highlighters to indicate the importance of sources based on the assigned color. As for time given to a research task prior to its due date, interviewee 1 stated that the gathering of sources was conducted early but the actual writing of a paper was done only a day or two before the due date. The researcher noted a fair to moderately high ability of this interviewee to define the information need. The calculation of responses indicated a level of 79%—an above average indication. This indication was slightly lower than expected—yet not beyond the possible range the author had in mind.

For ACRL standard two, the retrieval of information, interviewee 1 was articulate concerning search strategy, periodical databases, and other information retrieval systems. This student formulated Boolean searches aloud—and knew the meaning of the term Boolean—and spoke of retrieving books using the Library of Congress Classification System. The author expected a high level for this standard and the instrument indicated a 97%. Similarly, for ACRL standard three, the evaluation and synthesis of information, interviewee 1 exhibited a strong level of aptitude in this area. The student stated that less emphasis was placed on critical analysis of published print media because it was assumed a “stricter policy on the authors” existed. As for Internet resources, the student was much more critical. An interesting note taken by the researcher during the discussion of standard three involved subscale 3.7, which dealt with revising one’s initial query, if needed. When the discussion entered this area, interviewee 1 stated that even though the
process of gathering sources was completed well in advance of the due date “there is no time to search for anything other than what I already have since I usually only have a short time to write the paper.” The instrument indicated 67% for this area—a level near what the author expected for this subscale. Overall, for ACRL standard three, the indicated level was around what the author expected at 86%.

The level indicated for ACRL standard four, 75%, was lower than expected. Interviewee 1 expressed a confident opinion concerning the ability to present information. The self-designation of this person was as above average. For ACRL standard 5, the ethical use of information, interviewee 1 discussed plagiarism and copyright without the need of discussion prompts. The author expected a high level of competency in this area for interviewee 1 and the instrument confirmed the expectation with an indicated level of 92%. Overall, the match between the instrument data and the interview assessment for interviewee 1 was similar—with the exception of ACRL standard four.

Interviewee 2 was statistically identical to interviewee 1 for the first ACRL standard, with an indicated level of 79%. A similar assessment of this student was also made by the author acknowledging the interviewee as competent in defining the information need—yet, less so than interviewee 1. For ACRL standard two it was discovered that interviewee 2 was familiar with Boolean searching and confident in preparing search strategies. However, this person could not discuss information retrieval systems beyond Google. Interviewee 2 did not realize the need to gather information from any place other than the Web. Given an articulate discussion of searching ability by interviewee 2, an
above average level on ACRL standard two was noted for this test subject. The instrument indicated a level of 83%, which was only slightly higher than expected.

For ACRL standard three, the author was unable to discern much from interviewee 2. The student talked of being concerned with the critical evaluation of information but did not respond well to questions on the issue. For example, it was asked if the student checked the reputation of the author and organization behind the Web sites used for information. The subject responded negatively and then stated, “I just compare the sources with each other and if one fits in with the others then I use it.” The researcher was left with an average impression of the student’s ability for ACRL standard three. The level indicated for the standard was 79%. This level is slightly higher than expected.

The level indicated for ACRL standard four, 78%, was lower than expected. As was the case with interviewee 1, interviewee 2 expressed a confident opinion concerning the ability to present information effectively. The self-designation of this student was as above average and the author expected to find a higher level indicated from the instrument based on the interview. For ACRL standard 5, the interviewee had no difficulty answering questions concerning software piracy, illegal downloading of copyrighted music, and plagiarism. The author expected a high level of competency in this area for interviewee 2 and the instrument confirmed the expectation with an indicated level of 89%. Overall, the match between the instrument data and the interview assessment for interviewee 2 was similar—with the exception of ACRL standard four.

Interviewee 3 was the most impressive interviewee of the group. This subject’s communication of information literacy concepts was excellent for all facets of the ACRL standards. During the interview, it was noted that this student had a high level of
competency for each of the five ACRL standards. Table 4 illustrated this perception of interviewee 3 for each standard except standard four. Interestingly, the self-assessment of ACRL standard four by the student was average when it came to information products such as papers and presentations. This seemed inconsistent with what the researcher had discerned through the interview. Yet, unlike the previous two subjects, this self-assessment for ACRL standard four was close to the level indicated by the instrument of 75%.

Interviewee 4 articulated a procedure for defining the information need consisting of discussing the topic with the instructor and sitting down to think about the topic in broad and narrow ways. In addition to expert opinion, interviewee 4 sought opinion from peers concerning selected and assigned topics of research. Then the person developed a strategy to narrow or broaden the topic based on ideas generated from that process. When searching, interviewee 4 used Boolean operators to search keywords and understood, and used, a variety of information retrieval systems. From this discussion, the author assessed the level of interviewee 4 as moderate to high for standards one and two. The instrument confirmed this by indicating levels of 84% and 88%, respectively.

In what seemed inconsistent with previous discussion, interviewee 4 indicated that no efforts were made by the subject to evaluate the credibility of information or consciously to challenge personal values. However, this student compared ideas with other students to see if the information held was “similar to the stuff my friends have.” ACRL standard three was assessed as average for this student by the author. The instrument indicated a slightly higher level, 79%—but this was not far from the researcher’s assessment of this item based on the interview.
The level indicated for ACRL standard four for interviewee 4 was 69%. This was near what the author expected based on the discussion of ACRL standard three. However, interviewee 4 explained that information products created by this subject were above average. For ACRL standard 5, the ethical use of information, interviewee 4 articulated the rights of ownership for the creators of information and seemed to understand ethical use of information. The author expected a high level of competency in this area for interviewee 4 and the instrument confirmed the expectation with an indicated level of 91%. Overall, the match between the instrument data and the interview assessment for interviewee 4 was similar. The exception with standard four, in this instance, was that the author thought the score would be average while the interviewee indicated above average work in this area.

Interviewee 5 was unable to articulate many information literacy concepts with certainty. The note by the author at the end of the interview was “not literate.” Interviewee 5 did not consider the topic beyond what the instructor told the student, admittedly waited until the last minute to research and write papers, used only Google, and never evaluated information for credibility. Interviewee 5 did not understand Boolean search statements or how to locate a book using the Library of Congress classification system. The most significant facet of information literacy noted by interviewee 5 was the student had an “open mind” to new information and let it challenge the person’s current knowledge base and value system. As indicated in Table 4, the information literacy levels for each standard were below average as expected from the interview. Interestingly, the self-assessment of standard four by interviewee 5 was as above average where the instrument indicated below average.
Interviewee 6 explained that the person was competent in the areas of defining the information need and searching information retrieval systems to meet the needs. However, the information retrieval system of choice was Google. This person stated that subscription databases provided by the library were only searched if required by the instructor. Interviewee 6 articulated Boolean and proximity search statements and seemed to understand the concepts well. The indicated levels for the two ACRL standards illustrated competency in this area. For ACRL standard three, interviewee 6 carried the discussion by indicating that Web sites must be examined for both bias and credibility—again indicating a moderately high understanding in this area. For ACRL standard four, the instrument paralleled the self-assessment by this test subject. Interviewee 6 indicated skills in the creation and presentation of information products as above average. For ACRL standard five, this subject acknowledged understanding of ethical and legal use of information in the United States but disagreed with many items labeled unethical. As an international student, interviewee 6 stated that it is legal in the person’s country of origin to share software and download songs over the Internet. The assessment of interviewee 6 during the interview matched the instrument results for each of the standards.

Interviewee 7 indicated not thinking about the definition of the information need. This person stated, “I grab and go and think about it later.” Rather than take the time to define the information need, the student grabs as much material on the basic topic in one search session and then fully defines the topic at the point of preparing the information product. The instrument indicated a low level for defining the information need in ACRL standard one, which matched the author’s perception.
As for searching, interviewee 7 appeared comfortable. The student expressed confidence in Boolean searching. The instrument indicated a level of 89% for ACRL standard 2. This level was slightly higher than expected. During the discussion of ACRL standard three, interviewee 7 spoke of comparing sources with other sources to discern authority. This person also mentioned trying to make sure Web sources were from respectable sites. The indicated level of 85% was near what the author expected based on the discussion with interviewee 7. Interviewee 7 and the author assessed the information product aspect of ACRL standard four as average. The instrument indicated a slightly higher level at 78%—this was not far from the assessment. ACRL standard five assessment of this student also matched the instrument, indicating a good understanding of ethical and legal issues surrounding information.

As a student with English as a second language, interviewee 8 told the researcher that beginning the process of defining the information need and seeking information early was essential for the student. The person also stated that discussing projects and topics with classmates and professors was important to help focus the student’s work. As anticipated, the instrument indicated a high level of competency for ACRL standard one. ACRL standard two also indicated an above average level for interviewee 8 as the author expected to find. Interviewee 8 discussed how the luxury of time allowed searches to be planned, revised, and thrown out in order to start over, if necessary. The student also noted that asking for assistance and using a number of library resources was a common practice. Yet, the person added, “I still also use Google like everyone else.”

When discussing ACRL standard three, interviewee 8 spoke of learning to evaluate Web resources and other types of information but stated, “I know it, but I usually don’t
take the time to do it.” Interestingly, the lowest measure in ACRL standard three for interviewee 8 was subscale 3.1 and 3 concerning the summary and synthesis of information. The subscale concerning evaluation, subscale 3.2, indicated a high level for interviewee 8. The author expected a moderately high level to be indicated since interviewee 8 explained understanding the concepts but not practicing them. Knowledge of evaluation was indicated by the instrument, regardless of the practice of such knowledge by interviewee 8.

