The Assessment of Information Literacy: A Case Study

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Abstract

This study presents an investigation of information literacy as defined by the ETS iSkills™ assessment and by the New Jersey Institute of Technology (NJIT) Information Literacy Scale (ILS). As two related but distinct measures, both iSkills and the ILS were used with undergraduate students at NJIT during the spring 2006 semester. Undergraduate students ($n =$ 331), first through senior years, took the iSkills and submitted portfolios to be judged by the ILS. First-year students took the Core iSkills assessment, which was designed to provide administrators and faculty with an understanding of the information and communication technology (ICT) literacy of a student doing entry-level coursework ($n = 155$). Upper classmen took the more difficult Advanced iSkills assessment, appropriate for rising juniors ($n = 176$). Across all class levels, iSkills scores varied as expected. First-year basic skills writing students performed at lower levels than first-year students enrolled in traditional composition and cultural history courses; seniors performed at higher levels than sophomores and juniors. Because the NJIT ILS scores were designed to be curriculum sensitive, portfolio scores did not similarly follow grade levels. Analyses revealed weak correlations between portfolio and Core iSkills scores and moderate correlations between portfolio and Advanced iSkills scores. As two associated yet distinct systems of inquiry designed to explore undergraduate student performance, the ETS iSkills assessment and the NJIT ILS—taken both individually and together—yield important information regarding student performance.

Key words: Information literacy, portfolio assessment, performance assessment, information technology, writing assessment, construct validity

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Background: The ETS/ New Jersey Institute of Technology (NJIT) Collaboration

In the fall of 2004, librarians and faculty at New Jersey Institute of Technology (NJIT) began a formal investigation of the information literacy skills of undergraduate students. Working with specialists in research and information literacy at the university's Robert Van Houten Library, instructors in the department of humanities worked to design an information literacy model based on standards derived from the Association of College & Research Libraries (ACRL). In that the faculty had been assessing the writing skills of students enrolled in general undergraduate requirements (GUR) in humanities since 1996, a traditional portfolio assessment system had emerged that allowed reliable and valid programmatic information to be gained about student writing (Elliot, Briller, & Joshi, 2007). A new portfolio assessment system launched in spring 2005—termed the NJIT Information Literacy Scale (ILS)—shifted the assessment focus from writing to information literacy assessment (Scharf, Elliot, Huey, Briller, & Joshi, 2007). While allowing similarly strong validity evidence to be warranted as the original portfolio system, the information literacy scores were lower than anticipated. Instructional and library faculty were interested in learning more about the information literacy skills of their students.

In fall 2005, NJIT and ETS undertook a collaborative research agreement to investigate more fully—by means of multiple approaches—the variables of information literacy as they were evidenced within student performance at a public comprehensive technological university. The collaboration was designed to provide insight into the following questions:

- What kind of validity evidence based on the construct of information literacy could be warranted from an analysis of the student scores on the ETS iSkills™ assessment and the NJIT ILS? While the concept of the ETS iSkills assessment focuses on information and communication technology (ICT) literacy, the NJIT ILS focuses on the kinds of information literacy skills needed for proficiency in writing research papers in the humanities. The relationship between the concepts of the two assessments—both critical in nature yet differently articulated within a higher education environment—is unknown.

- What kinds of evidence could be warranted based on the relationship of the two measures of information literacy to other variables? If the ETS iSkills assessment and the NJIT ILS posited associations that were congruent yet distinct, as we hypothesized, the relationships between these measures and general academic measures (course grade,

grade point average [GPA], and scores on the College Board's SAT® Math [SAT-M] and SAT Verbal [SAT-V] assessments) refine our understanding of the discrimination between ICT literacy and NJIT's concept of information literacy in the humanities.

- Based on the consequences of the release of the scores and the consequences of the collaboration itself, what kinds of evidence could be warranted to describe the impact of the ETS and NJIT collaboration upon the NJIT community? While the impact of various kinds of portfolio scoring at NJIT had been demonstrated—both internally to the institution (e.g., New Jersey Institute of Technology, 2007, pp. 53–54) and externally to a national community (e.g., Coppola & Elliot, 2007)—the impact of an assessment system using a nationally developed assessment of information literacy and a locally developed assessment of that construct is unknown.

The American Educational Research Association, the American Psychological Association, and the National Council on Measurement in Education (1999) provide a meaningful heuristic to the process of validation in *Standards for Educational and Psychological Testing*. By reflecting on the construct at hand, examining the relationship of the construct to other variables, and documenting the consequences of the assessment activity, we offer the following case study as a heuristic by which the concept of information literacy may be more fully understood.

Theoretical Grounding

The Information and Communication Technology (ICT) Literacy Framework

Predating the collaboration described in this case study, ETS convened an international panel in 2001 to study current and emerging information and communication technologies and their relationship to critical cognitive skills (International ICT Literacy Panel, 2002). Understanding that information and communication technologies cannot be defined as the mastery of technical skills, the international panel concluded that the cognitive skills involved in information literacy included general literacy (reading and numeracy), critical thinking, and problem solving. Subsequent to identifying a need for a measure of ICT literacy, the panel worked to develop a framework for that literacy. A consortium of seven college and university systems worked with ETS to tailor this ICT literacy framework to the needs of higher education, refining the intended construct in the process. Over a 2-year period, consortium members and other

institutions collaborated in the design, development, and testing of the iSkills assessment of ICT literacy.

Conceptual definition of ICT literacy. The definition of ICT literacy adopted by the consortium members reflects this comprehensive view of information literacy:

> ICT literacy is the ability to appropriately use digital technology, communication tools, and/or networks to solve information problems in order to function in an information society. This includes having the ability to use information as a tool to research, organize, and communicate information and having a fundamental understanding of the ethical/legal issues surrounding accessing and using information. (Katz et al., 2004, p. 7)

Content domain of the iSkills assessment. Consortium members further refined and deepened this construct, identifying seven performance areas (Katz, 2007): definition (using ICT tools to identify and appropriately represent an information need), access (collecting and retrieving information in digital environments), evaluation (determining the degree to which digital information satisfies the needs of the task in ICT environments), management (applying an existing organizational or classification scheme for digital information), integration (interpreting and representing digital information), creation (generating information by adapting, applying, designing, or inventing information in ICT environments), and communication (sharing information properly in its contexts of use for ICT environments).

Research regarding the skills required to use ICT tools to define an information need and to access information has revealed that both disciplinary expertise and general search expertise affect how a person searches for information. Actions taken by both domain and search experts in accessing information are associated with efficient and productive patterns. Experts take less time and fewer actions to locate relevant information, for instance, and less time to complete successfully the information-seeking task (Downing, Moore, & Brown, 2005; Lazonder, Beimans, & Wopereis, 2000). Search experts are more likely than novices to look over results before moving on (Hsieh-Yee, 1993) and choose target documents for closer inspection (Hölscher & Strube, 2000). The search refinement strategies of domain and Web novices, conversely, are associated with patterns of inefficiency, and these search patterns are often redundant with only minor strategic changes made from one query to the next (Hembrooke, Granka, Gay, & Liddy, 2005; Hölscher & Strube, 2000). In addition, novice searchers waste significantly more time navigating and backtracking than do experts (Hölscher & Strube, 2000; Luconi & Tabatabai, 1999; Tabatabai

& Shore, 2005). Search expertise and domain knowledge each make a unique contribution to the ways in which people seek information.

