Research Report

Direct Assessment of Information Literacy at NJIT:
A Portfolio Assessment Model

Abstract

Designed to document levels of information literacy evident in the writing portfolios of senior-level students (n=100) at a public technological university, the relational model described in this study demonstrated both excellent internal consistency (r^2=.909, df (4, 95), F=238.051, p<.001) and a solid correlation with overall writing performance (.497, p<.01). Replicable in design, the model is promising for community-based outcomes assessment efforts.

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The concept of information literacy has become increasingly important to the nation's higher education agenda. The Association of College and Research Libraries (ACRL) has formulated Standards, Performance Indicators, and Outcomes for a complex cognitive concept associated with lifelong learning. Beyond technological fluency, the pursuit of authentic information literacy involves critical thinking. As such, the individual in possession of information literacy is able to access information appropriate to a given content while documenting the origin of that information and integrating it analytically. For the ACRL, such an individual becomes an informed citizen within and beyond that academic community.[1] Building upon the ACRL Standards, the Middle States Commission for Higher Education has taken the position that information literacy skills should be integrated across-the-curriculum as a reflective, integrative, and iterative process. [2]

The assessment of such a process is both compelling and challenging. The Project for Standardized Assessment of Information Literacy (Project SAILS) hosted at Kent State University offers a limited response test that allows libraries to document information skill levels within a limited-response format.[3] The Educational Testing Service, offering a simulation-based assessment—the Information Communication and Technology Test (ICT)—offers both a core and advanced test within a computer-mediated environment.[4] While these emerging tests have great promise, librarians and classroom instructors nevertheless want to assess the skills of their students within institutional contexts and specified courses. Such local assessment, often termed authentic assessment, has the power to improve and yield insight into performance, not

merely audit it.[5] It is the development of such an assessment process that is needed if institutions are to use tests such as SAILS and ICT in order to interpret the results of these tests within a framework that offers deep information about student performance. The more librarians and instructors know about the contact zone in which information learning occurs, the better the chance of realistically implementing a continuous circle of improvement in which the results of assessment are used in the classroom in order to enhance student performance. [6]

Background of the Study

Since 1996, the Department of Humanities at New Jersey Institute of Technology has hosted an undergraduate portfolio assessment project. Used within a series of courses offered from the first to the senior year, portfolios are used to gain information about student performance in courses such as first-year writing, cultural history, technical writing, and senior seminars. [7]

As Figure 1 illustrates, the portfolio assessment process is designed to yield six validation goals: environmental validity (addressing the need for present student assessment in a sustainable manner so that undue burden, compromising both classroom time and future assessment, is not placed on instructors); construct validity (defining the constructs under examination by both literature review and instructor validation); reliability (reporting in detail both inter-reader agreement and inter-reader reliability in a number of ways both to justify the reported scores and to validate the existence of an assessment community unified in its observations of student work); associative validity (exploring the relationships of the defined variables to course grade and cumulative grade point average—measures of concurrent validity—as well as to placement and admissions

tests); and consequential validity (ensuring a continuous cycle of improvement in which research results are both reported to a broad audience—from the individual instructor to the university's administrative team—and used to improve classroom instruction). These six validation goals continue to support a unified concept of validity, what Messick has called the "bridge or connective tissue" that sustains "the meaningfulness or trustworthiness in interpretability of the test source"—the validation goal itself (8). [8]

Analysis of the results of the fall 2004 portfolio reading of students enrolled in the NJIT senior seminars—a cohort of humanities courses taken by all senior-level students[9]—indicated that these students were doing poorly in their ability to cite sources, one of the three independent variables of the writing model shown in Figure 1. That is, in assessing the portfolios of these senior-level students (n=80), we found that the scores on critical thinking (M=7.82, SD=1.55) and drafting (M=7.08, SD=2.13) met the cut score of 7. (That is, as two readers independently award a score from 6 (high) to 1 (low), a score on any variable below 7 suggests below average work and is cause for concern.) Indeed, the overall portfolio score (the dependent variable), a holistically-oriented reading by the instructors, was also acceptable (M=8.10, SD=1.70). The citation variable, however, received scores that were unacceptably low (M=6.37, SD=2.32), a score validated by the senior seminar instructors who had repeatedly reported weak research skills among our students.

Concurrent with this assessment, librarians at NJIT's Van Houten Library were working with first-year students to improve their skills in the freshman writing course. It soon became clear that an assessment of our graduating students, using a new information

literacy rubric, would benefit the shareholders of the curriculum—students, instructors, and administrators.

Study Design

Experience demonstrates that post-secondary program assessment differs from student testing. Testing is often an isolated process in which an instrument (validated by those external to the institutional context) is administered (to each student within a designated sampling plan) and results are reported (primarily to administrators). Conversely, program assessment demands that the construct under examination be both researched and validated by those integral to the institutional context, that the assessment be administered within a sustainable assessment environment that allows empirical justification while refusing to place demands on students and their instructors that compromise instructional time. Perhaps equally important to the development process is the consequential validity of program assessment: The assessment results are used those integral to the institutional context to improve instructional quality. In order to begin the information literacy program assessment of our senior students, three procedures were followed: community formation, construct validation, and process formulation.

Community Formation: Librarians and Instructors

During the spring of 2005, librarians became an integrated part of the Department of Humanities. While a librarian had traditionally been designated to the unit, during the spring semester the Director of Reference and Instruction and the Information Literacy Librarian attended all departmental and program meetings. Following the model offered by Lindauer, Arp, and Woodard each of the librarians began to work closely with the instructors in the senior seminars to order books for topics within the seminars and to

deepen the concept of information literacy.[10] Thus, the librarians became part of an academic unit consisting of 6 professors, 6 associate professors, 3 assistant professors, and 17 lecturers who work together in the service of the university's undergraduate General University Requirements (GUR). While studies of citation behavior such as that preformed by Carlson must sample across multiple departments, the Department of Humanities—with members holding advanced degrees in anthropology, history, philosophy, and policy studies—hosts classes across the entire undergraduate curriculum for approximately 7, 000 students each year.[11] Thus, both assessment and new instructional methods informed by the program assessment would be undertaken within one academic unit. In the six months of the spring semester, the two librarians began to work within the academic unit around an assumption of shared responsibility, an acknowledgement of interconnectedness, and a commitment to integrity that has developed around a common purpose.[12] Community formation, thus, is a required pre-condition to the pursuit of environmental validity describe in Figure 1.

Construct Design: A Relational Model

The act of construct validation was performed by the two librarians in two phases. In the first phase, the librarians carefully examined the portfolios collected for the spring 2005 assessment so that a construct of information literacy would be articulated that was meaningful to our institution. Realizing that the program assessment of the senior seminars and its instructors had identified a problem in the citation trait the previous semester, the librarians monitored the end-of-semester writing assessment in which the writing assessment model was used to evaluate 100 portfolios collected for the assessment.[13] The writing assessment, performed just after final examinations in the

spring of 2005, yielded the scores shown on Figure 1: critical thinking (*M*=8.94, *SD*=1.46), drafting (*M*=7.73, *SD*=2.65), citation (*M*=7.45, *SD*=1.55), and overall writing score (*M*=8.89, *SD*=1.50). After that reading, the librarians and selected senior-seminar instructors—that is, those most interested in now examining the portfolios for their contained information literacy evidence—used the ACRL standards, performance indicators, and outcomes shown in Table 1 to reinforce the four independent variables. Each variable was ultimately fully defined in the assessment scale shown in Figure 2. Thus, the librarians and instructors designed a relational model of four independent variables to capture the construct of information literacy as it appeared in the portfolios of senior students, a construct given validity both by the ACRL Standards and by the actual work of students contained in the portfolios—physical products that reified the aptness of the ACRL Standards.

Citation. In previous assessment work by the senior seminar instructors, the citation trait was judged as the ability of students to properly cite their sources according to MLA style. While remaining a connecting independent variable between the two models, as shown in Figure 1, the description of this trait was expanded for the construct of information literary. Citing sources so they could be found was more important than strict adherence to a standard citation style. If all the elements necessary to easily locate a referenced work were present and clear, it would seem to be strong evidence that a student understood the particular attributes of a source, even if the punctuation or capitalization might not conform to standard documentation systems sponsored by the Modern Language Association or the American Psychological Association. If students were to cite used sources in this fashion, they would achieve competence in ACRL

Performance Outcomes 2.5, c and d. (See Table 2.) That is, 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. For example, in the case of a print source, the place of publication of a book is not as important to locating it as the date of publication. Locating a cited article using only an author, and article title, but no source, date or volume and issue number would place an undue burden on the reader as it would require multi-step searching to verify the full citation in order to locate the full text. Similarly, a URL without a sponsoring organization, author, or other identifying information, could prove impossible to locate should the URL change or disappear. A multi-line URL copied from a commercial database as a substitute for an article reference would indicate a lack of understanding of how information is produced, organized, and disseminated, ACRL Performance Outcome 1.2.a. Finally, consistently following proper citation style and usage for both in text and cited works complied with ACRL Standard 5 because such adherence is evidence that the student acknowledges the intellectual property issues surrounding information use in our society.