During the discussion of ACRL standard four, it was asked how the student would describe the person’s performance concerning information products such as research papers and presentations. Interviewee 8 explained being pleased with successfully overcoming the language barrier to produce good work in school. The student then offered the comment that “I usually make some C’s but it is usually due to the language.” The instrument indicated a high level for this standard as the self-assessment of the student would lead one to expect. The author interpreted the student’s comments as indicative of a high level for standard four. For ACRL standard five, interviewee 8 understood the ethical aspect of information use in the areas of intellectual property and the need for proper citation of the work of others. The instrument indicated this level of competency.

The assessment noted by the author during the discussion with interviewee 9 read “above average, below perfect.” The levels indicated by the instrument were slightly higher than expected. Interviewee 9 seemed to understand many aspects of information literacy yet not all. This student stated that working “under pressure” was the practice most often the case for the person when working with information. While sometimes
interviewee 9 conducted research early, the writing of papers and the preparation of presentations were always done at the last possible moment. In addition to this for the discussion of ACRL standard one, interviewee 9 expressed that time was indeed given to thinking about the topic and what was important for addressing the information need—including developing keywords.

For ACRL standard two, Interviewee 9 understood the concept of Boolean searching yet did not compose search statements more complex than keywords—search operators were never used. The primary reason for this was stated as, “I can’t use them on Google.” That begged the question of whether or not this student used any information retrieval system other than Google. To this, interviewee 9 responded that sometimes periodical databases provided by the library were used but rarely books. The author expected around a 75% level to be indicated for this standard and the instrument indicated 82%. The level was somewhat higher than expected.

In response to every interview question posed for ACRL standard three, interviewee 9 responded with “sometimes.” Sometimes the student evaluated credibility of sources, sometimes the student consciously challenged presuppositions with new information, and sometimes the person revised the information seeking process to improve upon a task. The author could not determine if the response of “sometimes” would indicate often or seldom. The assessment estimated by the author again placed this level at around 75% or higher, since it was difficult to discern the ability of this student. The instrument indicated a level of 80% for ACRL standard three. This indication was within the range of possibility estimated by the author from the interview.
For ACRL standard four, interviewee 9 indicated that the student achieved success at producing quality information products such as power-point presentations, papers and oral reports. For this student the instrument indicated the level expressed in the interview. The author, primarily based on the interviewee’s self-assessment, expected a high level. During the discussion of ACRL standard five, interviewee 9 indicated that because information policies of the college were unknown to the student, the student did not know whether they were followed. Interviewee 9 appeared to understand copyright issues and plagiarism. Even so, it was uncertain what level to expect for ACRL standard five. The author estimated an average level to be indicated by the instrument and a slightly higher level of 79% was the result.

All interviewees up to this point stated they took the instrument seriously and actually read each of the questions before responding. Interviewees 10, 11, and 12 all admitted, during separate interviews, that they did not take the instrument seriously. Interviewee 12 stated that the person “Christmas tree’d it.” Interviewee 11 said, “there were too many questions.” Interviewee 10 simply explained how the incentive was the goal of participation. Nevertheless, the actions of these three test subjects are important for reporting. From the analysis of the results for these subjects came only two moderately high false positives from among random responses. Interviewee 10 had a level of 84% for ACRL standard five and Interviewee 11 had 86% indicated for ACRL standard two. The other standards for interviewees 10 and 11, and all standards for interviewee 12, were mostly low.

The author continued the discussions with each of these subjects after they indicated that their responses were random and not thoughtful responses. During their discussions,
both interviewee 11 and interviewee 12 articulated high levels of understanding for information literacy skills across all ACRL standards. The author would expect a high level of competency to be indicated if the students had completed the instrument properly. As for interviewee 10, the author estimated a low level of competency for ACRL standard one after the discussion with the student. This person always waited to the last minute, and never narrowed, or broadened, or even thought about the information need until a day or two before a project or paper was due. The instrument indicated a low level of competency for this standard and the indicated level was what the author would have expected for interviewee 10. A similar pattern emerged during the discussion of ACRL standards two and three. While interviewee 10 did understand the concept of Boolean searching, the student indicated that only keywords were used for searching without any articulated search statement. Given that this subject “jumps in” to the information seeking process, Interviewee 10 stated that sometimes “it is a needle in a haystack when I try to find information.” When the information was found, this person did not evaluate the information for credibility, did not talk with others about the information or ideas developed from the information, and never asked for help. The low levels indicated by the instrument for ACRL standards two and three would be expected of interviewee 10 based on the interview.

When asked about the nature of the student’s responses to the questionnaire, interviewee 13 looked at a copy of the instrument and noted that it was long but that all the items were read prior to making responses. As the discussion continued, the author assessed a good level of competency for ACRL standard one. Interviewee 13 described how starting research early was a choice determined by the extent of the information
need. The student also described an understanding of defining various aspects of a topic to determine both narrow and broad aspects to investigate. After listening to interviewee 13 discuss the information need, the author expected a higher level on the instrument than 80%. Yet this level was within the upper range of competency.

For ACRL standard two, interviewee 13 described an understanding and use of Boolean operators, that the student comprehensively organized sources for future use, and used more than one information retrieval system to gather information. The level indicated by the instrument for ACRL standard two was high, as expected. The author also expected the level for ACRL standard three to be high. The level indicated by the instrument was slightly lower than expected at 83%. For ACRL standard three, the student described evaluating information critically, engaging with information to increase knowledge, and developing different ideas through learning. For ACRL standard four, interviewee 13 stated that the student’s presentation of oral information was good, presentation of written information was average, and use of technology to present information was bad. The instrument indicated a level of 84% for this standard. Based on the self-assessment by interviewee 13, the author expected a lower level than indicated by the instrument. For ACRL standard five, interviewee 13 stated an understanding of ethical and legal use of information yet proclaimed to still use file-sharing software such as Kazaa—specifically citing a Gnutella client called Ares. The instrument indicated knowledge in this area as expected.

Interviewee 14 also began the discussion by stating all items on the questionnaire were read and the responses given were thoughtful. For ACRL standard one, interviewee 14 stated the seriousness with which the student conducted research. The student explained
that research was started well in advance of due dates. Interviewee 14 also discussed defining topics by reading encyclopedia articles to better understand what was needed. The author expected a high level of competency in this area and the instrument indicated a moderately high level at 85%. After a lengthy discussion of standard one, the interviewee was somewhat impatient and ready to go. All responses thereafter by the student were quite short. For ACRL standards two, three, and four the author expected low levels to be indicated. Interviewee 14 expressed no knowledge of composing search statements with Boolean operators, minimal understanding of periodical databases, and the nearly exclusive use of Web sites for assignments.

When asked if the student evaluated Web sites for authority and credibility, interviewee 14 answered “no” and pressed the discussion onward. When asked to describe information products and ability in this area, the student quickly stated, “it depends on my interest or the percentage of the grade” concerning the level of output quality. The author expected a low level in this area as indicated by the instrument results. For ACRL standard five, interviewee 14 expressed an understanding of the ethical and legal use of information and the instrument indicated a moderately high level of competency. The author agreed with the brief assessment by the student in this area and expected a moderately high competency level for standard 5. The indicated level was 96%.

Discussion of Interview Results

The qualitative observations made during the interviews were comparable to the quantitative outcomes from the instruments completed by the interviewees—with the
obvious exceptions of interviewees 10, 11, and 12. The interview process reinforced the statistical assessment of the instrument as a reliable indicator of information literacy skills. Table 5 provides a summary of the approximate degree to which the interview assessment was similar to each interviewee’s instrument results.

Table 5. Interview Comparison with Instrument Results of Interviewees

<table>
<thead>
<tr>
<th></th>
<th>Major scale 1</th>
<th>Major scale 2</th>
<th>Major scale 3</th>
<th>Major scale 4</th>
<th>Major scale 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NEAR</td>
<td>YES</td>
<td>YES</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>2</td>
<td>YES</td>
<td>NEAR</td>
<td>NEAR</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>3</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>4</td>
<td>YES</td>
<td>YES</td>
<td>NEAR</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>5</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>6</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>7</td>
<td>YES</td>
<td>NEAR</td>
<td>YES</td>
<td>NEAR</td>
<td>YES</td>
</tr>
<tr>
<td>8</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>9</td>
<td>NEAR</td>
<td>NEAR</td>
<td>NEAR</td>
<td>YES</td>
<td>NEAR</td>
</tr>
<tr>
<td>10</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>11</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>12</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>13</td>
<td>NEAR</td>
<td>NEAR</td>
<td>NO</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>14</td>
<td>NEAR</td>
<td>NO</td>
<td>YES</td>
<td>YES</td>
<td>NEAR</td>
</tr>
</tbody>
</table>

Note. Yes = approximately the same; Near = close assessment; No = not the same

Major scale 4, or ACRL standard four, was the construct that produced the greatest discrepancy between the interview assessments and the instrument results. ACRL standard four was concerned with the presentation of information. Of the 11 interviewees who gave thoughtful responses to the instrument items, four of those were incorrectly assessed by the author regarding major scale 4. This troubled the author since other assessments were more accurate. In order to understand this better, the author composed a table to compare instrument scores visually, with both student and author assessments for major scale 4. Table 6 illustrates each interviewee’s score for major scale 4, along
with whether or not the self-assessment of the interviewee matched the level indicated by the instrument as well as whether or not the interview assessment by the author matched the level indicated by the instrument.