Much research on information literacy has focused attention on the ways and extent to which information is evaluated. A number of factors may be considered in information evaluation, including trustworthiness, relevance, currency, accuracy, objectivity, sufficiency, resource type, and ethical use. Empirical studies cited by Rieh (2002) demonstrate that cognitive authority and information quality are important standards of judgment that experts use in evaluating the usefulness of information. Interviews, verbal protocols during searches, and search logs of a small yet diverse group of scholars documented the consideration of trustworthiness, reliability, scholarliness, credibility, and authority when judging information sources (Rieh, 2002).

Studies of novice users, however, reveal a lack of such judgmental standards. In a survey of 1,050 college students who use the Internet, only 4% of respondents felt that the quality of the information they found through Web searches was not of sufficient quality for their school assignments; half of all students surveyed, however, believed strongly that the information on the Web was indeed acceptable for school assignments. Almost two-thirds of students believed that the range of resources on the Web was adequate for their needs (OCLC Online Computer Library Center, 2002). Confirming such a lack of judgmental standards, Hepworth (1999) posited that only minimal student knowledge existed regarding the differing value of various sources of information.

Managing abundant information is often noted as a challenge in today's information-rich society. The field of human–computer interaction is a recognized source of empirical research regarding the application of existing organizational schemes on artifacts of digitally transmitted information such as e-mails and electronic files. Research regarding the strategies by which professionals and students save e-mail folders, for example, reveals that such digital information, once archived into the computer for a long time, is rarely archived out (Boardman & Sasse, 2004; Lantz, 1998). Such high volume of e-mails subsequently leads to excess clutter that makes e-mail difficult to manage, organize, and locate (Boardman & Sasse, 2004; Lantz, 1998). In a relational study, Lantz identified a significant correlation (0.72) between the number of messages that employees store in their inbox and problems managing e-mail. Research on information management behavior can also provide insight into information management patterns. Bondarenko and Janssen (2005) concluded that documents related to administrative activities are easier to categorize than those related to research. While administrative activities that have a precise

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function (e.g., preparing for a meeting at the end of the week) remain relevant for a much shorter period of time, research documents encompass more variety and thus remain active for a longer period of time. Human–computer interaction studies have much to contribute to an understanding of storage and organizational patterns within ICT environments.

As a skill needed for information literacy, integration has received little empirical attention. Integration, an act of bringing together potentially disparate pieces of information from different sources containing different information formats, is the mediating function between creation and communication. Insight into the little studied but complex nature of integrative acts is seen in a study by Jones, Bruce, and Dumais (2001) on the shortcomings of bookmarking as a means of storing information. While two tools provided by the Web browser (history and bookmarking) were among the least frequently used methods for saving Web information, other methods were found to be more logical choices for integrating information. Techniques such as printing the Web page guarantees persistence of information, strategies such as saving the Web page itself as a file guarantees preservation of information in its current state, and simply pasting the Web address into an e-mail or word processing document with a short description allows for establishment of a context. Such varied practices allow integration into an existing organizational scheme and yield ease in sharing information.

The literature of composition studies reveals much about the creation and communication of information. Sheehy (2003) examined two competitive forces in an analysis of student work. Students were instructed to present an argument to the school board against closing their school, and the researcher collected audio-taped classroom and group discussions, student writing, and the texts from which students drew their information. In her 8-week study, Sheehy found that that the students were informed by their perceived knowledge of audience, even though they received standardized instructions of task assignment given by the teacher. Reviewing this research, Beach and Friedrich (2006) noted that the study demonstrates the importance of perceptions about audience knowledge and beliefs in fulfilling communicative tasks. As Nelson (2008) has noted, social cognition—the ability to consider perspectives of others and to make assumptions about what they will gain from reading—is key to the communicative process (Bonk, 1990; Rubin, 1984). When Kroll (1984) asked participants of various ages to revise their texts to serve the needs of particular audiences, he identified distinct differences in the ability of older participants to reduce the level of lexical and syntactic complexity for young readers. It appears, as Nelson

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suggests, that developmental differences in social cognition may be evidenced in the ability to adapt a text to a given audience (Kroll, 1984, p. 439). Such research supports the iSkills assessment's inclusion of such tasks as creating presentation slides to support a position (an act of creation) and transforming a document to make it more useful to a particular group (an act of communication).

Administration of the iSkills assessment. The ETS iSkills assessment is an Internet-delivered assessment. In that the assessment focuses on cognitive problem-solving and critical thinking skills associated with using technology to handle information, the scoring algorithms target cognitive decision making rather than technical competencies. Assessment administration takes approximately 75 minutes, divided into two sections lasting 35 and 40 minutes, respectively. During this time, students respond to 15 interactive tasks that are performance-based. Each interactive task presents a real-world scenario, such as a class or work assignment, that frames the information task. Students solve the tasks in the context of a simulation (for example, e-mail, Web browser, or library database) having the look and feel of typical applications. In the assessment, for example, students might encounter a scenario requiring the use of a search engine to access information from a database. The results are tracked and strategies scored based on how well the students search for information, such as key words chosen and refinement of search strategies, and how well the information returned meets the demands of the task. As a scenario-based assessment, students become engaged in the world of the tasks—themselves representative of the types of ICT literacy assignments students should be seeing in their coursework. As a simulation, task-based assessment, the iSkills assessment purports to elicit higher-order critical thinking and problem-solving skills. Katz (2007) provided further details on the assessment, including its development and field testing.

The iSkills assessment has two versions, Core and Advanced. The Core iSkills assessment was designed for students entering higher education, such as college freshmen. The Advanced iSkills assessment was designed for students moving to upper level coursework, such as sophomores and juniors. Identical in structure, general content, and assessment approach, the Core and Advanced assessment tasks differ in their complexity. Core tasks were designed to be easier, with lower reading loads, more straightforward task instructions, and fewer options than Advanced tasks. In the present study, first-year students took the Core iSkills assessment and second year and higher students took the Advanced iSkills assessment.

The NJIT Information Literacy Scale (ILS)

It is the social and cognitive aspects of written communication, reflecting critical thinking and problem-solving ability, that are under investigation in the student portfolios required by the NJIT Department of Humanities. Indeed, these portfolios serve as the vehicles that capture the information literacy skills of NJIT undergraduate students as that ability is socially formed and cognitively tasked to exhibit critical reflection and problem exposition within courses.

The literature of composition studies provides the research background for the definition of information literacy employed by NJIT. In her social cognitive theory of writing, Flower (1994) emphasized a model in which readers and writers construct meaning within a three-fold context of social and cultural information, of language processes, and of discourse conventions. Such a broad, outer circle of influence is informed by a more immediate circle of general purposes, specific goals, and activated knowledge linked to the task at hand. These public and situational contexts must also be understood as intertwined with an individual's personal cognitive constructs, those individualized contours of thought that shape the act of meaning making. The mental representations—the webs of meaning that writers construct—reveal the complex interactions of forces often in conflict. As well, Flower identifies individual metacognitive awareness through which individuals may, or may not, be aware of their own constructive processes. For Flower, meaning is created and communicated through reproduction, conversation, and communication. In her interviews and protocol analyses of college-age writers, Flower focuses on ways to teach the strategic acquisition of knowledge. Her research informs our understanding of the complex social and cognitive processes that influence the construction of literate acts. Methods for analyzing students' texts, such as rhetorical structure theory (RSA; Mann & Thompson, 1988), and procedures for incremental structure analysis (PSIA; Sanders & Van Wijk, 1996) also hold promise to reveal detailed information about the cognitive dimensions of writing (Sanders & Schilperood, 2006).