Evidence of Research. Evidence was sought in student papers that relevant research had been conducted that went beyond the syllabus and sources recommended by the instructor. If the student sought ideas from a variety of additional sources to become truly informed about the topic at hand, it would be good evidence that the ACRL Standards 1 and 2 were being met. Additionally, papers with little variety or diversity of sources in scope, subject, and format, were less likely to have been well-researched.

Appropriateness. Did students choose sources that were not only relevant, but had

a high probability of being accurate and authoritative? If so, they were meeting Standards 1 and 3. Standard 1 and Standard 3 require that information literate students evaluate information and its sources critically and, inferentially, incorporate selected information into both a knowledge base and value system. If students were able to use outside information as part of the knowledge base on which the essay was developed, these standards would be met.

Integration. Did students integrate the information found into the argument of the paper or were the citations pasted in to fulfill a source requirement? To judge the work against ACRL Standards 3 and 4, the portfolio reader would be asked to begin to evaluate the arguments and ideas presented in the work. Evidence of integration would include the use of concepts from outside sources to build a foundation, compare, contrast, and refute arguments—that is, to use sources in a fashion that were not merely cosmetic. The use of in-text citations relevant to concepts and arguments made would be taken as further evidence of integrative ability. This variable was also intended to assess the degree to which a student was able not only to summarize the main ideas from sources consulted (ACRL Performance Indicator 3.1), but synthesize ideas to construct new concepts (ACRL Performance Indicator 33). To meet Standard 4—to use "information effectively to accomplish a specific purpose"—the sources cited would be used reflectively in the paper. For instance, if a student was able to use outside information as part of the knowledge base on which the essay was developed, that student would meet ACRL Performance Indicator 4.1. Following the writing assessment model, citation, evidence of research, appropriateness, and integration were understood as the independent variables of the model. To identify performance levels associated with these

variables on a Likert scale, the readers would adopt an analytic reading method. Advanced by Purvis, Gorman, and Takala, this scoring method takes into account the specific features of writing in relation to a general framework, while allowing the preservation of the four independent variables as they are investigated across the various sections of the senior seminars.[14]

Overall Holistic Score. The overall score was designed to address this complex skill, rather than be a sum of the other local criteria. There are certainly many more criteria that could be identified as information literacy skills that we did not include specifically in our assessment rubric. As well, as Table 2 illustrates, even the existing four variables overlap as they are related to the ACRL Standards. For these reasons, the holistic score was taken to represent overall student competence of information literacy. Identified as a valid method of general impression scoring by Godshalk, Swineford, and Coffman, holistic scoring remains the most common form of assessment when written texts are evaluated for evidence of writing ability.[15] Following the writing model, the information literacy model also took the overall score as the dependent variable.

Because the ACRL Standards had both informed the local criteria (shown in Table 2) and had been modified to fit our courses, an appropriate understanding of construct validity was integrated into the assessment process. In addition, a comprehensive literature review on the construct of information literacy was also conducted.[16] Thus, every effort was made to fulfill the validation goal of construct validity shown in Figure 1. The scoring sheet used in the assessment, employing the 6-point Likert scale from the writing assessment model, is shown in Figure 2.

In the second phase of construct validation—a more conceptual process—the librarians and instructors identified the relationship between writing and information literacy. Rutz and Lauer-Gelebov have identified the potential of portfolio assessment used in conjunction with Project SAILS for program assessment. [17] Yet more explicit connections were warranted between the writing model and the information model shows in Figure 1. Three areas of commonality were identified.

First, both writing and information literacy are complex cognitive constructs. While both are often misunderstood as a set of skills—clerking commas on applying a standard citation format—writing and information literacy are processes that, in fact, have the potential to restructure consciousness. As Ong has famously proposed, the act of writing operationalizes psychodymanic processes: Writing forces relational rather than additive thought; compels analytic rather than aggregative classification; requires clarity rather than copious expression; prompts thought that is measured, objective, definitional, and abstract; and results in the formulation of questions rather than reliance on tradition.[18] Similarly, the *Information Literacy Competency Standards for Higher Education*, stress the cognitive complexity of 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."[19] As well the ETS-sponsored ICT International Literacy Panel concluded that "the concept of ICT literacy should be broadened to include both critical cognitive skills as well as the application of technical skills and knowledge. These cognitive skills include general

literacy, such as reading and numeracy, as well as critical thinking and problem solving. Without such skills, the panel believes that true ICT literacy cannot be attained."[20]

In reviewing the second area of commonality between writing and information literacy, the librarians and instructors realized that application of informed definitions of writing and information literacy results in an informed citizenry. Heath has called for a new vision of literacy that embraces the creation of humaneness achieved through authentic writing tasks, community-based reflections of experiences, and engagement that embraces both academic content and personal experience.[21] So, too, an individual possessing information-seeking abilities and impulses will serve as an informed citizen. "The sheer abundance of information will not in itself create a more informed citizenry," the *Information Literacy Competency Standards for Higher Education* state, "without a complementary cluster of abilities necessary to use information effectively."[22] The Educational Testing Service makes similar claims in justifying its ICT Literacy Assessment: "Society demands much of its young people, and it demands much of institutions of higher education by requiring that they prepare the next generation for success in a world that grows more complex, more independent and more information driven."[23]

Third, the librarians and instructors came to realize that both writing and information literacy are best captured in behaviors; as such, an optimal place to look for evidence of information literacy is within student writing portfolios, vehicles that capture deeply-contextualized student work on a longitudinal basis and thus allow insight into process and product.[24] Defined by Huot as "part of a tradition in the visual and performing arts that looks at multiple products and processes, hoping to discover and

document the progress of an individual student or learner," portfolios—because they contain writing and information literacy behaviors—have the added benefit to both to interrupt negative attitudes toward assessment and to transform the relationship between assessment and teaching.[25]

Process Formulation: Planning the Reading, Analyzing the Results

During process formulation, the third phase of the study design, a commitment was made by the librarians and the instructors to design an assessment session, examine the data, and make use of the results of that investigation. Therefore, after the portfolios were read according to the writing model by the 13 humanities instructors who had taught the 21 sections of senior seminars, the librarians and instructional faculty arranged to begin the process of gathering validity evidence for their derived construct of information literacy.

A week before the reading, two librarians and one senior seminar instructor began the design of the reading process by selecting at least two sample training portfolios to represent each of the four independent variables, as well as the dependent variable expressed in the overall portfolio score. On the day of the reading, these training portfolios were then used as models to orientate five librarians and two senior seminar instructors to the assessment process. The combination of the scoring sheet (Figure 2) and the training portfolios was used to fulfill the goal of content validity. That is, the construct of information literacy would be judged according to the functional performance level expressed in the scoring sheet (a criterion-referenced approach) as well as student samples within the portfolios (a norm-referenced approach). The construct of information literacy was thus operationalized in a minimalist fashion in the scoring sheet

as criterion statements that would stand over time and circumstance; more robustly the construct of information literacy was operationalized in the sample training portfolios, reflecting levels of ability, which would be deeply contextualized within the senior seminars from the spring of 2005.

Each portfolio was read independently by two readers, 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 students' portfolios. Following the writing assessment model, the information literacy assessment model held that any score on any of the four independent variables or on the overall 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 provided in the Figure 2 scoring sheet) and a score of 3 (indicating that the second reader disagreed with the statement) would be sent to third reader who would then make an independent judgment and resolve the discrepancy. In addition, 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 score (7) would be awarded. Estimated of such agreement would be calculated, as well as two estimates of inter-reader agreement: Cronbach's α and Pearson's *r*. While Cronbach's α provides a general index of reliability, Pearson's r allows an estimate of the probability value obtained in a .05 test level of significance and a control against Type 1, or blindness, error.[26] In that a non-specific direction of the reliability was assumed (e.g. $\text{Reader}_1 > \text{Reader}_2$ or $\text{Reader}_2 > \text{Reader}_1$), a two-tailed *p* value was used for the later measure.