Table 6. Instrument Scores Compared with Interviewee Self-assessments and the Assessment of the Author Pertaining to Major Scale 4

<table>
<thead>
<tr>
<th>Level indicated by instrument for major scale 4:</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>75%</td>
<td>78%</td>
<td>75%</td>
<td>69%</td>
<td>84%</td>
<td>78%</td>
<td>91%</td>
<td>91%</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>84%</td>
<td>75%</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Did the interviewee’s assessment match the level indicated by the instrument?:</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NO</td>
<td>NO</td>
<td>YES</td>
<td>NO</td>
<td>NO</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>YES</td>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Did the author’s assessment match the level indicated by the instrument?:</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>NO</td>
<td>YES</td>
<td></td>
</tr>
</tbody>
</table>

Upon further examination, the author discovered the discrepancies to be less troubling than first thought. When closely examined the results divide into four categories, namely, no match to the instrument score at all, student self-assessment matched the instrument score without an author match, author assessment matched the instrument score without student match, and student and author assessments matched the instrument score. For interviewees 1 and 2 there were no matches to the instrument scores either by a student or by the author. Both the students and the author expected a level higher than indicated. For interviewees 3 and 13, the student self-assessments matched the instrument scores while the author expected interviewee 3 to have a higher level and interviewee 13 to have a lower level. The self-assessments by interviewees 4, 5, and 14 did not match the
instrument scores while the assessments by the author for the interviewees matched the scores. The assessments by both the student and the author matched the instrument scores for interviewees 6, 7, 8, and 9. If accepting the sum of correct assessments compared to the instrument scores, without duplication if both the author and interviewee both correctly matched, then there were nine overall matches between the assessments and instrument scores. This illustrated an 81% accuracy of the comparison between assessment and instrument score. This was a value slightly above the expected reliability measure of the Cronbach alpha value .75 for the scale—yet close to the range of reliability.

When reviewing how interviewees 4 and 5 offered self-assessments exceeding the levels described by the instrument results, the author considered the Hawthorne effect as a possible explanation. Qualitative observation of interviewees might be confronted with the threat of the Hawthorne effect (Fraenkel & Wallen, 1996, p. 249). In this case, the Hawthorne effect was a threat to internal validity due to increased attention placed on an interviewee. Efforts to please the interviewer, indicate ability, and appear more conversant in the topic would be typical in such a setting. As a result, the comparison of qualitative to quantitative research may be called into question. Further research needs to be done to understand better the issues surrounding major scale 4 when compared with the interviews. Yet, even with the minor issues concerning the testing of major scale 4, the interview process as a whole served to confirm the reliable nature of the instrument for this study.
Instrument Version 2

Scale Reliability for Instrument Version 2

The statistical analysis of the second testing illustrated the instrument as consistent in Cronbach alpha values between both trials for major scales 1, 2, 3, and 4. Table 7 provides a comparison of the Cronbach alpha results between the first and second tests of the instrument. The results were also positive for the testing of the second version of the instrument and reinforced the reliability measures of the first test in four of the five major scales. For version 2 of the instrument, the major scales for ACRL standards two and three again achieved alpha values above .90. The internal consistency of these scales again indicated the highest level of reliability in describing that which they intended.

Major scale 1 was again in the moderate-to-high range of internal consistency with an alpha value of .86. While subscale 1.3 was again below the Cronbach alpha value of .70, it increased to .69 in version 2 and remained worthwhile to retain. In addition, the result for major scale 4 in version 2 was statistically similar to the version 1 result. In version 1, the alpha value was .74 and in version 2, the alpha value for major scale 4 was .70.

In the area of ethical and legal use of information for ACRL standard five, analysis of major scale 5 for version 1 indicated a .92 Cronbach alpha while the result for version 2 was an alpha value of .79. Subscale 5.1 & 3 was statistically similar between trials but subscale 5.2 was significantly different for version 2 and thus reduced its internal consistency. Nevertheless, major scale 5 of version 2 produced a Cronbach alpha value within the statistical guidelines for a reliable and meaningful scale.
Table 7. Cronbach Alpha (α) Values for Instrument Version 1 Compared with Version 2

<table>
<thead>
<tr>
<th>Major Scale 1 (Standard One)</th>
<th>Version 1</th>
<th>Version 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The definition of the information need:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>α = .8858</td>
<td>α = .8563</td>
<td></td>
</tr>
<tr>
<td>Subscale 1.1 (performance indicator 1):</td>
<td>α = .7559</td>
<td>α = .7397</td>
</tr>
<tr>
<td>Subscale 1.2 (performance indicator 2):</td>
<td>α = .7768</td>
<td>α = .8281</td>
</tr>
<tr>
<td>Subscale 1.3 (performance indicator 3):</td>
<td>α = .6545</td>
<td>α = .6907</td>
</tr>
<tr>
<td>Subscale 1.4 (performance indicator 4):</td>
<td>α = .7909</td>
<td>α = .7052</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Major Scale 2 (Standard Two)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The retrieval of information:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>α = .9513</td>
<td>α = .9352</td>
<td></td>
</tr>
<tr>
<td>Subscale 2.1 (performance indicator 1):</td>
<td>α = .7996</td>
<td>α = .8233</td>
</tr>
<tr>
<td>Subscale 2.2 (performance indicator 2):</td>
<td>α = .8852</td>
<td>α = .8318</td>
</tr>
<tr>
<td>Subscale 2.3 (performance indicator 3):</td>
<td>α = .7950</td>
<td>α = .7693</td>
</tr>
<tr>
<td>Subscale 2.4 (performance indicator 4):</td>
<td>α = .8779</td>
<td>α = .8960</td>
</tr>
<tr>
<td>Subscale 2.5 (performance indicator 5):</td>
<td>α = .8490</td>
<td>α = .7978</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Major Scale 3 (Standard Three)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The evaluation and synthesis of information:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>α = .9520</td>
<td>α = .9259</td>
<td></td>
</tr>
<tr>
<td>Subscale 3.1 &amp; 3 (performance indicators 1 &amp; 3):</td>
<td>α = .9045</td>
<td>α = .8074</td>
</tr>
<tr>
<td>Subscale 3.2 (performance indicator 2):</td>
<td>α = .8934</td>
<td>α = .8885</td>
</tr>
<tr>
<td>Subscale 3.4 (performance indicator 4):</td>
<td>α = .8694</td>
<td>α = .8476</td>
</tr>
<tr>
<td>Subscale 3.5 (performance indicator 5):</td>
<td>α = .7795</td>
<td>α = .7791</td>
</tr>
<tr>
<td>Subscale 3.6 (performance indicator 6):</td>
<td>α = .8106</td>
<td>α = .8426</td>
</tr>
<tr>
<td>Subscale 3.7 (performance indicator 7):</td>
<td>α = .7278</td>
<td>α = .7294</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Major Scale 4 (Standard Four)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The presentation of information:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>α = .7470</td>
<td>α = .7096</td>
<td></td>
</tr>
<tr>
<td>(Performance indicators 1, 2, &amp; 3 compose the one scale for standard four.)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Major Scale 5 (Standard Five)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ethical use of information:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>α = .9222</td>
<td>α = .7936</td>
<td></td>
</tr>
<tr>
<td>Subscale 5.1 &amp; 3 (performance indicators 1 &amp; 3):</td>
<td>α = .7996</td>
<td>α = .7903</td>
</tr>
<tr>
<td>Subscale 5.2 (performance indicator 2):</td>
<td>α = .7917</td>
<td>α = .5701</td>
</tr>
</tbody>
</table>
Future implementations of the instrument may or may not produce statistically similar results as found in the first testing of the instrument for major scale 5. That remains to be seen. However, the differences between trials in the current study must be noted here given the statistical disparity between the two trials concerning major scale 5. The first difference was the delivery method. While the majority of instruments for the first testing were completed through hard copy questionnaires, all of the instruments for the second testing were completed online. Another difference was the age of the test subjects. The first sample consisted of all freshmen with an average age of 20 years. The second sample consisted primarily of upperclassmen with an average age of 28 years. A third difference was that 37% of the persons in the first sample were female compared to 79% of the second sample. Sixty-three percent of the persons in the first sample were male compared with 21% of the second sample. The fourth difference was that four items were eliminated from major scale 5 of version 1, namely, 127, 130, 131, and 140. These items were eliminated to increase the Cronbach alpha value in order to increase instrument reliability. If those items were not removed from major scale 5 for version 1, the alpha value would be .9135.

As for the first difference, it is unlikely that the medium would be the cause of the disparity among trials for a construct about ethical and legal use of information. While it is possible that age, educational level, and gender could be a factor in the difference between the two alpha values, future research will be needed to discern a root cause among one, or more, of these. The fourth difference may be the most likely cause—at least it would provide a more concrete project for future research. Further testing of the instrument can be conducted to see whether the inclusion of the items omitted to produce
version 2 would result in Cronbach alpha values similar to those of version 1 for major scale 5.

**Summary of Results**

Instrument version 1 was tested with 78 college freshmen. The scale reliability for each major scale, or ACRL standard, and each subscale, or performance indicator, for each major scale proved to be internally consistent. The Cronbach alpha values for major scales 2, 3, and 5 were above .90. This illustrated the high level at which the instrument consistently indicated aspects of information literacy for these major constructs based on the ACRL standards. The Cronbach alpha value for major scale 1 was .89, which indicated moderate to high scale reliability, and .75 for major scale 4, which indicated a good level of reliability. Overall, the statistical analysis of the instrument confirmed the development of a reliable instrument to indicate information literacy levels. Interviews with 14 freshmen were conducted. The interviews provided empirical support for the statistical results indicating the instrument to be a meaningful and reliable tool.