Conceptual definition of writing. Within the NJIT Department of Humanities, we have adopted a definition of writing given by Camp (1996): "a rich, multifaceted, meaning-making activity that occurs over time and in a social context, an activity that varies with purpose, situation, and audience and is improved by reflection on the written product and on the strategies used in creating it" (p. 135). We have expanded that definition as follows:

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Writing is an act of critical thinking that extends beyond summary into persuasion, an act that improves with drafting and is best when informed by the voices of others, an act that is interrelated with demands of informal and formal oral presentation and that is often undertaken in collaboration with fellow writers. (Elliot et al., 2007)

Conceptual definition of information literacy. This definition of writing is taken as the construct domain that has been assessed at NJIT since 1996. The definition of information literacy, understood as a set of behaviors included as part of the construct of writing, was formed by librarians and instructional faculty in spring 2005:

Within the Department of Humanities at NJIT, information literacy is the ability to demonstrate that a coherent, planned intellectual framework has been used to identify, find, understand, and use information in drafting, revising, and finalizing researched, persuasive writing (Scharf et al., 2007).

Content domain of the NJIT ILS. The NJIT definition of information literacy was and remains based on the definition of information literacy offered by the Middle States Commission on Higher Education (MSCHE; Middle States Commission on Higher Education, 2006). Because the portfolios exist within a specific institutional site and because the GUR impacted the entire undergraduate curriculum at NJIT, instructors wanted to address competency issues associated with accreditation. Addressing the goals of information literacy as established by the ACRL and embraced by the MSCHE was of paramount importance. To meet such demands, librarians and faculty members further refined and deepened this construct, identifying four performance areas to be used in the assessment of information literacy within student portfolios: citation (the ability to cite sources so that information may be identified without undue burden), evidence of independent research (the use of information beyond the syllabus), appropriateness (the use of sources germane to the topic), and integration (the use of sources marbled into the development of ideas). These four component variables thus became the NJIT ILS. As component variables, these four characteristics of information literacy were associated with an overall information literacy portfolio score (a holistic impression of research competency).

In previous assessment work by humanities faculty at NJIT, the citation variable was judged as the ability of students to properly cite their sources according to the style of the Modern Language Association or the American Psychological Association. The meaning of this component

variable was expanded for information literacy study. Because citing sources so they could be found was more important than strict adherence to a standard citation style, evidence of a student's sense of a retrievable reference suggested that the student understood the particular attributes of a source. Such evidence addressed the *Information Literacy Competency Standards for Higher Education* developed by the ACRL (2002) as Performance Outcomes 2.5, c and d. Competence would be exhibited if students differentiated between types of sources and included all pertinent information in the varying cases so that sources could be retrieved by a reader without undue burden.

Regarding the importance of independent research, NJIT instructional faculty felt that it was important that student papers provided evidence that research had been conducted extending beyond the syllabus (and sources) recommended by the instructor. Papers with little variety of sources in scope, subject, and format were unlikely to have been well researched by the student. Conversely, if the student sought ideas from a variety of additional sources to become truly informed about the topic at hand, evidence would be present that ACRL Standards 1 and 2 were being addressed.

To investigate appropriateness, NJIT instructors sought to determine if students chose sources that were not only relevant, but that also had a high probability of being accurate and authoritative. If so, the students would be addressing ACRL Standards 1, 3, and 4 and the standards' emphasis that information-literate students should be required to evaluate information and sources critically and to incorporate selected information into an information base and value system.

With the most complex variable—that of integration—instructional faculty sought to determine if sources were truly integrated into the portfolio papers. To judge the work against ACRL Standards 3 and 4, the readers were asked to evaluate the student's arguments and ideas. Realizing that a citation may be merely cosmetic in nature, faculty sought evidence of integration that included the use of concepts from outside sources to build a foundation and compare, contrast, and refute arguments. The use of in-text citations was thus linked to concepts and arguments used to provide further evidence. Faculty sought to investigate the degree to which a student was able not only to summarize the main ideas from sources consulted (ACRL Performance Indicator 3.1), but also to synthesize ideas to construct new concepts (ACRL Performance Indicator 3.3). To meet Standard 4—to use "information effectively to accomplish a specific purpose"—the sources cited

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had to have been used reflectively in the paper. If a student was able to use outside information as part of the knowledge base on which the writing in the portfolio was developed, it would be clear that ACRL Performance Indicator 4.1 was being addressed.

Administration of the NJIT ILS. Unlike the detailed, time-intensive methods undertaken in RSA and PSIA analysis, the NJIT effort is designed to allow all instructors teaching undergraduate courses to come together each semester and, within less than 3 hours, reliably evaluate the work of a representative number of students by the methods described below.

The NJIT ILS assessment is used within a program assessment environment. Within a planned sequence of assessment episodes each semester, evidence is gathered about the performance of students in different undergraduate cohorts. The spring 2006 assessment described in this study was devoted to the assessment of information literacy by the two methods herein described. Because the individual instructor's grade is not an influence in the assessment process—indeed, portfolio scoring takes place after final grades are given—the NJIT assessment program avoids the consequential issues encountered within an environment of high-stakes testing. Assessments always take place face-to-face, usually in a morning or afternoon. In that the majority of the instructors are employed full-time, the assessment environment is always collegial; all involved realize that they are present to learn more about the abilities of their students, critical shareholders whom they will very likely encounter again in subsequent semesters.

During the assessment period, trained instructors evaluate student portfolios, artifacts capturing the work completed in a 15-week semester. Within the portfolio are contained a variety of documents, depending on the cohort and instructor: annotated planning bibliographies, proposals for research projects, drafts of various writing tasks, evidence of collaborative work, and researched final documents. With the courses in technical writing, the documents may be contained in a student-designed Web site, the site itself designed according to audience-based usability principles. Common to all aspects of the undergraduate curriculum is the emphasis on persuasion. While no claim can be made that the Toulmin (2003) model is universally adopted, various strategies of warranting evidence are common elements across the NJIT undergraduate humanities curriculum.

Differences in the iSkills and the ILS assessments. While the NJIT ILS was informed by a literature review similar to that which informed the ETS ICT literacy framework, the purpose of the NJIT assessment differs in two ways from the iSkills assessment. First, within the specific

institutional site, humanities instructors were interested in the variables of information literacy as they were articulated within the undergraduate curriculum. As such, the NJIT ILS focused on written products—the researched, persuasive documents contained in portfolios. Unlike the iSkills assessment, the NJIT assessment does not therefore account for the process by which students completed their classroom writing assignments. Second, because students take humanities GUR courses from first through senior years, instructors realized that they were capable of investigating differences within levels—but not across levels—of the offered curriculum. Instructors realized authentic and comprehensive assessments—"ideally constructed to examine how much students have *grown* during the college experience"—were needed (Ewell, 2006). Yet because course content differed from the first to the senior years, the NJIT assessment focused on the context in which the portfolios emerged; hence the portfolio scores were not designed to follow grade level but, instead, were designed to reveal performance of students in the humanities classes in which they were enrolled.