Orienting the readers to the assessment process took approximately 75 minutes, with a three hour reading following the orientation. Two additional hours of readings undertaken over the following week allowed the readers to complete the scoring of the 100 portfolios and to make any necessary adjudication.

After the reading was completed, pursuit of associative validity began. In this study, associative validity was defined as the relationship of the independent and dependent variables to the grade in the senior seminar course that the portfolio was designed to capture as well as to each student's cumulative grade point average. Relationships of the variables to placement tests (in reading, sentence sense, and essay performance, all tests based on forms of the New Jersey Basic Skills Placement Test) and to admissions tests (the SAT Reasoning Tests in mathematical and verbal ability used before the 2005 College Board revisions) would also be performed. Again, an estimate of the probability value obtained in a .05 test level of significance—a control against Type 1, or blindness, error—was established for all correlations.

Results

While it is traditional to report the results of experimentation with the data analysis, the kind of program evaluation we are describing cannot be delineated sharply from the consequences of that assessment. Writing at exactly one-year's distance from the first reading reveals that the collaborative process remains strong. Hence, the consequential aspects of the collaborative effort are part of the environmental validity that drives the effort.

Environmental Validity: A Potentially Enduring Community

As the analysis below reveals, those involved in the study of information literacy have identified a sustainable method of assessment, a way of fostering community in which assessment becomes most meaningful. One year after that May 2005 reading, a university-wide, provost-and-dean driven committee has been formed to address assessment and instructional issues of information literacy across-the-curriculum. At each administrative level, the information presented below has accompanied the process. Within this administrative context, collaborative instruction is beginning. While work continues with first-year students, librarians are beginning to work more actively with the senior-seminar instructors by serving as consultants to each of the instructors. Along with such administrative and instructional efforts, our university has entered into a research partnership with the Educational Testing Service in which 200 students have taken the ICT Academic Core Test and 257 students have taken the Academic Advanced Test. The same students who have taken these tests have also submitted portfolios for courses in first-year writing, sophomore cultural history, junior-year technical writing, and the senior seminars—all humanities courses required of all undergraduate students. These portfolios have been read by the majority of the humanities faculty and by the librarians as well. In that both the ETS ICT Test and the portfolios are based on the same ACRL Standards, analysis of commonalities between the tests and with student performance will greatly enhance validity efforts. In that our sampling plan is always constrained because of dedication to a sustainable assessment model yielding environmental validity (see note 13), the computer-mediated 75-minute ETS tests could greatly enhance present assessment capacity at our university, affording opportunities to test different areas of information literacy by means of different tasks extending beyond the domain of those

tasks within humanities courses. Without the formation of a community of those interested in pursuing the assessment of information literacy, such collaborative partnerships would have been impossible. For the present, the community of librarians and instructors appears to have the potential to endure in its administrative, research, and instructional efforts.

Content Validity: Internal Consistency of the Models

As an indication of content validity, the relationship expressed in the association between independent variables and the outcome variable of the overall portfolio score was examined for both the writing and the information literacy models. That is, empirical validation was sought to demonstrate that that this independent-dependent variable relationship was robust enough to capture the writing performance and the information literacy performance that occurred within senior seminar classes.

Since the fall of 2004, regression analysis of the writing model as it functioned in the assessment of senior seminar portfolios had been recorded. Regression analysis of the fall 2004 model revealed a solid coefficient of determination (r^2 =.548, F (3, 76) = 32.91, $p < .001$) of the relationship of the independent variables (critical thinking, drafting, and citation) to the independent variable expressed by the overall portfolio score. That is, for the fall 2004 senior seminar portfolios, 55% of the variability of the overall portfolio score represented the proportion of the variation in the dependent variable (i.e., the overall portfolio score) that is explained by the independent variables (i.e., critical thinking, drafting, and citation). Regression analysis of the spring 2005 model, however, reveals a higher coefficient of determination. Regression analysis of the spring 2005 portfolios relating the overall writing score (the dependent variable) to critical thinking,

drafting, and citation (the independent variables) reveals a high coefficient of determination (r_2 =.647, *df* (3, 96), *F*=66.078, *p*<.000). That is, for the spring of 2005, 65% of the variability of the overall portfolio writing score represents the proportion of the variation in the dependent variable (i.e., the overall portfolio writing score) that is explained by the independent variables (i.e., critical thinking, drafting, and citation). Clearly, instructors continue to be able to use the writing model to assess the construct of writing with an increasingly solid degree of internal consistency.

Regression analysis of the information literacy model demonstrates high internal consistency. Regression analysis relating the overall information literacy score (the dependent variable) to citation, evidence of research, appropriateness, and integration (the independent variables) reveals a strong coefficient of determination (r^2=.909, *df* (4, 95), *F*=238.051, *p*<.001). That is, for the spring of 2005—the first use of the information literacy model—91% of the variability of the overall portfolio information literacy score represents the proportion of the variation in the dependent variable (i.e., the overall portfolio information literacy score) that is explained by the independent variables (i.e., citation, evidence of research, appropriateness, and integration). Such a strong coefficient of determination reflects the ability of the derived construct to capture the information literacy behaviors of our students as those behaviors were identified within the portfolios. In their efforts to design a relational construct of information literacy (Figures 1 and 2) based on a thorough literature review and tailored use of the ACRL Standards (Tables 1 and 2), librarians and instructors are now confident that their efforts are validated by such a high coefficient of determination. As well, the coefficient of determination suggests

that our librarians and instructors were confident in making judgments about the quality of submitted work.

Reliability: Confidence in Observation

In all NJIT humanities programs using portfolios, both inter-reader agreement and inter-reader reliability are held as an essential precondition to analysis for the validation goals of environmental validity, construct validity, associative validity, and consequential validity. How effective was the Information Literacy Scoring Sheet (Figure 2) in allowing readers to make reliable judgments about the constructs of writing and information literacy contained in the portfolios? Classified by Stemler as a consensus estimate, inter-reader agreement was solid for the writing assessment model.[27] As Table 3 illustrates, 61 % of the portfolios assessing the writing model needed no adjudication whatsoever. Ninety-two percent needed no adjudication on critical thinking score, and 95% needed no adjudication on the overall writing score. Assessment of the drafting and citation scores proved more problematic, with 64% of the portfolios needing no adjudication. Comparatively, these results are lower than to those evidenced from the fall of 2004 regarding the total number of portfolios needing no adjudication. During that earlier reading 75% of the portfolios needed no adjudication whatsoever, while 88% of the portfolios needed no adjudication on the critical thinking score, 85% needed no adjudication on the drafting score, and complete consensus was found on the citation score. Regarding consensus estimates, therefore, the writing assessment model appears, across two administrations, to have achieved a very good level of inter-reader agreement. That is, writing model variables are viewed similarly within the portfolios at no less than 61 percent for all of the portfolios read, with scores ranging from 64% to 92% on the

independent variables, and with the overall portfolio score remaining high at 90% for the fall of 2004 and 95% for the spring of 2005.

As was the comparative case with the regression analysis between the writing model and the information literacy model, the latter again proves superior in its inter-reader agreement estimates. Again, as Table 3 shows, 69% of the portfolios needed no adjudication when used to assess the information literacy model. More significantly, no agreement rate fell below 78% in the information literacy model. In these consensus estimates, the information literacy model achieves an excellent level on inter-reader agreement.

Classified by Stemler as a consistency estimate, the reliability estimates shown in Table 4 are given for both non-adjudicated and adjudicated scores as measured by Cronbach's alpha (α) and Pearson's product moment correlation (r).[28] As the table illustrates, the writing model performs well, with the lowest score shown for non-adjudicated critical thinking variable ($r=.390$, $p<.01$) and the highest level of agreement for the adjudicated drafting variable ($\alpha=.911$). While the process of adjudication clearly improves these reliability estimates, it is important to recognize that—as was the case with the measures of inter-reader agreement—the process of adjudication does not mask disagreement. In other words, readers were able to use the writing model to assess the portfolios for the variables of critical thinking, drafting, and citation. Comparative levels of inter-reader agreement were found during the fall 2004 reading in which estimates ranged from $r=.444$ ($p<.01$) for a non-adjudicated critical thinking score to $\alpha=.870$ for an adjudicated drafting score.