Sixteen items were removed from instrument version 1, based on statistical analysis, to produce instrument version 2. Instrument version 2 was tested with a sample of 81 college students as a confirmatory study of the statistical analysis for instrument version 1. The results for version 2 were consistent with the results of version 1 for major scales 1, 2, 3, and 4. While major scale 5 resulted in a reliable measure, the Cronbach alpha value for version 2 was .79, where version 1 had a value of .92. A possible explanation for the trial disparity may be related to the elimination of items in the scale to form version 2. Further testing is recommended. Overall, the statistical analysis of instrument
version 2 resulted in confirming the findings of version 1—the study instrument was a statistically reliable indicator of information literacy skills.
Chapter 5

Conclusions, Implications, Recommendations, and Summary

Conclusions

The goal of the study was to develop and test the reliability of an instrument designed to indicate the level of information literacy of incoming college freshmen based on the ACRL (2000) Information Literacy Competency Standards for Higher Education. The goal was met and the result was a reliable and valid instrument to indicate student information literacy levels. Expert review of the item-construct relationships affirmed construct validity of the instrument. The statistical analysis of instrument version 1 revealed the instrument to be moderately to highly reliable for indicating information literacy levels for ACRL information literacy standards. The items concerning ACRL standards two, three, and five were confirmed as internally consistent for each construct by producing Cronbach alpha values above .90. The items drafted for ACRL standard one had moderately high internal consistency with a .89 Cronbach alpha value, while the value of scale reliability of items for ACRL standard four was within an acceptable range of .75. The interview process served to illustrate further the reliability of the instrument. The statistical analysis of instrument version 2 served to confirm the reliability results for the instrument—with similar results for all major scales except for major scale 5.
Nevertheless, major scale 5, concerning ACRL standard five, resulted in a reliable Cronbach alpha value of .79.

The study instrument was successful as a tool to indicate information literacy levels among the test participants. The conclusion of the study was that the development and testing of the information literacy indicator proved to be valid and reliable for indicating information literacy skills across all five ACRL information literacy standards. Further study and use of the instrument will be meaningful both to the author’s local context and to the field of library and information science as a whole.

**Implications**

Given the local context of the study, the successful information literacy indicator will benefit the author’s institution in future efforts to provide information literacy training to incoming freshmen. In addition to this, the instrument could be applied on an individual basis—outside of a specific institutional setting—to indicate an individual’s level of information literacy based on the ACRL standards. Since information literacy is a process and cannot be taught in its entirety in any one course, this individual awareness could provide a foundation for personal improvement in known areas of need. As Abramson (2001) stated, “with educated, well-trained people teaching children during the day and working with families in the evening settings that are comparable to the workplace, information literacy will soon become widespread and lifelong learning as desirable as entertainment” (p. 24). It is possible persons may find information literacy and the pursuit of lifelong learning a form of entertainment and a way to improve society. Nevertheless, Cahoy (2002) emphasized that “until we are fully cognizant of what all students at all
levels need in order to be information literate, we will not be adequately serving their lifelong learning needs” (p. 12). The information literacy indicator developed in this study can help in this pursuit.

In addition, the information literacy indicator, and the process of its development, will contribute to the professional literature and practice of the field through the publication of the study itself. In addition, the instrument will provide a comprehensive evaluative tool, free for anyone to use, to indicate information literacy levels based on accepted ACRL information literacy competency standards. Further testing and implementation of the information literacy indicator will have research implications in areas such as information literacy training programs, information literacy instrument development, and addressing and reporting information literacy issues concerning higher education accrediting agency standards. The study will be of interest to both secondary school and higher education researchers and practitioners in the area of information literacy. Scholars and information professionals may use the instrument, analyze the process, replicate the study, and/or otherwise examine the study in order to further the academic process.

**Recommendations**

While the author intends to build upon the research of the study, it is recommended that other researchers use this pilot study to further the academic process in the area of information literacy scholarship. Attention should be placed on major scale 5, which represented ACRL standard five. The statistical results for instrument version 2 were inconsistent with instrument version 1. A possible explanation for the trial disparity may be related to the elimination of items in the scale to form version 2. It is recommended
that the items eliminated from instrument version 1 for major scale 5 be replaced for additional testing of the instrument.

Summary

The author began the study with the concern that library instruction at the author’s institution did not provide comprehensive information literacy training to incoming college freshmen within the allotted instructional sessions. There was a need to identify information literacy strengths and weaknesses in order to improve student instruction in the area of information literacy. The application of a comprehensive instrument to identify information literacy competencies extended its local need into one for all information professionals in the academic library setting.

The goal of the study was to develop a comprehensive information literacy instrument based on the accepted benchmarks of the ACRL information literacy standards. Support for this goal came from increased emphasis on information literacy by higher education accrediting agencies and the need for increased efforts to teach critical thinking skills. The involvement of the academic library, and its information professionals, in this teaching mission appears to be more acute in liberal arts colleges—the contextual setting of the author. The instrument developed in this study proved to be a valid and reliable indicator of information literacy skills. Noted constraints for the study were language, focus only on the ACRL standards, and the size of the instrument.

The literature review focused on the historical context of information literacy training, research concerning information literacy assessment independent from information literacy instruction, relevant studies that associated assessment with components of
information literacy instruction, surveying secondary school information literacy standards, and examining expected levels of information literacy for high school students. The historical context of information literacy instruction in academic libraries in the United States began in the late 19th century and early 20th century but reemerged in renewal and influence during the 1960s. In the 1960s, Patricia Knapp at Monteith College of Wayne State University and Earlham College librarians rekindled library instruction and sparked the modern-day library instruction movement. The proliferation of information and information technology from the mid-to-late 1980s to the present resulted in the rise of information complexity and information overload. One way academic librarians tried to cope with this overwhelming situation was through information literacy training.

This study focused on indicating information literacy skills of incoming college freshmen by developing a reliable and valid instrument independent from specific information literacy training programs. The literature review showed Project SAILS also sought to develop an instrument to assess information literacy competencies independent from training programs. Other studies illustrated the importance and emphasis of the ACRL information literacy standards associated with information literacy instruction assessment.

The AASL/AECT information literacy standards for school media programs constituted a foundational approach to indicating the skills needed by high school students to move into college. High school students with librarians who earned advanced training in the discipline had a greater chance of receiving information literacy training based on the professional information literacy standards prepared by the AASL and
AECT than did students without a librarian or without a librarian with advanced training. Therefore, high school graduates come to college with disparate levels of information literacy skills.

This study will contribute to the body of literature by presenting a comprehensive, evaluative tool that reliably indicates information literacy levels based on the ACRL information literacy standards. It will be of interest to both secondary school and higher education researchers and practitioners in the area of information literacy. Scholars and information professionals may use the instrument, analyze the process, replicate the study, and/or otherwise examine the study in order to further the academic process.

The methodology for the study involved the development, implementation, and statistically analysis of an instrument to indicate information literacy competencies based on the ACRL information literacy standards. The composition of the instrument statements reflected aspects of each performance indicator for each ACRL standard to provide specific construct feedback within each standard. Expert review of the instrument was conducted in order to evaluate its content validity. O’Connor, Johnson, and Seamans provided largely favorable reviews affirming the content validity of the instrument. The reviews provided direction for excluding three items, rewording five items, and focusing attention on library-centric language as a limitation.

The first test of the instrument was administered in April 2005. Statistical reliability was determined for items in each construct. Statistical analysis was conducted with SPSS software to calculate the internal consistency of the items using Cronbach’s Alpha. Instrument items, not as consistent as others in the scale, were eliminated. A second test
was conducted with the remaining items and the same statistical process was followed. The data of the first testing was triangulated with 14 personal interviews.

Instrument version 1 was tested with 78 college freshmen. The reliability for each major scale, or ACRL standard, and each subscale, or performance indicator, for each major scale proved to be internally consistent. The Cronbach alpha values for major scales 2, 3, and 5 were above .90. This illustrated the high level at which the instrument consistently indicated aspects of information literacy for these major constructs based on the ACRL standards. The Cronbach alpha value for major scale 1 was .89, which indicated moderate to high scale reliability, and .75 for major scale 4, which indicated a good level of reliability. Overall, the statistical analysis of the instrument confirmed the development of a reliable instrument to indicate information literacy levels. Interviews with 14 freshmen were conducted. The interviews provided empirical support for the statistical results indicating the instrument to be a meaningful and reliable tool.

Sixteen items were removed from instrument version 1, based on statistical analysis, to produce instrument version 2. Instrument version 2 was tested with a sample of 81 college students as a confirmatory study of the statistical analysis for instrument version 1. The results for version 2 were consistent with the results of version 1 for major scales 1, 2, 3, and 4. While major scale 5 resulted in a reliable measure, the Cronbach alpha value for version 2 was .79, where version 1 had a value of .92. A possible explanation for the trial disparity may be related to the elimination of items in the scale to form version 2. Further testing is recommended. Overall, the statistical analysis of instrument version 2 resulted in confirming the findings of version 1—the study instrument was a statistically reliable indicator of information literacy skills.
The study instrument was successful. The conclusion of the study was that the development and testing of the information literacy indicator proved to be valid and reliable for indicating information literacy skills across all five ACRL information literacy standards. Further study and use of instrument will be meaningful both to the author’s local context and to the field of library and information science.