The present case study of NJIT undergraduate students thus allowed investigation of the way that students defined, accessed, managed, integrated, evaluated, created, and communicated information in the broad context of information literacy, a task that is often (though not always) executed within a set time frame reflective of the 75-minute assessment. As well, the case study allowed investigation into the effectiveness with which students cited sources, launched independent research, employed appropriate sources, and integrated their ideas with the ideas of others, a task that is often (though not always) executed within a set time frame reflective of the duration of a semester course. In some instances, we hypothesized we would identify congruence between the two assessment methods; in other instances, valuable discriminant evidence on the different aspects of information literacy captured by the two measures would be identified. Such evidence could be used in planning future instruction and assessment of NJIT undergraduate students.

Method

Participants

Late March, April, and early May of 2006 provided an ideal occasion for the administration of the iSkills assessment. Planning the assessment to follow a traditional withdrawal date in the third week of March, the researchers believed that the NJIT students remaining in undergraduate classes were those most committed to successful completion of the class. In addition, the five

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student cohorts of the study—writing students (first year), cultural history students (first year), cultural history (second and third year), technical writing students (third and fourth year), and senior seminar students (third and fourth year)—allowed a comprehensive representation of NJIT undergraduate students. Because students from each of the cohorts were required to submit portfolios at the end of the semester to their instructors, students whose portfolios were targeted for submission would also take the appropriate version of the iSkills assessment.

A simple random sample of students was created across each section of all but the senior seminars (for which all students were selected as described below), and students were identified for portfolio submission. Students who were unable or declined to take the iSkills assessment were replaced with other randomly selected students (who, in turn, were then identified for portfolio submission). Students who did not submit portfolios for any reason or who submitted portfolios with no work suitable for the NJIT ILS rubric (i.e., no researched documents) were excluded from analyses. The senior seminar students consisted of a census of all whose transcripts revealed that they had never taken any course outside of NJIT; hence, these students, while small in number, represented a meaningful population of NJIT students.

First-year students were found in first-year writing courses ($n = 110$) and in cultural history courses ($n = 45$). These first-year students all took the Core iSkills assessment. Students taking the Advanced iSkills assessment were also found in cultural history ($n = 95$), as well as in technical writing ($n = 48$) and the senior seminars ($n = 33$).

The sampling plan design closely matched the NJIT student population. For example, among the first-year students for whom SAT scores were available, the overall average SAT-M and SAT-V scores for the entire first-year class (SAT-M = 588, SAT-V = 525) were comparable to that of the tested population (SAT-M = 578, SAT-V = 509). The gender of the first-year sample (85% male) was similarly representative of all first-year NJIT students (83% male). The first-year sample was also comparable to all first-year NJIT students on the basis of ethnicity: 13% versus 11% African-American students, 35% versus 37% Caucasian students, and 16% versus 15% Hispanic students. Asian students were slightly overrepresented in the first-year sample (23% versus 18% overall). The remaining students comprise those of other races or those who declined to answer the ethnicity question.

Procedure

In late March 2006, researchers contacted and provided instructors in each of the four cohorts with a list of their students who were to take the ETS iSkills assessment and submit portfolios for the NJIT ILS. A member of the NJIT research team then met the students in their classroom and escorted them to secure computers in the NJIT Robert Van Houten Library. To ensure the integrity of iSkills assessment scores, research team members proctored the test-taking sessions.

In May 2006, portfolios of targeted students enrolled in first-year writing, cultural history, and the senior seminars were evaluated according to each of the variables in the NJIT ILS. Because students in the technical writing courses were evaluated by means of variables related to that course's content (Johnson, 2006), only two NJIT ILS variables were evaluated in that cohort: citation and evidence of research.

Portfolio Scoring and Interrater Reliability

While the administration of the iSkills assessment required careful planning, scoring was computer based and, thus, efficient. While execution of the sampling plan for the NJIT portfolio assessment required a level of planning equal to that of the iSkills administration, scoring of the portfolios with the NJIT ILS was complex and time consuming, requiring 3- to 4-hour sessions with all instructors for the first-year writing, cultural history, technical writing, and senior seminar courses. Following procedures established for portfolio assessment of writing ability at NJIT (Elliot et al., 2007), sample portfolios served as models to orient readers to the information literacy assessment process. The 75- to 90-minute orientation included independent scoring by readers of the samples, followed by group discussion to help readers calibrate their assessments and agree about the parameters that would ensure consistency. A reading session followed the orientation.

The combination of the scoring sheet (see the appendix) and the sample training portfolios was used so readers would score according to the functional performance level expressed in the scoring sheet as well as calibrate performance within the range of student sample portfolios.

Two readers independently read and evaluated each portfolio using the information literacy scoring sheet, and steps were taken to make sure that the readers did not know each other's scores. In addition, none of the instructors read their own students' portfolios. Each of the five portfolio scores was expressed as the total of two readers' scores. The first four judgments (see the appendix) represent components of information literacy (citation, evidence of research,

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appropriateness, and integration); the fifth is an overall assessment of the portfolio. Readers were encouraged to judge each variable independently of their judgments of other variables. The overall score, therefore, was not a component score but a holistic judgment (White, 1984) that may, or may not, relate to scores given for other, analytically read variables (Purves, Gorman, & Takala, 1988). Table 1 shows the interrater agreement for these scores using weighted kappa with quadratic weights (as is appropriate for ordered categories). Following the strength of agreement benchmarks described by Landis and Koch (1977), the ratings are in moderate to substantial agreement for first-year writing, cultural history, and the senior seminars, while the technical writing scores may be classified as being in fair agreement.

Table 1

Interreader Reliability for NJIT Information Literacy Scale (ILS): Nonadjudicated Scores

Variables	1st-year writing ($n = 110$)	Cultural history (1st-year students; $n = 45$)	Cultural history (2nd–3rd year students; $n = 95$)	Technical writing (3rd–4th year students; $n = 48$)	Senior seminar (3rd–4th year students; $n = 33$)
ILS components					
Citation	.601	.734	.623	.386	.535
Evidence of research	.588	.639	.734	.276	.484
Appropriateness	.459	.496	.711	n/a[a]	.525
Integration	.501	.546	.681	n/a[a]	.603
Holistic ILS	.660	.956	.755	n/a[a]	.599

Note. Scores were adjudicated before used in analyses. See the *Portfolio Scoring and Interrater Reliability* subsection in this report for a description of the adjudication procedure.

[a] A weighted kappa was not run for the technical writing students because no appropriateness, integration, or holistic ILS score was derived in the study.

Following the writing assessment model, the information literacy assessment model held that any score on any of the four component variables or on the overall (holistic) information literacy portfolio score would have to be adjudicated by a third reader if the first two readers did not award matching or adjacent scores. Thus, a portfolio receiving a score of 5 (indicating that the first reader strongly agreed with the statement) and a score of 3 (indicating that the second reader disagreed with the statement) would be sent to a third reader who would then make an independent

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judgment and resolve the discrepancy. For consistency, in cases where a third reading could be resolved in either direction (e.g., Reader 1 = 4, Reader 2 = 2, Reader 3 = 3), then the higher summed score (7) would be awarded.

Analyses

The goal of the analyses was to investigate the similarities and differences in measurement provided by the iSkills assessment and NJIT portfolio rubric. Data were analyzed from three sources: iSkills scores, portfolio scores, and NJIT student records. The latter included academic variables such as SAT scores, GPA, and grades in the humanities courses (in which students submitted portfolios) for the spring 2006 semester. Analyses included comparison of mean scores across the five student groups and inspection of correlations from the combined sample. The variables included in the analyses are as follows:

- *iSkills scores.* Scores on the iSkills assessment range from 0 to 300 for the Core iSkills assessment and from 400 to 700 on the Advanced iSkills assessment. Reliability (Cronbach alpha) for both tests is approximately 0.80.