Once again—as was the case in comparison of the regression analysis between the writing model and the information literacy model and the inter-reader agreement estimates between the models—the levels of inter-reader reliability identified in the information literacy model were superior. As Table 4 shows, the lowest level of inter-reader reliability was r=.7 (p<.01) for the non-adjudicated score of appropriateness; the highest level of agreement was α=.962 for the adjudicated score of that variable. No adjudicated reliability score—the score used to perform the associative analysis—fell below r=.892 (p<.01)

Although promising new scoring systems are beginning to emerge, questions of inter-reader reliability remain largely unanswered in portfolio assessment of writing ability.[29] While Snavely and Wright have reported on portfolio use in honors thesis research, nothing is empirically known about the abilities of readers to reach consensus on the assessment of information literacy through the use portfolios.[30] Within this environment, inter-reader agreement and reliability were understood as valid evidence affording the assessment of stated the information literacy model. As Moss suggests, evidence of reliability is offered for discussion as part of a comprehensive system designed to reflect a range of educational goals.[31] Reliability is thus part of a network on information that ranges from librarian and instructor e-mails regarding assessment to the scores reported in statistical tables. As such, the information gathered from Tables 3 and 4 is noteworthy. The information literacy model, operationalized within the context of the senior seminars, achieves higher levels of inter-reader agreement and inter-reader reliability than the writing model.

Associative Analysis: Gyrating Together

Beyond investigating the internal relationships of the model and the abilities of readers to reach consensus and consistency, librarians and instructors wanted to know if relationships existed with other measures of student ability. As such, the writing model and the information literacy mode were both examined for their relationships with criterion-based performance levels of the students: course grade and cumulative grade point average (measures of concurrent validity); placement tests; and admissions tests. All associative relationships are shown in Table 5.

As had been the case in the fall of 2004, each of the independent variables in the writing model correlated at least the .05 level of significance with each other. The highest had been between critical thinking and the overall writing score (r=.699, p<.01), and the lowest relationship had been between the critical thinking and drafting variables (r=.337, p<.01). In the spring of 2005, the correlations increase for the writing model. Now, the highest correlation for the spring 2005 reading is, again, between critical thinking and the overall writing score (r=.771, p<.01), an increase from the fall 2004 sample. The lowest correlation is, again, between critical thinking and drafting (r=.543, p<.01).

As was the case in comparison of the regression analysis between the writing model and the information literacy model, the inter-reader agreement estimates between the models, and the levels of inter-reader agreement and inter-reader ability, the information literacy model again proves superior. Indeed, the excellent observed regression (r^2=.909) is a result of the excellent associations observed within the model. The lowest correlation is between the citation variable and the integration variable (r=.738, p<.01), a value just below the highest correlation observed in the writing model. Within the information literacy model, the highest correlation is identified between the

integration independent variable and the dependent variable, the overall score (r^2=.909, p<.01).

Equally as important as the interaction among the variables in both models are the relationships identified in the writing model and the information literacy model. The highest correlation is between the citation variable of the writing model and the citation variable of the information literacy variable (r=.605, p<.01). The relationship between citing according to format and citing for identification is evident in the correlation. It is important, however, to recall that the citation trait in the information literacy model was designed to expand the emphasis on correctness incorporated within that variable as it was expressed in the writing model. A paired sample t-test, used to investigate performance, revealed a significant difference (t (99)=8.13, p<.01 (two-tailed)) between the mean scores of the citation variable in the information literacy model (M=6.68, SD=3.01) and the citation variable in the information literacy model (M=8.94, SD=1.46). As the significantly lower score given to that variable within the information literacy model suggests, there is more to citation than mere adherence to documentation format.

The lowest association between the two models is evidenced in the correlation between the critical thinking variable of the writing model and the citation variable of the information literacy variable (r=.399, p<.01).The relationship of critical thinking (reflecting complexity) to document identification (reflecting correctness) is, understandably, low.

Overall, the relationship between the citation trait of the writing model and each of the independent variables of the information literacy model, as well as the dependent variable of the overall information literacy score, each meet and exceeded a .5 correlation

(p<.01). Thus, each of the variables of the information literacy model may be understood as an explication of the citation variable of the writing model. The relationship between the two dependent variables—the overall scores of both models—suggests, as well, a solid relationship between the construct of writing and the construct of information literacy used in this study (r=.497, p <.01).

Investigation of concurrent validity of the writing model with course grades in the senior seminar and cumulative grade point average identified statistically significant relationships between each of the independent variables of the model, as well as with the overall portfolio score. Correlations between the overall score of the writing model and course grade (r=.445, p<.01) and between the overall score of the writing model and the cumulative grade point average (r=.497, p <.01) are especially noteworthy. Such correlations had been observed in the fall 2004 sample between overall portfolio score and course grade (r=.430, p=.01). In a similar fashion, statistically significant relationships between the independent variables of the information literacy model, as well as with the overall information literacy score, are also identified with the course grades and the cumulative grade point average. (The single exception is the relationship between the integration variable and the cumulative grade point average.) However, in comparison to the concurrent validity of the writing model, correlations are between the overall score of the information literacy model and the course grade (r=.281, p <.01) and between the overall information literacy model score and the cumulative grade point average (r=.223, p <.01) are statistically significant but smaller. While the relationship between the writing model and the criterion variables may be higher, there is nevertheless

a relationship between the construct of information literacy and the students' academic performance.

As the librarians the instructors analyzed the data during the fall of 2005, it was realized that 54 of the students had not graduated the previous spring. Although the average earned hours in the spring of 2005 among the students in the sample sat at 136 credits, work during an additional semesters allowed a rough measure of the predictive validity of both models. Regression analysis reveals that a model in which the cumulative grade point average of students in the fall of 2005 serves as the dependent variable and the writing model itself—critical thinking, drafting, citation, and overall writing score—serves as the independent variable, the r^2=.456 (*df* (4, 48), *F*=10.064, *p*<.001). Thus, there is a predictive relationship between the writing model and the overall grade point average. Regression analysis of the information literacy model reveals a no coefficient of determination (r^2=.155. *df* (5, 47), *F*=1.723, *p*<.148).

Regarding the 45 possible relationships between the writing models, the information model, and admissions/placement tests, only two correlations were identified. Both models, as they are manifested in the portfolios of senior students, appear to have nothing to do with tests given before and upon admission,

Consequential Validity: Fear and Trembling

What is to be done when graduating seniors--with an average of 136 earned credits, a average cumulative GPA of 2.95, and an average course grade in the senior seminar of 3.31—earn the unacceptably low scores on the information literacy model that are shown in Figure 1? Each portfolio score on the information literacy model—citation (*M*=6.68, *SD*=3.01), evidence of research (*M*=6.46, *SD*=3.25), appropriateness (*M*=6.24,

SD=3.0), integration (*M*=6.05, *SD*=2.86), and overall information literacy score (*M*=6.14, *SD*=2.90)—fell below the cut score of 7; indeed, these stand as the lowest scores, on any scale, that have been recorded since the Department of Humanities began its assessment program a decade before. Further, what is to be done when preliminary analysis of new collaborative research with ETS reveals that the spring 2006 portfolio reading of the senior students (n=35)—aside from a significant difference noted in the citation variable (*M*=8.29, *t*=2.876, *p*<.01)—remains unacceptably low? That is, after a year's work on the part of the instructors, each of the spring 2006 scores remained low: evidence of research (*M*=6.82, *SD*=2.48, range=2, 11), appropriateness (*M*=7.09, *SD*=2.26, range=2, 11), integration (*M*=6.62, *SD*=2.36, range=2,11), and overall information literacy score (*M*=6.85, *SD*=2.33, range=2, 11). Indeed, it appears that the lowest source identification variable was all that was addressed: Students could present the sources used in their research papers so that the source could be retrieved. The present situation is, indeed, even more alarming when it is considered that the smaller sampling plan for the spring of 2006 was created to include only those students who had been admitted to our university as first-time, full-time students and who had never taken any basic writing courses. That is, in that these 35 students had never taken a class at another college these students were identified as those receiving all of their general university requirement humanities and their major concentration and elective courses at our university. These were, in other words, our most representative students. And their information literacy skills were remarkably low.