The instrument will benefit the author’s institution in future efforts to provide information literacy training to incoming freshmen. It could also have individual utility for self-improvement. A major implication of the study was that the instrument, and the process of its development, would contribute to the professional literature and practice of the field through the publication of the study itself. In addition to this, the information literacy indicator will provide a comprehensive evaluative tool, free for anyone to use, to indicate information literacy levels based on accepted ACRL information literacy competency standards. Further testing and implementation of the information literacy indicator will have research implications in areas such as information literacy training programs, information literacy instrument development, and addressing and reporting information literacy issues concerning higher education accrediting agency standards. While the author intends to build upon the research of the study, it was recommended that other scholars also use this pilot study for future research in the field.
Appendix A

ACRL Information Literacy Competency Standards for Higher Education.


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
Appendix B

Information Literacy Indicator – Item-Construct Association

In this appendix, the item numbers found on the information literacy indicator were listed beside the ACRL information literacy standard and construct with which they were associated. This was delineated for both versions of the instrument. See Appendix A for a list of standards and performance indicators—the constructs for the instrument. See Appendix C for a list of the items used in instrument version 1 and Appendix H for the items in instrument version 2.

Instrument Version 1

Standard one: The definition of the information need

Construct one: Items 1 through 9
Construct two: Items 10 through 18
Construct three: Items 19 through 22
Construct four: Items 23 through 27

Standard two: The retrieval of information

Construct one: Items 28 through 36
Construct two: Items 37 through 55
Construct three: Items 56 through 67
Construct four: Items 68 through 74
Construct five: Items 75 through 83
Standard three: The evaluation and synthesis of information

Constructs one and three combined: Items 84 through 90

Construct two: Items 91 through 101

Construct four: Items 102 through 109

Construct five: Items 110 through 112

Construct seven: Items 113 through 115

Construct six: Items 116 through 118

Standard four: The presentation of information (the standard as construct)

Constructs one, two, and three combined: Items 119 through 126

Standard five: The ethical use of information

Constructs one and three combined: Items 127 through 139

Construct two: Items 140 through 145

Instrument Version 2

Standard one: The definition of the information need

Construct one: Items 1 through 8

Construct two: Items 9 through 17

Construct three: Items 18 through 21

Construct four: Items 22 through 25
Standard two: The retrieval of information

Construct one: Items 26 through 33
Construct two: Items 34 through 51
Construct three: Items 52 through 62
Construct four: Items 63 through 69
Construct five: Items 70 through 78

Standard three: The evaluation and synthesis of information

Constructs one and three combined: Items 79 through 84
Construct two: Items 85 through 95
Construct four: Items 96 through 101
Construct five: Items 102 through 104
Construct seven: Items 105 through 107
Construct six: Items 108 through 109

Standard four: The presentation of information (the standard as construct)

Constructs one, two, and three combined: Items 110 through 114

Standard five: The ethical use of information

Constructs one and three combined: Items 115 through 124
Construct two: Items 125 through 129
Appendix C

Information Literacy Indicator (version 1)

**Directions:** At one sitting, please respond to the following items by marking the appropriate selection with either a ✔️ or an X in the corresponding square. Start time:______ End time:______

**Identification Number_________**

<table>
<thead>
<tr>
<th><strong>Response Legend:</strong></th>
<th>Always</th>
<th>Often</th>
<th>Seldom</th>
<th>Never</th>
<th>NA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Always</strong> = means that I do this all the time and fully understand the concept.</td>
<td>✔️</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Often</strong> = means that I do this frequently and understand the concept fairly well.</td>
<td>✗</td>
<td>✗</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Seldom</strong> = means that I have done this but I am unclear about the concept.</td>
<td>✗</td>
<td></td>
<td>✗</td>
<td>✗</td>
<td></td>
</tr>
<tr>
<td><strong>Never</strong> = means that I have not done this and do not understand the concept.</td>
<td>✗</td>
<td></td>
<td></td>
<td>✗</td>
<td></td>
</tr>
<tr>
<td><strong>Not applicable (NA)</strong> = means that this does not apply to me (I have not been in such a scenario).</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

| 1. When preparing for a research paper I talk with the teacher and/or other students to get a better idea about the topic and assignment. | | | | | |
| **When searching for information to do a research paper:** (Items 2-8) | | | | | |
| 2. I begin by developing a thesis statement (i.e., a sentence or more about what I want my research to accomplish concerning my topic). | ✗ | | | | |
| 3. I decide ahead of time what types of information I need such as books, articles, images, or other types. | | ✗ | | | |
| 4. I decide ahead of time how much information I need. | | | ✗ | | |
| 5. I decide ahead of time on a specific area of the topic to research. | | | | ✗ | |
| 6. I begin by looking for information that will help expand my initial idea. | | | | | ✗ |
| 7. I read subject dictionary and/or encyclopedia articles in order to increase my familiarity with a topic and develop a better understanding of what information I will need. | | | ✗ | | |
| 8. I identify key concepts and terms that will guide my research. | | | | | |
| 9. When using information for a research paper, I realize that my own thoughts can be combined with the information to produce new thoughts on the topic. | | | | | |
| **When identifying possible sources to use in a research paper:** (Items 10-18) | | | | | |
| 10. I realize that information in the library is organized into subject areas. | | | ✗ | | |
| 11. I realize that information found in scholarly journals is more thoroughly reviewed, critiqued, and edited than the information found in magazines. | | | | | |
When identifying possible sources to use in a research paper: (Items 10-18)

12. I realize that the information found in scholarly journals is for an academic audience.
13. I realize that the information found in magazine articles is for a popular, more general audience.
14. I realize that there are a variety of possible formats for potential sources (including, among others, print, electronic, images, audio, and video).
15. I realize that some formats will be better to use for the topic than other formats.
16. I realize that different sources will have different perspectives on the topic.
17. I realize a primary source is a source that provides words of the witnesses or the first recorders of an event or work of literature.
18. I realize a secondary source is a source that discusses another person's work.

When looking for information for a research paper: (Items 19-22)

19. I develop a timetable within which to gather all of the needed resources.
20. I give myself sufficient time to acquire information in advance of when it is needed.
21. I will seek needed sources outside my library through inter-library loan of books and articles.
22. I realize a fee may be involved when seeking sources through inter-library loan that are not owned by my library.

After finding information for a research paper: (Items 23-25)

23. I realize I may have to revise my topic depending upon the amount of sources found.
24. I realize I may have to refine my topic by narrowing it if sources lead me to understand that my topic is too broad.
25. I realize I may have to refine my topic by broadening it if sources lead me to understand that my topic is too narrow.
26. After looking for information for a research paper, I realize I may have to abandon my original topic if limited sources, or no sources, are available.
When looking for information for a research paper: (Items 27-36)

27. I take into consideration the requirements of the assignment as indicated by the teacher and decide how much information is needed based on them.

28. I realize there are a variety of investigative methods to gather information such as experiments, surveys, field observations, and literature reviews.

29. I decide ahead of time the most appropriate investigative method for my topic.

30. I realize there are many information retrieval systems, such as periodical indexes (citations for articles in journals, magazines, newspapers, etc), the online book catalog, and various subject-specific full-text databases, to assist in locating information.

31. I learn about the coverage dates of the information provided by various information retrieval systems available to me in order to see if the dates are appropriate for finding information on my topic.

32. I learn about the possible locations of the information covered by various information retrieval systems available to me.

33. I learn about the type of content (for example, full-text articles or bibliographic citations) provided by various information retrieval systems available to me.

34. I look for periodical indexes and other subject-specific information retrieval systems that are appropriate to my topic.

35. I learn how to efficiently and effectively use the appropriate information retrieval systems.

36. I realize that full-text and bibliographic databases are different.

When searching information retrieval systems: (Items 37-52)

37. I develop a plan to follow while searching.

38. I determine key words, based on my topic, to use in searching.

39. I identify and search for synonyms and/or other terms related to the key words previously used to search on my topic.
When searching information retrieval systems: (Items 37-52)

40. I make an effort to assist my searching by reading general resources such as dictionary and/or encyclopedia articles to better understand the terminology of the subject area of my topic.

41. I use subject search options to find information on my topic.

42. I realize I can use truncation (or shortcuts) in my searches to locate various forms of a root word or word fragment (for example, king* will search for words starting with king to find king, kings, kingship, kingdom, etc.).

43. I use search statements containing Boolean operators (relational search logic) such as AND, OR, and NOT (for example, "dog AND cat", "cat OR dog", "cat NOT dog").

44. I realize a search statement using the Boolean operator AND limits results by retrieving items containing all search terms (for example, "dog AND cat" will return items that have both the words "dog" and "cat" in them).

45. I realize a search statement using the Boolean operator OR expands results by retrieving items containing any of the search terms (for example, "dog OR cat" will return items that have either the word "dog" or the word "cat" in them).

46. I realize a search statement using the Boolean operator NOT excludes a term or phrase by retrieving items that do not contain the search terms that follow the operator (for example, "cat NOT dog" will return items that have the word "cat" in them but do not contain the word "dog").

47. I realize I may be able to combine Boolean search statements, called nesting, to perform more advanced searches (for example, "(cat AND dog) NOT poodle" will return items that have both the words "cat" and "dog" in them but do not contain the word "poodle").