- *Holistic ILS.* The overall assessment of a portfolio is rated on a scale from 1 (very strongly disagree that the contents of the portfolio demonstrate that the student has employed an information literacy framework) to 6 (very strongly agree). The variable used in these analyses is the sum, ranging from 2 to 12, of the adjudicated ratings of two judges. Technical writing students' portfolios were not assessed holistically, so these students did not receive a holistic ILS score.

- *Component ILS.* The ILS includes four component scales (citation, application, evidence, and integration; Questions 1 to 4, respectively in the appendix), which are each rated from 1 to 6 (very strongly disagree to very strongly agree with the rubric's analytic statements). The score for each component is the sum of the adjudicated ratings, ranging from 2 to 12, from two judges,. To simplify discussion, analyses used the mean of the four component scores for each student. Cronbach alpha for the four-item scale is 0.87. Note that the technical writing students were scored on a modification of the ILS that included only the citation and application scales. For this group, Cronbach alpha for the two-item scale is 0.77.

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- *Course grade.* This variable is a numerical translation of the letter grade each student received in the humanities class from which he or she was recruited. The variable ranges from 0 (F) to 4 (A). Course withdrawals and incompletes were interpreted as missing data.

- *GPA*. This variable is the undergraduate GPA of each student, including all courses up to the semester in which the study occurred. As with course grade, values range from 0 to 4.

- *SAT-M and SAT-V.* These SAT-M and SAT-V scores were obtained from NJIT student records. Each score ranges from 200 to 800. Cronbach alpha for SAT-M and SAT-V have been reported as 0.92 and 0.93, respectively (Ewing, Huff, Andrews, & King, 2005).

Results

The results are organized as follows. First, we compare cohorts in their performance on the two information literacy variables (iSkills and ILS) and other academic variables, analyzing the students who took the Core iSkills assessment separately from those who took the Advanced version. Next, we inspect the correlations among these variables, again separately considering the two groups of freshmen from the three groups of upper classmen. Conducting the analyses in this way allows us to consider the differencing performance with respect to the level of iSkills assessment taken (Core or Advanced).

Cohort Comparisons

At NJIT, first-year students are placed into either a 2-semester basic skills writing course (Reading, Writing, Speaking I and II) or a 1-semester writing course (Writing, Speaking, Thinking). Because the speaking component has proven complex to assess, current efforts concentrate solely on the writing component of the courses. Basic writers track into the 2-semester sequence because of low scores on the SAT-V and on locally developed placement tests. Students from both tracks were sampled during the spring semester to take the Core iSkills assessment. One group was sampled from Reading, Writing, Speaking II to represent basic writers. The second group was enrolled in cultural history. First-year students in this course (a) needed no remediation in writing, (b) had taken the prerequisite 1-semester writing course (Writing, Speaking, Thinking)

during the fall semester, (c) received a passing grade, and (d) immediately enrolled in cultural history, the next course in the NJIT humanities sequence. Such students, as the experience of instructors reveals, show confidence in their ability to perform well in humanities courses and a desire to move forward in the course sequence.

Comparisons between these two groups illuminated differences in the performance of basic versus nonbasic writers on information literacy measures. Because SAT-V scores were used to determine tracking, it is not surprising that these groups differ on this variable (first-year writing: M = 487, SD = 70; cultural history: M = 562, SD = 61), although they have similar SAT-M scores (first-year writing: M = 572, SD = 66; cultural history: M = 594, SD = 68), GPAs (first-year writing: M = 2.8, SD = 0.7; cultural history: M = 2.9, SD = 0.6), and grades in their respective courses (first-year writing: M = 3.1, SD = 0.9; cultural history: M = 3.2, SD = 0.7).

Table 2 shows the means and standard deviations for the information literacy variables. Preliminary analyses revealed that SAT-V score was a significant covariate for Core iSkills scores but not for the ILS scores. The comparison on iSkills scores used analysis of covariance to control for the effect of SAT-V scores. The comparisons on holistic and component ILS involved checking on differences in means via a *t*-test. On all variables, first-year writing students scored lower, although only scores on component ILS were statistically significant. Hence, the lower scores of this group reflect the presence of basic writers. Indeed, as a portfolio score of 7 is considered the lowest acceptable by NJIT instructional faculty, the holistic ILS Score (6.7) indicates that students barely meet expectations. While the holistic ILS scores of the cultural history students did not differ significantly from the scores of those enrolled in first-year writing, it is nevertheless important to note that the score did indicate an acceptable level of proficiency. The significantly higher scores of the cultural history students on the component ILS demonstrate, again, that these students possess a higher level of information literacy skill. Among all of the five groups in the case study, only the first-year cultural history students and the senior seminar students (see Table 3) submitted portfolios that demonstrated competency—a score at or above 7—on both the holistic ILS and component ILS variables.

Table 3 provides the means and standard deviations of the information literacy variables for the three cohorts that took the Advanced iSkills assessment.

Table 2

Means (Standard Deviations) for Two First-Year Cohorts

	First-year writing ($n = 110$)	Cultural history ($n = 45$)	Statistic (*df*)	*p*
iSkills scores (Core)	133.7 (35.2)	157.9 (31.3)	$F(1,152) = 1.3$	*ns*
Holistic ILS	6.7 (1.9)	7.4 (2.4)	$t(68) = 1.9$	*ns*
Component ILS	7.1 (1.7)	7.9 (2.1)	$t(69) = 2.1$	<.05

Note. Three students did not have SAT scores in their NJIT student records. *T*-tests for holistic and component ILS scores assumed unequal variances between the independent groups. Effect size for component ILS analysis is $d = 0.42$.

Table 3

Means (Standard Deviations) for Three Groups Taking the Advanced Level iSkills Assessment

	Cultural history ($n = 95$)	Technical writing ($n = 48$)	Senior seminar ($n = 33$)	$F(2,143)$	*p*	Partial η^2
iSkills scores (Advanced)	548.5$_a$ (36.9)	547.2$_a$ (39.5)	568.3$_b$ (28.2)	3.9	<.05	0.05
Holistic ILS	6.8 (2.4)	n/a	7.0 (2.2)		*ns*[a]	
Component ILS	7.4$_a$ (2.1)	6.2$_b$ (2.0)	7.4$_a$ (1.7)	4.90	< .01	0.06
Course grade	3.2 (0.8)	3.4 (0.8)	3.5 (0.5)	1.90	*ns*	
GPA	2.9$_a$ (0.5)	2.9$_a$ (0.6)	3.1$_a$ (0.4)	3.30	< .05	0.04
SAT-M	585.4 (73.6)	571.5 (88.1)	610.3 (67.5)	2.20	*ns*	
SAT-V	511.5 (81.8)	513.0 (98.7)	528.4 (40.1)	0.55	*ns*	

Note. Different subscripts within a row represent means different at the 0.05 level by Tukey's honestly significant difference test. Partial η^2 is an effect size measure representing the proportion of the total variance attributed to an effect. GPA = grade point average, SAT-M = SAT Math, SAT-V = SAT Verbal.

[a] Because the technical writing group did not have holistic ILS scores, a *t*-test was used to compare the cultural history and senior seminar groups on this variable ($t[125]=.38$, *ns*).