Discussion

Twenty-first century assessment functions at the end of a tradition in which measurement, description, and judgment informed three generations of practice. In their well-known call to embrace fourth generation evaluation, Guba and Lincoln ask assessment sponsors to recognize stakeholder concerns as significant.[32] From the point of view of the students—54% majors in the college of engineering, 26% majors in the college of computer science, 13% majors in the college of architecture, 4% majors in the college of management, and 3% majors in the college of science and liberal arts—the concept of information literacy does not necessarily reside within courses associated within their chosen degrees. Indeed, the variables of information literacy in the present study were designed on the basis both of ACRL Standards and on the basis of work performed within a humanities curriculum. The centrality of the writing model to the intersection of humanities courses and technical majors may be inferred from the relationship of the overall score from the writing model with the cumulative grade point average (r=.422, p<.01). Indeed, the relationship of the course grade and the overall score from the writing model (r=.445, p<.01) is present; the relationship of the overall score from the information literacy model with the humanities course grade itself is scarcely evident (r=.281, p<.01). Ultimately, the relationship of the overall information literacy score to the cumulative grade point average (r=.223, p<.01) suggests that the construct of information literacy is not yet as central to students at our university as is writing ability.

From the point of view of the humanities instructors, the concept may be central, yet it is likely not as central as the writing model. In 2006, an informed view of the construct of writing ability will describe the construct in ways similar to Camp's

description as "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."[33] As such, an instructor in a senior seminar in humanities may well focus on having students read and think critically about a Shakespearean tragedy or a structured interview without ever going beyond the text. Within the humanities, the tradition of composition instruction remains a formalist undertaking simply because there is so very much to handle on the page itself. It is, therefore, understandable the spring of 2005 writing assessment model yielded an acceptable overall writing score (M=8.89, SD=1.50) and acceptable scores on all of the independent variables associated with that model, while the same students received significantly lower overall information literacy scores (M=6.14, SD=2.90) and poor scores on all the associated variables.

From the point of view of administrators accountable to, for example, a Middle States Commission accreditation team, a central question remains: "Can it be stated with confidence that, upon graduation, students have achieved the institution's standards for information literacy?"[34] Within the limits of the information literacy model presented in this study—a measure with demonstrated reliability and validity evidence—the students do not. At present, three directions are in play. First, the university committee continues to sponsor collaborative research with ETS, research that may yield a broader sampling plan as well as an alternative view of the construct as it is presently defined in our university. The more that is known about the divergent aspects of this construct, the more the extent of the challenge. Second, the faculty has voted to add a second composition course to the first-year curriculum, and that course will certainly continue to

stress the relationship between writing and information literacy. Third, a junior-level technical writing course—taken by the vast majority of first-time and transfer students—has embraced the concept of information literacy and is presently adding components of the model to all sections of the course. In both the second first-year composition course and the junior-level technical writing course, program developers will integrate lessons learned from researchers such as Wang who have studied the lasting impact of credit-bearing library instruction.[35] As well, the work of Holliday and Fagerheim will serve as a valuable model for unifying writing and information literacy instruction.[36] The shareholders at our university will continue to monitor the ACRL research agenda in its call for evaluation and transferability of programs.[37] Instructors and administrators will continue to address information literacy in ways that are beyond cosmetic, by methods that acknowledge how truly difficult it is to extend effort beyond the syllabus and textbook, to select voices that are appropriate for a given context, and to truly integrate those new voices with one's own.

At the end of the day, the concept of borderlands, borrowed from the feminist writer Gloria Anzaldúa helps to explain the elusive concept of information literacy as it is documented in the present study.[38] For to understand this construct, perhaps, requires a mestiza consciousness—an awareness of that which is mixed, fluid, and emerging, of that which is and is not. Everyone wants what is best for students. But in this borderland world, a contact zone of defined and emerging literacy, what is authentically best may take some time to obtain.

Figure 1. The Writing and Information Literacy Assessment Models

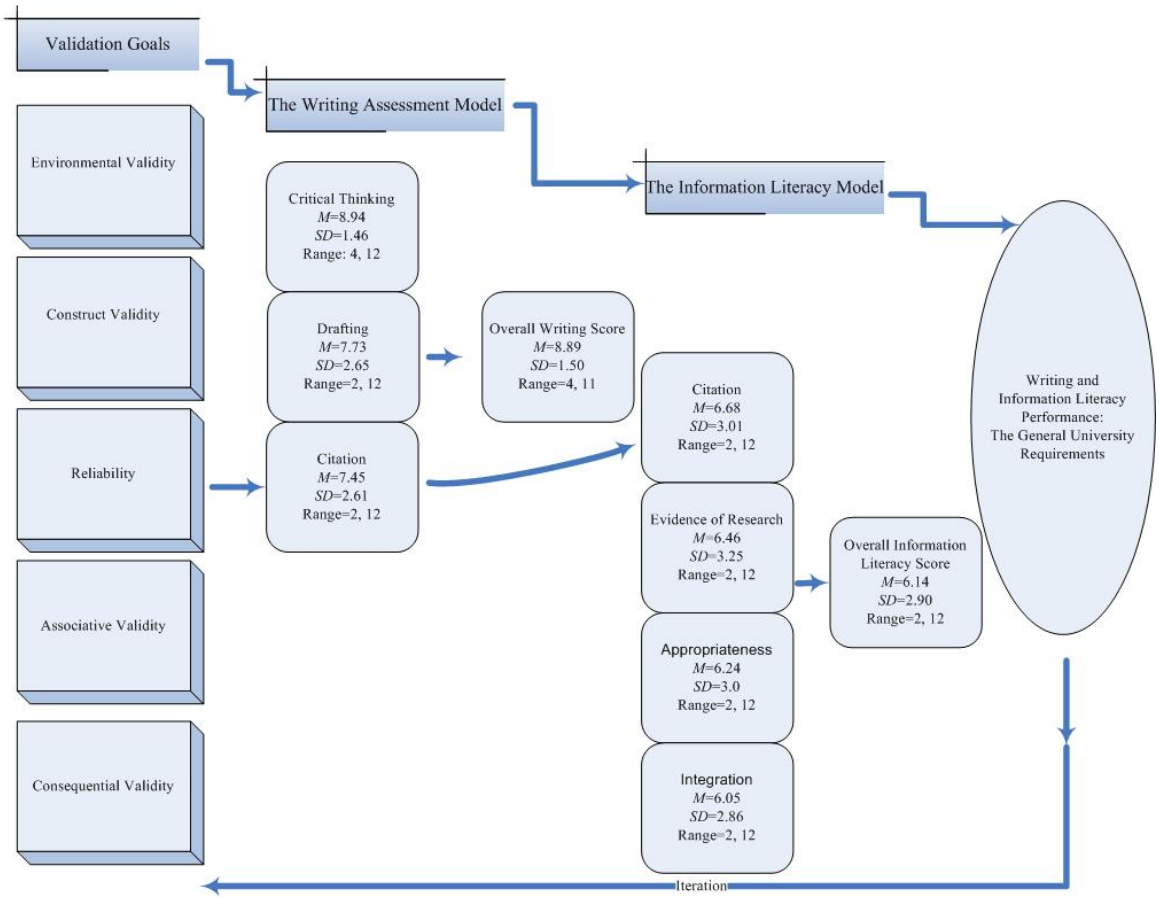

Figure 2. Information Literacy Scoring Sheet

NJIT Assessment Scales: Information Literacy

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*.

Table 1: Local Criteria Mapped to National Standards*

Local Criteria category	Local Criteria	ACRL Standards + Performance Indicators	ACRL Performance Outcomes
Citation	- Can correctly designate different types of sources.	**1 .2** Identifies a variety of types and formats of potential sources for information.	**a.** Knows how information is formally and informally produced, organized, and disseminated.
	- Differentiates between the types of sources cited and understands the elements and correct syntax of a citation for a wide range of resources. - Records all pertinent citation information for future reference.	**2 .5** Extracts, records, and manages the information and its sources.	**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.
	- Follows a citation style as a guide to include all necessary information	**5 .3** Acknowledges the user of information sources in communicating the product or performance	**a.** Selects appropriate documentation style and uses it consistently to cite sources.
Evidence of Research	- Puts effort into obtaining outside sources outside of those references in the syllabus. - Recognizes the need for more research.	**1 .1** Defines & articulates the need for information	**c.** Explores general information sources to increase familiarity with the topic. **f.** Recognizes that existing information can be combined with original thought, experimentation, and/or analysis to produce new information
	- Obtains resources not only from the web, but also books, articles, and other materials when necessary.	**2 .3** Retrieves information online or in person using a variety of methods	**a.** Uses various search systems to retrieve information in a variety of formats
Appropriateness	-Knows when a website, article, or book is appropriate. - Uses scholarly materials when necessary.	**1 .2** Identifies a variety of types and formats of potential sources for information.	**c.** Identifies that value and differences of potential resources in a variety of formats. **d**. Identifies the purpose and audience of potential resources.