48. I realize I may be able to search using proximity (location search logic) operators to find terms within a specific distance of each other (for example, "food(N)fish" is a statement seeking items where food and fish are near (N) to each other with no words between them resulting in the return of items that have either "food fish" or "fish food" in their records.).

49. I realize I should search the title field when I know the title of a book and need to locate it.
When searching information retrieval systems: (Items 37-52)

50. I realize I should search the author field when I know the author of a book and need to locate it.

51. I realize I should search the subject field when I know the subject of books I need to locate.

52. I browse items on the same subject to locate books I need for my topic.

53. If I need more information for my research paper after searching one information retrieval system, I then use the same search strategies with another information retrieval system in order to access more information.

54. When searching on more than one information retrieval system, I realize each system may have a different interface and that I may have to modify my search statements for each system.

55. When locating information within a book, I utilize the table of contents and/or its indexes to access information in the book.

When gathering information for a research paper: (Items 56-67)

56. I realize I should not gather all my information from Internet sources only (i.e., non-academic and/or databases not available online through the library)—unless instructed to do so by the teacher.

57. I access information from any format, Internet, books, articles, or other format, as long as it is appropriate to my topic.

58. I would recognize the format of the item in the following citation to be a journal article: Rader, H.B. (2002). Information Literacy 1973-2002: A Selected Literature Review. Library Trends, 51(2), 242-261.


60. I recognize the format of an item found on the World Wide Web because its citation includes a Uniform Resource Locator (URL, or web address: http://www.warner.edu).
When gathering information for a research paper: (Items 56-67)

61. I would recognize the format of the item in the following citation to be a journal article accessible online:

62. I understand how to locate books using call numbers.

63. I understand how to locate journal and/or magazine articles using periodical indexes.

64. I understand that the following is a Library of Congress call number: RC954 .G4735 2 000.

65. I understand the location of and importance of noting the author, article title, title of the periodical, date, volume number, issue number and page numbers when using a periodical index [A periodical index entry might look something like this: Lazar, Bonnie A.; Why social work should care: Television violence and children. / (In Child & Adolescent Social Work Journal 1994 Feb Vol. 11 (1) 3-19)].

66. I identify information on my topic that is not located in my library.

67. I take advantage of one or more available library services to assist in finding and/or retrieving information (for example, reference librarian help, arranged contact with experts on the subject, interlibrary loan, et cetera).

When searching for information: (Items 68-72)

68. I revise my search strategy as many times as necessary in order to get the best possible results.

69. I realize that if too many items are returned I need to revise my search strategy to gain a more manageable number of items.

70. I realize that if too few items are returned I need to revise my search strategy to gain a greater number of items.

71. I realize that if I receive unwanted items (for example, magazine articles when I want journal articles, secondary sources when I want primary sources, unknown authors when I want authors known to me, etc.) I need to revise my search strategy to find the wanted items.
### When searching for information: (Items 68-72)

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72. I realize that if too few items are relevant to my information need (for example, items are too old, or items are not specific enough, or items are too broad, or items are in a different language than needed, etc.) I must revise my search strategy to gain a greater number of relevant items.

73. When searching for information to write a research paper, I realize it is usually not the best strategy to search only one information retrieval system and use whatever results I retrieve—unless instructed to do so by the teacher.

74. After searching one information retrieval system for information on my topic, I realize there may be gaps in the information I retrieved and make certain to search more than one information retrieval system.

75. When I retrieve information I organize items in a meaningful way rather than keeping items in random order.

76. When I retrieve information I understand that different disciplines will use different citation styles (for example, scholars of literature use the MLA citation style while scholars of information science use the APA citation style).

77. When I retrieve information I know how to write a proper bibliographic citation for an item based on an accepted citation style, such as MLA or APA.

78. When I retrieve information from a computer-based information retrieval system, I understand how to save information to a disk or e-mail it to myself.

79. When I retrieve information from an Internet source, I understand how to save information to a disk or e-mail it to myself.

80. When I retrieve information from an Internet source, I understand how to copy and paste information into another document.

81. When I retrieve information from an information retrieval system, I know how to determine whether the material is available in the library or if I must locate the material elsewhere.

82. When I retrieve information from a bibliography, I know the difference between a citation for a periodical article and a citation for a book.
83. When conducting research, I write down, or record in some way, citation information I come across for relevant items so that I may search for these items at a later time.

   When reading information for a research paper: (Items 84-89)

84. I make notes and/or highlight the main ideas found in the text.
85. I identify material that would be appropriate to quote directly in my paper.
86. I paraphrase important concepts in my own words.
87. I recognize main ideas found in the text.
88. I utilize main ideas to provide supporting evidence for my topic.
89. I utilize the interrelationship of main ideas within one source, or multiple sources, to develop new ideas.

   When examining information for a research paper: (Items 90-102)

90. I utilize computer software when appropriate, such as spreadsheets and databases, to analyze the relationship of data I have gathered.
91. I evaluate the authority of its source (for example the journal it came from, or the affiliation of the author, or the organization behind the Web site it came from, etc.) rather than simply taking information at face value.
92. I evaluate the authority of its author by determining her or his qualifications and credentials in some manner.
93. I evaluate the accuracy of its content by also reading sources cited in its bibliography.
94. I evaluate the timeliness of the information by learning its publication date.
95. I realize information may contain certain biases towards one perspective or another.
96. I note any particular points of view I find in the information.
97. I note my personal opinions about the structure and logic of the arguments presented in the information.
98. I recognize that information in any format will contain a certain point of view.
When examining information for a research paper: (Items 90-102)

99. I realize the creation of information is accomplished within many contexts such as historical, cultural, and/or geographical.

100. I consider the impact various contexts, such as historical, cultural, and/or geographical, might have on the perspectives presented in the information.

101. I consider the time in history when the information was written and its appropriateness for my topic.

102. I determine whether or not an item meets my need for information on the topic.

When reading information for a research paper: (Items 103-114)

103. I compare the information from one source to another to note contradictions and/or similarities among sources.

104. I draw my own conclusions based upon information gathered.

105. I find out the source of the data in order to determine the accuracy of the information.

106. I examine the reasonableness of the conclusions of an item by comparing the conclusions with my own knowledge.

107. I examine the reasonableness of the conclusions of an item by comparing the conclusions with similar information items I retrieved.

108. I compare the new information learned with my previous knowledge to reach conclusions.

109. I evaluate the sources based on accepted criteria such as authority, accuracy, and timeliness and from this select the most appropriate information to use for my paper.

110. when I come across a new point of view I take time to examine and understand the new perspective.

111. when I come across a new point of view I take time to determine if the perspective should be incorporated into my paper or rejected.

112. when I come across new information that challenges my value system I take time to examine my beliefs and what might be right or wrong about them.

113. I determine whether I need to go back to the search phase and use a different search strategy to find information that is more relevant.
When reading information for a research paper:
(Items 103-114)

114. I examine footnotes and bibliographies from my sources to identify additional items on my topic.

115. After reading all the information I gathered for a research paper, if more information is needed I determine where I have already searched so that I can go back and search other information retrieval systems.

During the process of writing a research paper:
(Items 116-119)

116. I seek to confirm my understanding of the topic by participating in classroom discussions or other discussions on the topic.

117. I seek to confirm my understanding of the topic by discussing it using electronic communication such as e-mail, chat rooms, listservs, and bulletin boards.

118. I seek to confirm my understanding of the topic by seeking expert opinion (by any means such as personal interview, e-mail, telephone, etc.).

119. During the process of writing a research paper, I keep a journal or log of my progress so that I will know what I have done and what I need to do.

120. When preparing for writing and/or presentation projects, I refer to past papers and/or presentations to remember past successes and/or failures to help improve the current project.

After writing a research paper: (Items 121-123)

121. I feel confident in the work I have produced.

122. I can apply the knowledge learned to produce topic outlines and/or topic presentations as assigned by the teacher.

123. I am able to transfer the knowledge learned into a digital format presentation such as a PowerPoint presentation and/or Web-based presentation.

When presenting my research information:
(Items 124-126)

124. I use information technology to prepare my presentation.

125. I am comfortable communicating what I have learned.

126. I receive feedback from the teacher indicating satisfaction in my effective presentation of the information.
During the research process: (Items 127-133)

127. I realize that not all information on the Internet is free.

128. I realize that results from free Internet search engines, such as Google, may not always lead me to credible sources of information as often as the search results will from subscription/fee-based information retrieval systems provided by the library/school.

129. I realize that online access to current, print-based journals and magazines is usually only possible through fee or subscription based Web databases paid for by my library/school for me to use.

130. I realize that the terms of subscription to various information retrieval systems limit the use of the products to only the immediate constituency (for example, faculty, staff, and students are the constituents of an academic library).

131. I realize that if I provide another person, who is not part of the library's constituency, with access to subscription based library products then I have committed an illegal act.

132. I understand that in the United States the protection of freedom of speech results in a variety of perspectives found in information.

133. I understand that because of the protection of freedom of speech in the United States, ideas are not censored from the information we can access.

When using information in my research paper: (Items 134-137)

134. I understand that the work of another author is intellectual property since it was a product of the author's intellect.

135. I understand that the work of another author must be properly cited in my paper acknowledging my use of the intellectual property.

136. I realize it is stealing to use the work of another person in my research paper and not properly acknowledge the author to give her or him credit for the work.

137. I understand that a legal device to allow an author to safeguard intellectual property is the establishment of a copyright for an item.

138. When writing a research paper, I realize that the fair use rule of copyright law allows me to quote a short passage of an author's work with proper citation.
139. When documenting information sources in my paper, I realize I should follow only one documentation style to keep my work consistent.