NJIT students may take cultural history at any time after the Writing, Speaking, Thinking course (or after the 2-semester basic writing sequence). While some first-year students move immediately into cultural history after fulfilling the first-year writing requirement, others delay taking the course until their sophomore or junior year. These sophomores and juniors represented one cohort that took the Advanced iSkills assessment. Students within the second cohort taking the Advanced iSkills assessment, those enrolled in the technical writing course, were required to fulfill only the first-year writing requirement as a prerequisite. Students enrolled in the senior seminars, the most advanced level of students taking the Advanced iSkills assessment, must have successfully completed the demanding humanities courses required of all NJIT undergraduate majors: the first-year writing requirement; the cultural history requirement; the basic social science requirement; the literature, history, and philosophy or the science, technology, and society requirement; and the open elective in humanities or social science. Although the iSkills Advanced assessment is not necessarily intended for graduating students, the NJIT researchers wanted to evaluate the performance of the university's highest level of student. In that many of NJIT's students either transfer into the curriculum or take their lower-division humanities requirements at other post-secondary institutions, the researchers wanted to gain a better understanding of the information literacy abilities of students who had taken all of their undergraduate humanities and social science work at NJIT. Students who had taken any English as a second language course were excluded as well. Of the 287 students enrolled after the March withdrawal deadline in spring 2006, only 33 students met these inclusion criteria.

Students enrolled in cultural history who were not first-year students earned lower scores in both the holistic ILS ($M = 6.8$, $SD = 2.4$) and the component ILS ($M = 7.4$, $SD = 2.1$; Table 3) than did their first-year classmates (Table 2). However, the cultural history students' iSkills Advanced scores ($M = 548.5$, $SD = 36.9$) were comparable with those of students enrolled in technical writing ($M = 547.2$, $SD = 39.5$). In that both cultural history and technical writing have the same prerequisite of the first-year writing course, the nearly identical iSkills Advanced scores of both groups suggest that additional information literacy instruction may not be forthcoming from other coursework outside of humanities courses.

Distressing to the NJIT instructional staff was the absence of evidence that students in technical writing had gained proficiency in the areas of citation and evidence of independent research, the two variables examined in this cohort of student portfolios. The component ILS score

for these two combined variables (M = 6.2, SD = 2.0) is significantly lower than the scores for either the cultural history (M = 7.4, SD =2.1) or the senior seminar students (M = 7.4, SD = 1.7). The technical writing students' component ILS (composed of only citation and evidence of independent research; M = 6.2, SD = 2.0) is also lower than the mean of the two corresponding scores for cultural history (M = 7.8, SD = 2.1) and senior seminar students (M = 7.7, SD = 1.6).

Less distressing, however, were the scores of the senior seminar students. Scharf, Elliot, et al. (2007), investigating a similar group of students at NJIT (*n* = 100), found holistic ILS scores below the cut score of 7 (M = 6.14, SD = 2.9; Scharf, Elliot, et al., 2007, p. 648), as were the scores of each of the other variables that make up the component ILS variable used in the current study. One year later, in the current study, both the holistic ILS scores (M = 7.0, SD = 2.2) and the component ILS scores (M = 7.4, SD = 1.7) of a similar cohort were higher, although just barely meeting expectations. It is important, nevertheless, to note that such scores were lower than the instructors were accustomed to seeing in the variables associated with the traditional NJIT writing assessment undertaken in the senior seminar, as reported by Scharf, Elliot, et al. (2007, p. 648): Critical Thinking (M = 8.94, SD = 1.46), Drafting (M = 7.73, SD = 2.65), Citation (M = 7.45, SD = 2.61), and Overall Writing Score (M = 8.89, SD = 1.5). As expected, the students in the senior seminar demonstrated significantly higher iSkills Advanced scores than students enrolled in cultural history and technical writing.

Correlations Among Variables

The intercorrelations among the variables are shown in Table 4 for the first-year students (those taking the Core iSkills assessment).

These analyses suggest distinctions between the ILS and iSkills measures. Information Literacy Scale scores are more closely correlated with each other (*r* = .90), course grade, and GPA than with the other variables. These correlations are higher than those observed 1 year earlier by Scharf, Elliot, et al. (2007). For example, Scharf, Elliot, et al. reported a correlation of .28 (p. 470) between holistic ILS scores and course grade, while the corresponding correlation here is .41.

Table 4

Intercorrelations for First-Year Students

	iSkills scores (Core)	Holistic ILS	Component ILS	Course grade	GPA	SAT-M	SAT-V
iSkills scores (Core)	-	0.18*	0.12	0.11	0.08	0.33**	0.52**
Holistic ILS		-	0.90**	0.41**	0.30**	0.17*	0.10
Component ILS			-	0.42**	0.33**	0.14	0.11
Course grade				-	0.62**	0.09	0.08
GPA					-	0.09	0.06
SAT-M						-	0.28**
SAT-V							-

Note: ILS = Information Literacy Scale, GPA = grade point average, SAT-M = SAT Math, SAT-V = SAT Verbal.

p < .05. **p* < .01.

Regarding general academic performance, although the portfolio scores are correlated with GPA (holistic ILS, r = .30, component ILS, r = .33), the alignment with SAT scores is considerably weaker. The weak correlations between grades (both course grade and GPA) and SAT scores might be due to differing grading standards between the basic writing course and cultural history. For basic writing students, grades may take into account factors such as evidence of reasoning, resilience, and responsibility (Sternberg & Subotnik, 2006)—all elements of classroom instruction that instructors seek to nurture within a fragile population. Conversely, the cultural history students who took the iSkills Core are among the most tenacious students, those who proceed directly from first-year writing to the next required humanities course. As such, these more resilient students are more likely to be evaluated on a content-based grading system that is uniformly traditional. Indeed, within just the cultural history course, correlations are higher between SAT scores and both course grades (SAT-V: r = .33; SAT-M: r = .22) and GPA (SAT-V: r = .24; SAT-M: r = .54) than they are for the full group of first-year students. For the first-year writing students, the corresponding correlations are all near zero (ranging from -.08 to .05). As Rose (1988) has famously pointed out, basic writers employ complex cognitive ability that is not uniform in its application to writing contexts. As such, the classroom assessment framework is not likely to be as uniform as it is for those students who are stronger writers—such as the first-year

cultural history students—and thus adapt to writing assignments using more uniform writing strategies, techniques that are more uniformly evaluated in a final grade.

The correlations of chief interest in this study—between iSkills scores and portfolio scores—are weak, with little to suggest comparable measurement. The only significant correlation identified is between the iSkills Core and the holistic ILS ($r = .18$). Any connection between iSkills Core scores and portfolio scores appears to be due to general academic ability. Note that there are significant correlations between both the iSkills Core and the SAT-M and SAT-V scores of first-year students. Indeed, the high correlation between the iSkills Core and the SAT-V suggests that verbally oriented critical thinking skills may be common to both assessments. Partial correlations controlling for SAT-M and SAT-V suggest the lack of unique correspondence between iSkills and portfolio scores: holistic ILS-iSkills: $\rho = .12$; component ILS-iSkills: $\rho = .06$.

The intercorrelations among the variables are shown in Table 5 for the sophomore, junior, and senior students (those taking the Advanced iSkills assessment).