Appropriateness *continued*	- Chooses sources reliable, authoritative sources that are appropriate to the topic the student addressed.	**3 .2** Articulates and applies initial criteria for evaluating both the information and its sources.	**a.** Examines and compares information from various sources in order to evaluate reliability, validity, accuracy, authority, timeliness, and point of view or bias
	- Chooses sources reliable, authoritative sources that are appropriate to the topic the student addressed.	**3 .4** Compares new knowledge with prior knowledge to determine the value added, contradictions, or other unique characteristics of the information.	**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 **f.** Integrates new information with previous information or knowledge **g.** Selects information that provides evidence for the topic
	- Finds resources that include enough evidence to support the thesis	**3 .7** Determines whether the initial query should be revised	**a.** Determines if original information need has been satisfied or if additional information is needed **c.** Reviews information retrieval sources used and expands to include others as needed
Integration	-Uses sources listed on the works cited page reflectively in the paper. - Uses sources to sharpen critical analysis. - Identifies verbatim material that can be then appropriately quoted	**3 .1.** Summarizes the main ideas to be extracted from the information granted.	**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
	- Demonstrates evidence that thought has been given to the resources. - The sources used are not merely cosmetic in nature	**3 .2** Articulates and applies initial criteria for evaluating both the information and its sources.	**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

	- Uses sources to sharpen critical analysis.	**3 .3.** Synthesizes main ideas to construct new concepts.	**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
	- Uses concepts from several sources to build new knowledge in support of the project at hand	**4 .1** Applies new and prior information to the planning and creation of a particular product or performance.	**c.** Integrates the new and prior information, including quotations and paraphrasing, in a manner that supports the purpose of the product or performance

*Association of College and Research Libraries. *Information Literacy Competency Standards for Higher Education* (Chicago: American Library Association, 2000) 8-14. http://www.ala.org/ala/acrl/acrlstandards/standards.pdf. Also at http://www.ala.org/ala/acrl/acrlstandards/informationliteracycompetency.htm

Table 2. ACRL Standards and Local Criteria

ACRL Standards		**Local Criteria**
Overall	Information literacy is a set of abilities requiring individuals to "recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information."	Overall Holistic Score
1	Determines the nature and extent of the information needed	Citation ; Evidence of Research; Appropriateness
2	Accesses needed information effectively and efficiently	Evidence of Research
3	Evaluates information and its sources critically and incorporates selected information into his or her knowledge base and value system.	Appropriateness; Integration
4	Individually or as a member of a group, uses information effectively to accomplish a specific purpose.	Integration
5	Understands many of the economic, legal, and social issues surrounding the use of information and accesses and uses information ethically and legally.	Citation

Table 3. Inter-reader Agreement: Senior Seminars, Spring 2005 (n=100)

VARIABLES	Inter-reader agreement
Writing Assessment Model	
Portfolios Needing No Adjudication	61
Portfolios Needing No Adjudication on Critical Thinking	92
Portfolios Needing No Adjudication on Drafting Score	64
Portfolios Needing No Adjudication on Citation Score	64
Portfolios Needing No Adjudication on Overall Writing Score	95
Information Literacy Assessment Model	
Portfolios Needing No Adjudication	69
Portfolios Needing No Adjudication on Citation	86
Portfolios Needing No Adjudication on Evidence of Research	85
Portfolios Needing No Adjudication on Appropriateness	82
Portfolios Needing No Adjudication on Integration	78
Portfolios Needing No Adjudication on Overall Information Literacy Score	82

Table 4. Inter-reader Reliability: Senior Seminars, Spring 2005 (n=100)

VARIABLES	Non-Adj. Cronbach α	Adj. Cronbach α	Non-Adj. Pearson r	Adj. Pearson r
Writing Assessment Model				
Critical Thinking	.561	.769	.390**	.631**
Drafting	.610	.911	.441**	.836**
Citation	.679	.923	.514**	.860**
Overall Writing Score	.710	.829	.551**	.708**
Information Literacy Assessment Model	.831	.955	.712**	.914**
Citation				
Evidence of Research	.866	.960	.765**	.923**
Appropriateness	.822	.962	.700**	.928**
Integration	.746	.942	.596**	.892**
Overall Information Literacy Score	.835	.953	.718**	.911**

**p<.01 (2-tailed)

Table 5. Associative Analysis: Senior Seminar Portfolio Scores, Spring 2005

ASSOCIATION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Writing Model																
1. Crit.Thinking	—	.543**	.579**	.771**	.399**	.414**	.402**	.373**	.353**	.471**	.406**	.288*	.215	.115	-.089	.154
2. Drafting	.543**	—	.677**	.555**	.482**	.478**	.569**	.550**	.504**	.206*	.262**	-.134	-.066	.114	-.101	-.139
3. Citation	.579**	.677**	—	.676**	.605**	.533**	.561**	.531**	.559**	.352**	.308**	.119	.172	.214	.016	-.081
4. Overall Score	.771**	.555**	.676**	—	.566**	.516**	.500**	.459**	.497**	.445**	.422**	.038	.071	.047	-.103	-.014
Information Literacy Model																
5. Citation	.399*	.482**	.605**	.566**	—	.812**	.779**	.738**	.834**	.239*	.22*	.036	.029	.183	-.086	.006
6. Evi. of Research	.414**	.478**	.533**	.516**	.812**	—	.882**	.826**	.893**	.348**	.260*	.073	.060	.198	-.050	-.010
7. Appropriateness	.402**	.569**	.561**	.500**	.779**	.822**	—	.905**	.908**	.273**	.223*	-.011	.001	.226	-.123	-.131
8. Integration	.373**	.550**	.531**	.459**	.738**	.826**	.905**	—	.909**	.279**	.193	-.079	-.011	.103	-.302*	-.206
9. Overall Score	.353**	.504**	.559**	.497**	.834**	.893**	.908**	.909**	—	.281**	.223**	-.018	-.021	.195	-.162	-.160
Concurrent Validity																
10. Course Grade	.471**	.206*	.352**	.445**	.239*	.348**	.273**	.279**	.281**	—	.521**	.099	.097	-.013	-.003	.263
11. CumGPAS05	.406**	.262**	.308**	.422**	.222*	.260**	.223**	.193	.223**	.521**	—	.018	.013	-.018	.019	.149
Placement Tests																
12. Reading	.288*	-.134	.119	.038	.036	.073	-.011	-.079	-.018	.099	.018	—	.779**	.253	.374*	.748**
13. Sentence	.215	-.066	.172	.071	.029	.060	.001	-.011	-.021	.097	.013	.779**	—	.309*	.320*	.700**
14. Essay	.115	.114	.214	.047	.183	.198	.226	.103	.195	-.013	-.018	.253	.309*	—	.145	.076
Admissions Tests	-.089															
15. SAT Math		-.101	.016	-.103	-.086	-.050	-.123	-.302*	-.162	-.003	.019	.374*	.320*	.145	—	.480**
16. SAT Verbal	.154	-.139	-.081	-.014	.006	-.010	-.131	-.206	-.160	.263	.149	.748*	.700**	.076	.480**	—

*p<.05
**p<.01

Table 6. Scores: Senior Seminars, Spring 2006 (n=34)

INDICATORS	Range	Mean	Standard deviation
Information Literacy Model			
Citation	2, 12	8.29	2.16
Evidence of Research	2, 11	6.82	2.48
Appropriateness	2, 11	7.09	2.26
Integration	2, 11	6.62	2.36
Overall Information Literacy Score	2, 11	6.85	2.33

Notes and References

[1] Association for College & Research Libraries, *Information Literacy Competency Standards for Higher Education* (Chicago, IL: ACRL 2000). http://www.ala.org/ala/acrl/acrlstandards/standards.pdf (accessed June 28, 2006). Information literacy, the ACRL proposes, is "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" (3).

[2] Two documents from the Middle States Commission on Higher Education address Information Literacy: *Guidelines for Information Literacy in the Curriculum* (Philadelphia: MSCHE, 2003); and *Developing Research & Communication Skills: Guidelines for Information Literacy in the Curriculum* (Philadelphia: MSCHE, 2003). An executive summary of the latter is available at http://www.msche.org/publications/devskill050208135642.pdf (accessed June 28, 2006). It is significant to note the importance attached to information literacy by the Middle States Commission; it is, the authors of *Developing Research & Communication Skills* claim, "a metaphor for the entire leaning experience" (2).

[3] O'Connor, Lisa G., Carolyn J. Radcliff, and Julie A. Gedeon. "Applying Systems Design and Item Response Theory to the Problem of Measuring Information Literacy Skills," *College and Research Libraries* 63.6 (2002): 528-543. Project SAILS hosts a website at https://www.projectsails.org/index.php?page=home (accessed June 28, 2006).