140. When participating in electronic discussions, I follow the accepted practices of the group.

141. When searching for information, I use approved passwords and/or approved forms of identification to gain access to information retrieval systems.

142. When using information resources provided by my institution, I follow the policies set forth by the library/school.

143. When using information resources provided by my institution, I do not intentionally change anything on the computer systems.

144. When obtaining information, including software, I legally obtain items either through free resources, resources provided by my library/school, or by purchasing items.

145. I realize that downloading and/or distributing copyrighted music without paying for it, through Internet file-sharing systems such as Kazaa, is an illegal act.
Appendix D

Research Permission from Warner Southern College

January 12, 2005

Mr. Ron Critchfield
Williams Hall #219
Warner Southern College
13895 Hwy 27
Lake Wales, FL 33859

Dear Ron,

Thank you for your continuing service to the students of Warner Southern College. I read with interest the focus and activities of your dissertation research. I believe it will be a valuable project for both Warner Southern and other institutions interested in assessing and improving the information literacy of college students.

Your request to survey and interview Warner Southern students in this project has been approved. If I can be of any further assistance in this process, please feel free to let me know.

Best wishes as you work to complete this valuable educational pursuit.

Sincerely,

William M Rigel, PhD
Executive Vice President & Chief Academic Officer
Appendix E

Institutional Review Board Approval

NOVA SOUTHEASTERN UNIVERSITY
Graduate School of Computer and Information Sciences

January 15, 2005
JDC:jdc

MEMORANDUM

From: James Cannady, Ph.D., Associate Professor, GSCIS
To: Ronald Critchfield

Subject: IRB Approval

After reviewing your IRB Submission Form and Research Protocol I have approved your proposed research (“The Development of an Information Literacy Indicator for Incoming College Freshmen”) for IRB purposes. Your research has been determined to be exempt from further IRB review based on the following conclusion:

Research using survey procedures or interview procedures where subjects’ identities are thoroughly protected and their answers do not subject them to criminal and civil liability.

Please note that while your research has been approved, additional IRB reviews of your research will be required if any of the following circumstances occur:

1. If you, during the course of conducting your research, revise the research protocol (e.g., making changes to the informed consent form, survey instruments used, or number and nature of subjects).

2. If the portion of your research involving human subjects exceeds 12 months in duration.

Please feel free to contact me in the future if you have any questions regarding my evaluation of your research or the IRB process.

Dr. Cannady
Appendix F

Informed Consent Form for Critchfield Information Literacy Questionnaire

Ron Critchfield, Assistant Professor, Warner Southern College, 13895 U.S. Highway 27, Lake Wales, FL 33859. Telephone: 863-638-7654. E-mail: critchfieldr@warner.edu. The study is field research for a Ph.D. dissertation in Information Science.

Description of the Study: You will complete and return an information literacy questionnaire. The responses to the questionnaire will indicate your understanding of library research and issues relating to the evaluation and use of information. It is a low-stress questionnaire that will in no way reflect negatively upon you. It is estimated that the questionnaire will take approximately 1 hour to complete. Thirty freshmen volunteers will be randomly selected for a brief follow-up interview with Mr. Critchfield. It is estimated that each interview will last approximately 15 minutes and this will be a low-stress, casual conversation.

The following is an example of how items are stated and of possible responses (the item is not on the questionnaire): When searching for information to do a research paper I begin by reading comic books.

- Always
- Often
- Seldom
- Never
- Does not apply

The following is expected of the volunteer:
- You will complete the questionnaire in one sitting in order to indicate completion time.
- You will complete the questionnaire within two days of receiving the confirmation e-mail and web link to the study (you will be ineligible for the prize drawing if your questionnaire is not promptly completed).
- 30 freshmen volunteers, out of approximately 100 volunteers, will be randomly selected for a follow-up interview in late April/early May.

Incentives for the Participant: Each volunteer who promptly returns a completed questionnaire to the researcher will be eligible for a drawing to win a $100.00 cash prize. Each freshman student randomly selected for a follow-up interview will receive $5.00 upon completion of the interview.

There is a very good chance of winning the drawing with a pool of approximately 100 volunteers.

Confidentiality: Information obtained in this study is strictly confidential and will be kept stored in the private office of the researcher. No personal information will be used in the research report. Each volunteer will be assigned a study number, and this number, rather than your name, will be recorded on the questionnaires that you receive. Your anonymity and confidentiality will be protected.
Participant's Right to Withdraw from the Study: You may choose to stop participation in this research study at any time. If you volunteer and later choose not to participate, please inform the researcher immediately.

Voluntary Consent by Participant: Participation in this research project is voluntary, and your consent is required before you can participate in the research study.

I have read the preceding consent form and I fully understand the contents of this document and voluntarily consent to participate. All of my questions concerning the research have been answered. I hereby agree to participate in this research study. If I have any questions in the future about this study, I can contact Ron Critchfield. A copy of this form will be returned to you with the first questionnaire.

Participant's signature:_____________________  Date:___________  Subject ID number:_____________
Appendix G

Subject Information Sheet

Volunteer Information for Critchfield Information Literacy Questionnaire

Ron Critchfield, Assistant Professor, Warner Southern College, 13895 U.S. Highway 27, Lake Wales, FL 33859. Telephone: 863-638-7654. E-mail: critchfieldr@warner.edu.

The study is field research for a Ph.D. dissertation in Information Science

THE FOLLOWING INFORMATION IS REQUIRED.
All information is kept confidential.

PLEASE PRINT

Name of volunteer: ________________________________

Subject ID number: ________________________________

Local address: ____________________________________
_________________________________________________________________________
_________________________________________________________________________

Telephone number: Area Code: (_______)______________
(please indicate if the number is a cell phone)

Warner e-mail address: ______________________________

What is your age? ______
(for data grouping purposes)
What is your sex? Female  Male
(for data grouping purposes)

Please circle one: I am a: Freshman  Sophomore  Junior  Senior
(for data grouping purposes)
Appendix H

Information Literacy Indicator (version 2)

**Directions:** At one sitting, please respond to the following items by marking the appropriate selection with either a ✓ or an X in the corresponding square. Start time:______  End time:______  Identification Number_________

**Response Legend:**
- Always = means that I do this all the time and fully understand the concept.
- Often = means that I do this frequently and understand the concept fairly well.
- Seldom = means that I have done this but I am unclear about the concept.
- Never = means that I have not done this and do not understand the concept.
- Not applicable (NA) = means that this does not apply to me (I have not been in such a scenario).

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1. When preparing for a research paper I talk with the teacher and/or other students to get a better idea about the topic and assignment.

When searching for information to do a research paper: (Items 2-7)

2. I decide ahead of time what types of information I need such as books, articles, images, or other types.
3. I decide ahead of time how much information I need.
4. I decide ahead of time on a specific area of the topic to research.
5. I begin by looking for information that will help expand my initial idea.
6. I read subject dictionary and/or encyclopedia articles in order to increase my familiarity with a topic and develop a better understanding of what information I will need.
7. I identify key concepts and terms that will guide my research.
8. When using information for a research paper, I realize that my own thoughts can be combined with the information to produce new thoughts on the topic.

When identifying possible sources to use in a research paper: (Items 9-17)

9. I realize that information in the library is organized into subject areas.
10. I realize that information found in scholarly journals is more thoroughly reviewed, critiqued, and edited than the information found in magazines.
When identifying possible sources to use in a research paper: (Items 9-17)

11. I realize that the information found in scholarly journals is for an academic audience.
12. I realize that the information found in magazine articles is for a popular, more general audience.
13. I realize that there are a variety of possible formats for potential sources (including, among others, print, electronic, images, audio, and video).
14. I realize that some formats will be better to use for the topic than other formats.
15. I realize that different sources will have different perspectives on the topic.
16. I realize a primary source is a source that provides words of the witnesses or the first recorders of an event or work of literature.
17. I realize a secondary source is a source that discusses another person’s work.

When looking for information for a research paper: (Items 18-21)

18. I develop a timetable within which to gather all of the needed resources.
19. I give myself sufficient time to acquire information in advance of when it is needed.
20. I will seek needed sources outside my library through inter-library loan of books and articles.
21. I realize a fee may be involved when seeking sources through inter-library loan that are not owned by my library.

After finding information for a research paper: (Items 22-24)

22. I realize I may have to revise my topic depending upon the amount of sources found.
23. I realize I may have to refine my topic by narrowing it if sources lead me to understand that my topic is too broad.
24. I realize I may have to refine my topic by broadening it if sources lead me to understand that my topic is too narrow.

When looking for information for a research paper: (Items 25-34)

25. I take into consideration the requirements of the assignment as indicated by the teacher and decide how much information is needed based on them.
When looking for information for a research paper: (Items 25-33)

26. I realize there are a variety of investigative methods to gather information such as experiments, surveys, field observations, and literature reviews.  

27. I decide ahead of time the most appropriate investigative method for my topic.  

28. I realize there are many information retrieval systems, such as periodical indexes (citations for articles in journals, magazines, newspapers, etc), the online book catalog, and various subject-specific full-text databases, to assist in locating information.  

29. I learn about the coverage dates of the information provided by various information retrieval systems available to me in order to see if the dates are appropriate for finding information on my topic.  

30. I learn about the possible locations of the information covered by various information retrieval systems available to me.  

31. I learn about the type of content (for example, full-text articles or bibliographic citations) provided by various information retrieval systems available to me.  