Table 5

Intercorrelations for Sophomores, Juniors, and Seniors

	iSkills scores (Advanced)	Holistic ILS	Component ILS	Course grade	GPA	SAT-M	SAT-V
iSkills scores (Advanced)	-	0.23**	0.21**	0.21**	0.27**	0.38**	0.49**
Holistic ILS		-	0.93**	0.35**	0.25**	0.05	0.25**
Component ILS			-	0.37**	0.25**	0.08	0.17*
Course grade				-	0.54**	0.20*	0.37**
GPA					-	0.32**	0.41**
SAT-M						-	0.52**
SAT-V							-

Note: ILS = Information Learning Scale; GPA = grade point average.

*$p < .05$. **$p < .01$.

Compared with the results for the freshmen, these data show stronger relationships among most measures. Again, there is strong correlation between the holistic and component scores on the ILS ($r = .93$), a pattern maintained by Scharf, Elliot, et al. (2007). As with first-year students, the correlation between holistic ILS and course grade increased from the Scharf, Elliot, et al. study ($r = .28$) to the present study conducted 1 year later ($r = .35$). The portfolio scores are similarly

correlated with course grades and GPA. In addition, while no correlation was evident between the ILS scores and the SAT-V scores in the first-year study, ILS scores are more strongly correlated within the group of upper classmen (holistic ILS, $r = .25$, component ILS, $r = .17$). The iSkills Advanced scores are moderately correlated with course grade ($r = .21$) and GPA ($r = .27$), the latter at a similar level to other research on the iSkills assessment (Katz & Smith-Macklin, 2007). As was the case for the first-year students, iSkills correlated well with SAT scores, in particular with SAT-V scores ($r = .49$), as befits a measure of information handling skills. Finally, moderate correlations exist between iSkills and portfolio scores (holistic ILS, $r = .23$, component ILS, $r = .21$). However, as was the case for the first-year students, these correlations are moderated by students' general academic skills as measured by SAT scores. Partial correlations controlling for SAT-M and SAT-V are quite low: holistic ILS-iSkills: $\rho = .14$; component ILS-iSkills: $\rho = .15$.

Discussion

An empirical investigation at NJIT began in fall 2004 when instructors recognized that the information literacy skills of their students were wanting. In fall 2007, the time of the present writing, NJIT has established and evaluated the information literacy skills of their students by two related yet distinct measures: the ETS iSkills assessment and the NJIT ILS assessment. What has the institution gained in its ability to warrant validity evidence based on its assessment of the information literacy construct? What has the institution gained in its ability to provide evidence based on the relationship of the two assessments to other variables of academic interest? And what, in terms of consequence, has the institution gained in terms of the impact of the two assessment systems?

The Construct of Information Literacy

The iSkills Core assessment correlated weakly with the holistic ILS, although the correlations with both holistic and component ILS improved somewhat in the iSkills Advanced assessment. For both versions of the iSkills assessment, SAT-V and SAT-M scores appeared to moderate most of the relationship with portfolio scores. The ETS and NJIT assessments appear to be more distinct than related.

Yet these results are quite meaningful, a reflection of two appropriately different definitions and measures of information literacy. Attention to the variable of integration, present on both assessments, suggests a possible reason for the low correlations. Within the ETS

framework, integration stresses the interpretation and representation of information from multiple sources. An integrative task could ask students to compare advertisements from competing vendors' Web sites by summarizing information into a table, or students could be asked to rerepresent results from a sporting event into a spreadsheet to clarify standings and decide the need for playoffs. Within the NJIT framework, the demand for integration also asks students to cull information from multiple sources to facilitate critical thought. However, as the appendix shows, the aim is to interpret, deepen, and reflect on a topic within a written document. As it is articulated in the fifteen-week cultural history courses, students engaging in an integrative task would be asked to read Mary Shelly's *Frankenstein* and think about the underlying assumption in Western thought that the world is mechanistic and that there is a decreasing role of divinity. Students would be encouraged to go to the library for hard copy books, such as Leo Marx's *The Machine in the Garden: Technology and the Pastoral Idea in America*, and to use the library databases, such as JSTOR, to identify peer-reviewed articles such as Barbara Johnson's "My Monster/My Self" from a 1982 archived issue of *Diacritics*. Students would prepare a series of drafted and edited documents, perhaps accompanied by an oral presentation. The final research paper might argue that the relationship between parenthood and monstrousness is examined by Shelly within a fatalist, deterministic setting in which divinity is absent but technology is ever present. Such activities are, in fact, common with our instructors (Hetherington, 2007).

The process of such critical reflections is the vehicle by which the concept of information literacy is operationalized within the NJIT humanities framework. The content domain of information literacy, intermixed with highly demanding reading and persuasive writing tasks, is executed in a different time frame and with an approach distinct from that used by the ETS iSkills assessment. The tasks and the constructs both assessments embody may be related, yet they are nevertheless distinct. Of course, information literacy as mediated by a humanities-oriented framework for writing may itself be distinct from the goal-directed writing of specific disciplines. Indeed, recent work suggests a relationship between iSkills assessment scores and grades in a business writing course (Katz, Haras, & Blaszczynski, 2008).

Without question, NJIT nevertheless values both constructs. The humanities tasks fit within the mission of that academic unit, just as the iSkills tasks apply across the curriculum. Students need to write and reflect during extended periods, just as they need to evaluate rapidly much of the information they encounter daily. Indeed, it is interesting that the correlations between the iSkills

scores and the holistic and component ILS scores are higher in sophomore, junior, and senior students, as compared with first-year students. Perhaps students gain both sets of cognitive complex abilities—those demanded by the iSkills and ILS tasks—as they progress through the curriculum. If so, then that congruence of domain and task would be an ideal academic outcome: an integration of discriminate skills, related yet distinct, required for all graduates.

Concurrent Relationships

The correlation of chief interest was the relationship between the iSkills scores and the portfolio scores, and the distinct nature of the two assessments was demonstrated. Evidence of concurrent validity, shown in Tables 4 and 5, is found in the consistent relationship of the iSkills Core and Advanced assessments to the SAT-M and SAT-V scores. In addition, scores on the iSkills Advanced assessment were all correlated with academic criterion measures (course grade and GPA). These results are consistent with the idea that some commonality is present among the information literacy skills of these more developed writers (as evaluated by products in portfolios and grades in their humanities classes), their more general information literacy processes (as evaluated by the iSkills Advanced assessment), and general academic ability (as revealed in GPA and SAT scores).

The ILS, conversely, demonstrates little or no relationship with SAT-M or SAT-V measures. Instead, both the holistic and component ILS scores correlate with course grades and GPA for all students, reflecting the appropriately curricular-bound emphasis of the ILS. Because the ILS was intended to measure the information literacy skills of students as they are manifested within written documents prepared for specific classes, the value of such an assessment is strengthened when it is shown to be related to academic performance at each grade level.

Consequences of the Collaboration for NJIT

Evaluation of the consequences of assessment must be part of all program evaluation (Messick, 1994). Instead of considering consequences a factor apart from the investigation of construct and concurrent relationships, the consequences involved with the assessment of information literacy should be warranted as equally important to the success of the assessment. Along with the gains realized through a highly articulated model of information literacy and empirical assessment of student ability, NJIT has realized a more fully articulated sense of information literacy as administrators and instructors have begun, in committee and classroom, to

address the information literacy skills of students. Even the rater agreement measures noted in this case study may be understood as evidence of the capability of faculty and librarians to unite in pursuit of a common assessment goal involving a new, yet critical, literacy that is as important to student success as academic writing ability—higher education's so-called composition emphasis—was to students at the turn of the 20th century.