[4] Educational Testing Service, ICT Literacy Assessment: An Issue Paper from ETS (Princeton: ETS, 2004). http://www.ets.org/Media/Tests/Information_and_Communication_Technology_Literacy/0202heapaper.pdf (accessed June 28, 2006). ETS hosts a website for the ICT Literacy Assessment at http://www.ets.org/portal/site/ets/menuitem.435c0b5cc7bd0ae7015d9510c3921509/?vgnextoid=b8a246f1674f4010VgnVCM10000022f95190RCRD

[5] Among the most eloquent to address the need for authentic assessment is Grant Wiggins, *Assessing Student Performance: Exploring and Purpose and Limits of Testing* (San Francisco: Jossey-Bass, 1993).

[6] For more about teaching in the contact zone, see Mary Louise Pratt, "Arts of the Contact Zone," *Profession* 91 (1991) 33-40. See also *Professing Theory in the Contact Zone*, ed. Janice M. Wolff (Urbana, IL: NCTE, 2002). The metaphor of the contact zone is related, in feminist criticism, to the metaphor of borderlands discussed in note 38.

[7] Portfolio research conducted by the Department of Humanities can be found in recent studies describing longitudinal assessment efforts (Nancy W. Coppola, "Setting the Discourse Community: Tasks and Assessment for the New Technical Communication Service Course. *Technical Communication Quarterly*. 8.3 (1999): 249-267), studies of on-line portfolios (Carol Johnson. 2005. Cycles of Improvement: Assessing Validity in Technical Writing Programs Using Online Portfolios. Paper presented at the annual meeting of Best Assessment Processes VII Symposium. Symposium sponsored by Rose-Hulman Institute and the Accrediting Board for Engineering and Technology, Terra Haute, IN), and of graduate student writing (Nancy Coppola and Norbert Elliot, "Assessment of Graduate Programs in Technical Communication: A Model," in J Allen and M Hundleby (Eds.), in *Assessment in Professional and Technical Communication* (New York: State University of New York Press, forthcoming). Research leading to the present study of information literacy can be found in Norbert Elliot, Vladimir Briller, and Kamal Joshi, "Portfolio Assessment: Quantification and Community," *Journal of Writing Assessment* 3.1 (2007, forthcoming). The NJIT Department of Humanities, in addition, maintains a site describing its range of assessment activities (College Writing Assessment, http://cwa.njit.edu/ accessed June 28, 2006).

[8] Samuel Messick, "The Interplay of Evidence and Consequences in the Validation of Performance Assessments," *Educational Researcher* 23. 2 (1994): 13-26. For a full explication of Messick's thesis, see Messick, "Validity" in *Educational Measurement*, 3rd ed., ed. Robert. L. Linn, 3-103 (New York: American Council on Education, 1989). Concepts of validity and reliability in the present study have also been informed by the American Educational Research Association, American Psychological Association, National Council on Measurement in Education, *Standards for Educational and Psychological Testing* (Washington, DC: American Educational Research Association, 1999).

[9] The senior seminars are a series of courses on diverse topics from Shakespeare on film to documentary studies. The series, however, is unified under a common set of course goals: to engage each student as a unique individual capable of humanistic appreciation of cultures and their diverse complexities, to engage that student in the course content through seminar techniques; to improve the communications skills of each by means of writing-as-process techniques which reinforce engagement with the course content; to improve the communication skills of each student by means of oral presentation techniques—student-led discussion topics, informal presentations, and formal presentations— techniques which reinforce engagement with the course content.

[10] Bonnie Gratch Lindauer, Lori Arp, and Beth Woodard, "The Three Arenas of Information Literacy Assessment." *Reference & User Services Quarterly* 44.2 (2004): 122-129.

[11] Carlson investigated bibliographies across six departments: Art, Classics, English, History, General Humanities, and Religion. In the present study, courses addressing each of these areas are offered within the unit. While Carlson found variance in citation behavior in academic discipline and level of course, such infrastructure issues (as they impact assessment and subsequent instruction based on the assessment results) are lessened in the Department of Humanities, a unit in which the majority of instructors teach courses from the first through the senior years. See Jake Carlson, "An Examination of Undergraduate Student Citation Behavior," *The Journal of Academic Librarianship* 32.1 (2006): 14-22.

[12] This definition of community is informed by George S. Wood and Juan C. Judikis, *Conversations on Community Theory* (West Lafayette, IN: Purdue University Press, 2002), 12-17. As well, the commitment to civil inquiry—"overcoming the fragmentation of consciousness without illegitimately distorting or suppressing any of its modes" (24)—is taken from Glenn Tinder, *Community: Reflections on a Tragic Ideal* (Baton Rouge, LA: LSU Press, 1980).

[13] The sampling plan for all portfolio assessment work undertaken at our institution is based on a two stage process: formula estimation; and both demographic and academic comparison. In stage 1, Equation 1 is used to provide the basic formula used for calculating a sample size at α level of confidence within $\pm$E units of the population mean in each of the cohorts. Because it is time-consuming to read each portfolio twice, we begin with a 90% confidence interval:

$$n = \left[Z\alpha/2 * \sigma/\mathrm{E} \right]^2 \qquad (1)$$

Where

$Z_{\alpha/2}$= 1.65, the Z-value associated with a 90% confidence interval

α = the Type-1 error rate

σ =1.31, the population estimated standard deviation; the estimates in this example, shown in equation 2 below, are based the calculations from the overall portfolio score standard deviation from the previous (fall 2004) semester senior seminars

E = the margin of error, in this case .25, the standard error as calculated from the overall portfolio score from the previous (fall 2004) semester senior seminars

Hence, inserting the values associated with the fall 2004 senior seminars in order to calculate the spring 2005 sampling plan, we find in Equation 2 that

$$n = \left[1.65 * 1.70 / 1.9\right]^2 \quad (2)$$

$$n = 215$$

However, during the three hours allotted to sustainable portfolio reading at the end of each semester, this number would have been nearly double the amount realistically handled by the 13 instructors serving as readers who independently assess each portfolio twice. (During the spring of 2005, 21 sections of the senior seminars were offered to 404 students.) Hence, Equation 1 was recalculated to yield the 80% confidence interval shown in Equation 2:

$$n = \left[1.282 * 1.70 / 1.9\right]^2 \quad (3)$$

n = 131

At this point, a random sample, taken across sections, is prepared of each student in each section of the senior seminars. During the last weeks of the class—a period selected to minimize instructor bias in portfolio preparation and to include only those students who have remained beyond the withdrawal data and are, thus, committed to the courses—instructors are notified which portfolios must be collected for the assessment. When the portfolios are collected, we perform the final sampling plan calculation, this time based on the portfolios on hand. In the spring of 2005, 100 portfolios were submitted. Thus, Equation 1 is now used with a $Z_{\alpha/2}$ associated with a 75% confidence interval:

$$n = \left[1.15 * 1.70 / 1.9\right]^2 \quad (4)$$

n= 106

Thus, as Equation 4 shows, the 100 portfolios to be read yield approximately a 75% confidence interval.

Phase 2 of the sampling plan design begins with the demographic comparison. During the spring of 2005, the demographic profile of our diverse senior students was as follows: male (*N*=1, 282, 79.9%), female (*N*=322, 20.1%0), African American (*N*=162, 10.1%), Asian American (*N*=162, 22.5%), Hispanic (*N*=215, 13.4%), Caucasian (*N*=564, 35.2%), and unknown (*N*=212, 13.2%). Comparatively, the 100 students in our sample had an extraordinarily similar demographic profile: male (*n*=74, 74%), female (*n*=26, 26%0), African American (*n*=11, 11%), Asian American (*n*=29, 29%), Hispanic (*n*=14, 14), Caucasian (*n*=31, 31%), and unknown (*n*=15, 15%). The percent of men (74%) and women (26%) were identical for both the general and sampled groups. African-American and Hispanic students were also sampled in near-equal percentages. While Asian-American students and students declining to record their ethnicity were slightly over sampled, Caucasian students were slightly under sampled. The academic comparison is made with two markers: SAT Math and Verbal scores; and cumulative grade point average. During the spring of 2005, the admissions tests scores were as follows: SAT Math (*M*= 594), SAT Verbal (*M*=522). Comparatively, the 100 students in our sample had a similar admissions profile SAT Math (*M*=582), SAT Verbal (*M*=524). The average grade point average for seniors during the spring 2005 was 2.94; the cumulative grade point average for the 100 students in the sample was somewhat higher at 3.07.