32. I look for periodical indexes and other subject-specific information retrieval systems that are appropriate to my topic.  

33. I learn how to efficiently and effectively use the appropriate information retrieval systems.  

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When searching information retrieval systems: (Items 34-49)

34. I develop a plan to follow while searching.  

35. I determine key words, based on my topic, to use in searching.  

36. I identify and search for synonyms and/or other terms related to the key words previously used to search on my topic.  

37. I make an effort to assist my searching by reading general resources such as dictionary and/or encyclopedia articles to better understand the terminology of the subject area of my topic.  

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When searching information retrieval systems: (Items 35-50)

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38. I use subject search options to find information on my topic.

39. I realize I can use truncation (or shortcuts) in my searches to locate various forms of a root word or word fragment (for example, king* will search for words starting with king to find king, kings, kingship, kingdom, etc.).

40. I use search statements containing Boolean operators (relational search logic) such as AND, OR, and NOT (for example, "dog AND cat", "cat OR dog", "cat NOT dog").

41. I realize a search statement using the Boolean operator AND limits results by retrieving items containing all search terms (for example, "dog AND cat" will return items that have both the words "dog" and "cat" in them).

42. I realize a search statement using the Boolean operator OR expands results by retrieving items containing any of the search terms (for example, "dog OR cat" will return items that have either the word "dog" or the word "cat" in them).

43. I realize a search statement using the Boolean operator NOT excludes a term or phrase by retrieving items that do not contain the search terms that follow the operator (for example, "cat NOT dog" will return items that have the word "cat" in them but do not contain the word "dog").

44. I realize I may be able to combine Boolean search statements, called nesting, to perform more advanced searches (for example, "(cat AND dog) NOT poodle" will return items that have both the words "cat" and "dog" in them but do not contain the word "poodle").

45. I realize I may be able to search using proximity (location search logic) operators to find terms within a specific distance of each other (for example, "food(N)fish" is a statement seeking items where food and fish are near (N) to each other with no words between then resulting in the return of items that have either "food fish" or "fish food" in their records.).

46. I realize I should search the title field when I know the title of a book and need to locate it.

47. I realize I should search the author field when I know the author of a book and need to locate it.
When searching information retrieval systems:
(Items 35-50)

48. I realize I should search the subject field when I know the subject of books I need to locate.
49. I browse items on the same subject to locate books I need for my topic.
50. If I need more information for my research paper after searching one information retrieval system, I then use the same search strategies with another information retrieval system in order to access more information.
51. When searching on more than one information retrieval system, I realize each system may have a different interface and that I may have to modify my search statements for each system.

When gathering information for a research paper:
(Items 52-62)

52. I realize I should not gather all my information from Internet sources only (i.e., non-academic and/or databases not available online through the library) unless instructed to do so by the teacher.
53. I access information from any format, Internet, books, articles, or other format, as long as it is appropriate to my topic.
54. I would recognize the format of the item in the following citation to be a journal article:
55. I would recognize the format of the item in the following citation to be a book:
56. I recognize the format of an item found on the World Wide Web because its citation includes a Uniform Resource Locator (URL, or web address: http://www.warner.edu).
57. I would recognize the format of the item in the following citation to be a journal article accessible online:

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When gathering information for a research paper: (Items 53-63)

58. I understand how to locate journal and/or magazine articles using periodical indexes.

59. I understand that the following is a Library of Congress call number: RC954 .G4735 2000.

60. I understand the location of and importance of noting the author, article title, title of the periodical, date, volume number, issue number and page numbers when using a periodical index [A periodical index entry might look something like this: Lazar, Bonnie A.; Why social work should care: Television violence and children. / (In Child & Adolescent Social Work Journal 1994 Feb Vol. 11 (1) 3-19)].

61. I identify information on my topic that is not located in my library.

62. I take advantage of one or more available library services to assist in finding and/or retrieving information (for example, reference librarian help, arranged contact with experts on the subject, inter-library loan, et cetera).

When searching for information: (Items 63-67)

63. I revise my search strategy as many times as necessary in order to get the best possible results.

64. I realize that if too many items are returned I need to revise my search strategy to gain a more manageable number of items.

65. I realize that if too few items are returned I need to revise my search strategy to gain a greater number of items.

66. I realize that if I receive unwanted items (for example, magazine articles when I want journal articles, secondary sources when I want primary sources, unknown authors when I want authors known to me, etc.) I need to revise my search strategy to find the wanted items.

67. I realize that if too few items are relevant to my information need (for example, items are too old, or items are not specific enough, or items are too broad, or items are in a different language than needed, etc.) I must revise my search strategy to gain a greater number of relevant items.
68. When searching for information to write a research paper, I realize it is usually not the best strategy to search only one information retrieval system and use whatever results I retrieve—unless instructed to do so by the teacher.

69. After searching one information retrieval system for information on my topic, I realize there may be gaps in the information I retrieved and make certain to search more than one information retrieval system.

70. When I retrieve information I organize items in a meaningful way rather than keeping items in random order.

71. When I retrieve information I understand that different disciplines will use different citation styles (for example, scholars of literature use the MLA citation style while scholars of information science use the APA citation style).

72. When I retrieve information I know how to write a proper bibliographic citation for an item based on an accepted citation style, such as MLA or APA.

73. When I retrieve information from a computer-based information retrieval system, I understand how to save information to a disk or e-mail it to myself.

74. When I retrieve information from an Internet source, I understand how to save information to a disk or e-mail it to myself.

75. When I retrieve information from an Internet source, I understand how to copy and paste information into another document.

76. When I retrieve information from an information retrieval system, I know how to determine whether the material is available in the library or if I must locate the material elsewhere.

77. When I retrieve information from a bibliography, I know the difference between a citation for a periodical article and a citation for a book.

78. When conducting research, I write down, or record in some way, citation information I come across for relevant items so that I may search for these items at a later time.

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When reading information for a research paper: (Items 79-84)
79. I make notes and/or highlight the main ideas found in the text.
80. I identify material that would be appropriate to quote directly in my paper.
81. I paraphrase important concepts in my own words.
82. I recognize main ideas found in the text.
83. I utilize main ideas to provide supporting evidence for my topic.
84. I utilize the interrelationship of main ideas within one source, or multiple sources, to develop new ideas.

When examining information for a research paper: (Items 85-95)
85. I evaluate the authority of its source (for example the journal it came from, or the affiliation of the author, or the organization behind the Web site it came from, etc.) rather than simply taking information at face value.
86. I evaluate the authority of its author by determining her or his qualifications and credentials in some manner.
87. I evaluate the accuracy of its content by also reading sources cited in its bibliography.
88. I evaluate the timeliness of the information by learning its publication date.
89. I realize information may contain certain biases towards one perspective or another.
90. I note any particular points of view I find in the information.
91. I note my personal opinions about the structure and logic of the arguments presented in the information.
92. I recognize that information in any format will contain a certain point of view.
93. I realize the creation of information is accomplished within many contexts such as historical, cultural, and/or geographical.
94. I consider the impact various contexts, such as historical, cultural, and/or geographical, might have on the perspectives presented in the information.
95. I consider the time in history when the information was written and its appropriateness for my topic.
When reading information for a research paper:  
(Items 96-106)

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During the process of writing a research paper:  
(Items 108-109)

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**After writing a research paper: (Items 110-111)**

110. I can apply the knowledge learned to produce topic outlines and/or topic presentations as assigned by the teacher.

111. I am able to transfer the knowledge learned into a digital format presentation such as a PowerPoint presentation and/or Web-based presentation.

**When presenting my research information: (Items 112-114)**

112. I use information technology to prepare my presentation.

113. I am comfortable communicating what I have learned.

114. I receive feedback from the teacher indicating satisfaction in my effective presentation of the information.

**During the research process: (Items 115-118)**

115. I realize that results from free Internet search engines, such as Google, may not always lead me to credible sources of information as often as the search results will from subscription/fee-based information retrieval systems provided by the library/school.

116. I realize that online access to current, print-based journals and magazines is usually only possible through fee or subscription based Web databases paid for by my library/school for me to use.

117. I understand that in the United States the protection of freedom of speech results in a variety of perspectives found in information.

118. I understand that because of the protection of freedom of speech in the United States, ideas are not censored from the information we can access.

**When using information in my research paper: (Items 119-122)**

119. I understand that the work of another author is intellectual property since it was a product of the author's intellect.

120. I understand that the work of another author must be properly cited in my paper acknowledging my use of the intellectual property.

121. I realize it is stealing to use the work of another person in my research paper and not properly acknowledge the author to give her or him credit for the work.

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When using information in my research paper:
(Items 119-122)

122. I understand that a legal device to allow an author to safeguard intellectual property is the establishment of a copyright for an item.

123. When writing a research paper, I realize that the fair use rule of copyright law allows me to quote a short passage of an author's work with proper citation.

124. When documenting information sources in my paper, I realize I should follow only one documentation style to keep my work consistent.

125. When searching for information, I use approved passwords and/or approved forms of identification to gain access to information retrieval systems.

126. When using information resources provided by my institution, I follow the policies set forth by the library/school.

127. When using information resources provided by my institution, I do not intentionally change anything on the computer systems.

128. When obtaining information, including software, I legally obtain items either through free resources, resources provided by my library/school, or by purchasing items.

129. I realize that downloading and/or distributing copyrighted music without paying for it, through Internet file-sharing systems such as Kazaa, is an illegal act.
Reference List