In preparing *The Future's Edge* (New Jersey Institute of Technology, 2007), a periodic accreditation review report prepared for the MSCHE, the office of the president featured both the traditional writing assessment of portfolios conducted by the department of humanities (pp. 46–47) and the new collaborative information literacy assessment with ETS (pp. 53–54). Demonstration of efforts to assess information literacy within the undergraduate population was clearly important to the NJIT administration, and research with ETS allowed NJIT to follow Category 8 *Characteristics of Programs of Information Literacy That Illustrate Best Practices: A Guideline* in its suggestion that multiple methods for program evaluation are needed for effective outcomes assessment (Association of College & Research Libraries, 2003). On November 27, 2007, the NJIT report was accepted and reaccreditation was confirmed, with the assessment of information literacy now a part of the university's narrative of success. Concurrent with the preparation of the accreditation report, NJIT began a Provost's task force on information, communication, and technology literacy and a Web site at the Robert Van Houten Library hosting research and curricular advances.

In addition to university-wide efforts, NJIT has added a second composition course—English Composition: Writing, Speaking, Thinking II—focusing on methods of research using print and online sources, the evaluation and proper citation of source material, and the development of researched essays and report writing. In spring 2008, 12 sections of the course are planned to accommodate 288 students. While the librarians will maintain their close relationship with the humanities, they have begun to address information literacy instruction and assessment in departments across the university. Informed by the results of the present study, the librarians would be the first to counsel that students who are selected to take the iSkills assessment must be identified from various departments within the academic institution; information literacy must not be seen to reside solely within the domain of the humanities.

External to NJIT, preliminary results of the present study were presented at the ETS iSkills National Advisory Committee (Scharf et al., 2006). As well, a replication study of the ILS was

undertaken with the University of North Carolina, Charlotte (Scharf, Huey, Elliot, Metzger, & Gunter, 2007). The information literacy effort at NJIT has become part of the NJIT recruitment plan, with an advertisement in the *New York Times Education Life* supplement noting information literacy among the skills offered at NJIT to give students a competitive edge in their fields of study ("Envision Your Future," 2007, p. 4). A subsequent front page article in *The Star Ledger*, referencing NJIT's efforts with ETS, further deepened the environment of information literacy at NJIT (Heyboer, 2007).

Best understood as related yet distinct measures, the NJIT ILS and the ETS iSkills assessment together provide a fuller construct representation of information literacy for the university than either measure separately. While it is clear from this case study that there is much room for improvement regarding the information literacy abilities of NJIT undergraduate students, the across-the-curriculum orientation gained by employing both measures has resulted in an instructional emphasis that is already demonstrating gains in awareness of the important and diverse nature of information literacy skills within a technological research university. Indeed, in that information literacy may be understood as an emerging construct—a point made by Tyler (2005) in associating information literacy with emerging global competitiveness—it is heartening to see the content of both the NJIT and ETS assessments so readily confirmed by instructors and librarians over the past 3 years. Significantly, at NJIT the definition of literacy as both an individual and communal good is strengthened by the use of both assessment systems, a consequence that has obviated the value dualisms often associated with literacy (Brandt, 2004). The collaborative effort described in this report has provided a combined assessment for New Jersey's only comprehensive technological university. While future studies are planned, they will be possible only because of the unique collaborative research model—one that recognizes the harmony that can and should exist between discriminant measures of information literacy—described in this report.

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Appendix

NJIT ILS Portfolio Scoring Sheet

The NJIT ILS portfolio scoring sheet is from *The Direct Assessment of Information Literacy at NJIT: A Portfolio Assessment Model* by N. Elliot, D. Scharf, H. A. Huey, V. Briller, and K. Joshi, 2006, retrieved February 11, 2008, from the Information Literacy at NJIT Web site: http://library1.njit.edu/infolit/researchreport.pdf. Copyright 2006 by New Jersey Institute of Technology. Used with permission.

Reader's Name:	Date:
Student's Name:	Course:

The Middle States Commission on Higher Education defines information literacy as "an intellectual framework for identifying, finding, understanding, evaluating and using information. It includes determining the nature and extent of needed information; accessing information effectively and efficiently; evaluating critically information and its sources; incorporating selected information in the learner's knowledge base and value system; using information effectively to accomplish a specific purpose; understanding the economic, legal and social issues surrounding the use of information and information technology; and observing laws, regulations, and institutional policies related to the access and use of information." It is the presence and extent of such literacy that we are assessing as it exists within undergraduate courses offered by the Department of Humanities at NJIT.

1. **Citation: This portfolio includes sources that are documented so that the original source can easily be found.** Discussion: All information needed to identify a source must be present. The audience-centered ability of students to present a source that may be *retrieved without undue burden* is more important than stylistic adherence to a particular citation system.

The contents of the portfolio demonstrate that the student has cited sources so that the original source can be easily found.

Very Strongly Agree	Strongly Agree	Agree	Disagree	Strongly Disagree	Very Strongly Disagree

2. **Evidence of Independent Research: This portfolio includes evidence of research independent of sources indicated within the course syllabus.** Discussion: While it is important that students reference information from textbooks, readers, and bibliographies provided by the instructor, researched work demands that students have sought, evaluated, and used information *beyond the syllabus*. An authentically researched assignment demonstrates that the student has sought ideas from a variety of sources to become truly informed about the topic at hand.

The contents of the portfolio demonstrate that the student has performed independent research.

Very Strongly Agree	Strongly Agree	Agree	Disagree	Strongly Disagree	Very Strongly Disagree

3. **Appropriateness: The sources used in this portfolio are appropriate to the topic the student addressed.** Discussion: Academic integrity demands that authoritative sources must be used in researched work. Research that is appropriate to the topic at hand will be sensitive to issues such as *validity, timeliness, and sufficiency*. An authentically researched assignment will demonstrate a student's ability to identify valid sources that have been reliably reviewed by those recognized as knowledgeable about the topic at hand, to select sources that offer time-appropriate views on that topic, and to ensure that the sources used are adequate to support the demands of the topic.

The contents of the portfolio demonstrate that the student has used appropriate sources.

Very Strongly Agree	Strongly Agree	Agree	Disagree	Strongly Disagree	Very Strongly Disagree

4. **Integration: The sources cited in this portfolio have informed the course work.** Discussion: Authentically researched work will demonstrate that the student has incorporated information in order to deepen critical thought. Authentic integration will demonstrate that the student has used sources to *interpret, deepen, and reflect* on the topic at hand.

The contents of the portfolio demonstrate that the student has integrated sources.

Very Strongly Agree	Strongly Agree	Agree	Disagree	Strongly Disagree	Very Strongly Disagree

5. **Overall Information Literacy Portfolio Score:**

The contents of the portfolio demonstrate that the student has employed an information literacy framework.

Very Strongly Agree	Strongly Agree	Agree	Disagree	Strongly Disagree	Very Strongly Disagree
The materials in the portfolio demonstrate *superior* information literacy skills.	The materials in the portfolio demonstrate *very good* information literacy skills.	The materials in the portfolio demonstrate and an *acceptable* level of information literacy skills.	The materials in the portfolio demonstrate *below average* information literacy skills.	The materials in the portfolio demonstrate information literacy skills at a *level near failure*.	The materials in the portfolio demonstrate information literacy skills at a level of *failure*.

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