Thus, our two-stage process of sampling plan design afforded a 75% confidence interval regarding the scores on our program assessment; as well, the sampling plan yielded a nearly perfect representation of the diversity present in our graduating seniors and a comparative profile of admissions scores and grade point average.

[14] Alan. C. Purves, Thomas P. Gorman, and Sauli Takala, "The Development of the Scoring Scheme and Scales," in *The IEA Study of Written Composition I: The International Writing Tasks and Scoring Scales*, 41-58 (Oxford: Pergamon Pres, 1988).

[15] Fred I. Godshalk, Frances Swineford, and William E. Coffman, *The Measurement of Writing Ability* (New York: College Entrance Examination Board, 1966). For more on the use of the combination of analytic and holistic scoring, see Elliot, Briller, and Joshi, "Portfolio Assessment: Quantification and Community."

[16] Most significant in the literature review used to validate the construct of information literacy in the present study were the following: Particia Senn Breivik and Gordon E. Gee, *Information Literacy: Revolution in the Library* (Phoenix, Arizona: American Council on Education and Oryx Press, 1989); Lori

Arp, "Information Literacy or Bibliographic Instruction: Semantics or Philosophy?" *RQ* 30.1 (1990): 46-49; Lisa G. O'Connor, Carolyn J. Radcliff, and Julie A. Gedeon. "Applying Systems Design and Item Response Theory to the Problem of Measuring Information Literacy Skills," *College and Research Libraries*. 63.6 (2002): 528-543; Hannelore B. Rader, "Information Literacy 1973-2002: A Selected Literature Review," *Library Trends* 51.2 (2002): 242-59; and Ilene Rockman, ed., *Integrating Information Literacy into the Higher Education Curriculum* (San Francisco: Jossey-Bass, 2004).

[17] Carol Rutz and Jacqulyn Lauer-Glebov, "Assessment and Innovation: One Darn Thing Leads to Another," *Assessing Writing* 10 (2005): 80-99.

[18] Walther Ong, *Orality and Literacy: The Technologizing of the Word* (London: Methuen, 1982). See especially 36-57.

[19] Association for College & Research Libraries, *Information Literacy Competency Standards for Higher Education*, 3.

[20] International ICT Literacy Panel, *Digital Transformation: A Framework for ICT Literacy* (Princeton: ETS, 2002), 1. http://www.ets.org/portal/site/ets/menuitem.c988ba0e5dd572bada20bc47c3921509/?vgnextoid=a1cfaf5e44df4010VgnVCM10000022f95190RCRD&vgnextchannel=6773e3b5f64f4010VgnVCM10000022f95190RCRD (accessed June 28, 2006).

[21] Shirley Brice Heath, "The Fourth Vision: Literate Language at Work," in *The Right to Literacy*, edited by Andrea A. Lunsford, Helene Moglen, and James Selvin, 289-306 (New York: MLA, 1990). For more connections between writing and citizenry, see Deborah Brandt, *Literacy in American Lives* (Cambridge: Cambridge UP, 2001).

[22] Association for College & Research Libraries, *Information Literacy Competency Standards for Higher Education*, 2. References to connections between the need for information literacy and the desire for an informed citizenry are also made on 4 and 7.

[23] Educational Testing Service, ICT Literacy Assessment: An Issue Paper from ETS, 6.

[24] A similar orientation is found in James Elmborg, "Critical Information Literacy: Implications for Instructional Practice," *The Journal of Academic Librarianship* 32.2 (2006): 192-199.

[25] Brian Huot, *(Re)Articulating Writing Assessment for Teaching and Learning* (Utah: Utah State University Press, 2002). For more on the assessment of writing ability, see Patricia Lynne, *Coming to Terms: A Theory of Writing Assessment* (Utah: Utah State University Press, 2004), *Norbert Elliot, On a Scale: A Social History of Writing Assessment in America* (New York: Peter Lang, 2005), and Edward M. White, "The Scoring of Writing Portfolios: Phase 2." *College Composition and Communication*, 56.4 (2005): 581-600. The use of rubrics described by Elizabeth Choinski, Amy E. Mark, Missy Murphey is similar to the approach proposed by White: "Assessment with Rubrics: An Efficient and Objective Means of Assessing Student Outcomes in an Information Resources Class," *Libraries and the Academy* 3.4 (2003): 563-575.

[26] Janice M Lauer and J. William Asher, *Composition Research: Empirical Designs* (Oxford: Oxford UP, 1988). See esp. 261-266. See also Roger D. Cherry and Paul R. Meyer, "Reliability Issues in Holistic Assessment," in *Validating Holistic Scoring for Writing Assessment: Theoretical and Empirical Foundations*, 109-141, ed. Michael M. Williamson and Brian A. Huot (New Jersey: Hampton Press, 1993). For more information on the practical aspects of designing successful assessment episodes in which written texts are evaluated, see the following: Norbert Elliot, Maximino Plata, and Paul Zelhart, *A Program Development Handbook for the Holistic Assessment of Writing* (Lanham, University Press of America, 1990); Edward M. White, *Teaching and Assessing Writing*, 2nd ed. (West Lafayette, IN: Calendar Islands Publishers and Parlor Press, 1998).

[27] Stemler, Steven E. "A Comparison of Consensus, Consistency, and Measurement Approaches to Estimating Interrater Reliability." *Practical Assessment, Research & Evaluation* 9.4 (2004). http://PAREonline.net/getvn.asp?v=9&n=4 (accessed June 28, 2006).

[28] Stemler, Steven E. "A Comparison of Consensus, Consistency, and Measurement Approaches to Estimating Interrater Reliability."

[29] For an innovative and promising method of portfolio assessment that is similar to the one used in the present study, see Martha W. Ostheimer and Edward M. White, E. M. "Portfolio Assessment in an American Engineering College." *Assessing Writing* 10.1 (2005): 61-73. For more on unresolved issues of scoring in portfolio assessment, see Robert Broad, " 'Portfolio Scoring:' A Contradiction in Terms," in Laurel Black et al., eds., *New Directions in Portfolio Assessment: Reflective Practice, Critical Theory, and Large-Scale Scoring*, 263-276 (Portsmouth, NH: Boynton/Cook, 1994)

[30] Loanne L. Snavely and Carol A. Wright, "Research Portfolio Use in an Undergraduate Honors Education: Assessment Tool and Model for Future Work," *The Journal of Academic Librarianship* 29.5 (2003): 298-303.

[31] Pamela Moss, "Can There Be Validity without Reliability?" *Educational Researcher* 23.2 (1994): 5-12. See also Michael Williamson, "The Worship of Efficiency: Untangling Theoretical and Practical Considerations in Writing Assessment." *Assessing Writing* 1.2 (1994): 147-173.

[32] Guba, Egon G. and Yvonna S. Lincoln., *Fourth Generation Evaluation* (Newbury Park: CA: Sage, 1989).

[33] Roberta Camp, "New Views of Measurement and New Models for Writing Assessment," in *Assessment of Writing: Politics, Policies, and Practices*, 135, eds. Edward M. White, William Lutz, and Sandra Kamusikiri (New York: MLA, 1996)

[34] Middle States Commission on Higher Education, *Developing Research & Communication Skills* 7.

[35] Rui Wang, "The Lasting Impact of a Library Credit Course," *Libraries and the Academy* 6.1 (2006): 79-92.

[36] Wendy Holliday and Britt Fagerheim, "Integrating Information Literacy with a Sequenced English Composition Curriculum," *Libraries and the Academy* 6.2 (2006): 169-184.

[37] ACRL, "Research Agenda for Library Instruction and Information Literacy," *College & Research Libraries News*, 64.2 (2003): 108-13.

[38] Gloria Anzaldúa, *Borderlands/LaFrontera: The New Mestiza* (San Francisco: Aunt Lute, 1987). See also Susan Stanford Friedman, *Mappings: Feminism and the Cultural Geographies of Encounter* (Princeton: Princeton UP, 1998), and Ivy Schweitzer, "For Gloria Anzaldúa: Collecting America, Performing Friendship," PMLA 212.1 (2006): 258-291. The kind of orientation suggested by Clarance Maybee is very much the kind of mestiza consciousness—here called phenomenological—that is needed for contemporary information literacy instruction: "Undergraduate Perceptions of Information Use: The Basis for Creating User-Centered Student Information Literacy Instruction," *The Journal of Academic Librarianship* 32.1 (2006): 79-85.