Assessing Information Competence of Students using iSkills™ : a Commercially-Available, Standardized Instrument

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Since the publication of the Association of College and Research Libraries information literacy standards, a growing number of higher education institutions have implemented information competency initiatives. To inform instructional improvement, librarians and other faculty often construct locally designed information competence assessments. Although tailored to the interests of the institution, homegrown assessments can be labor intensive to develop, administer, and score, and may lack the reliability and validity needed for usable results. The iSkills assessment, a third-party tool, provides an alternative for institutions faced with developing information competence assessments. The iSkills assessment reflects collaborations with academic librarians from across the U.S., embodying a national perspective of information competence. Evidence for the reliability and validity of the instrument comes from studies conducted at many institutions, compared with the single-school perspective of most locally developed assessments.

The iSkills instrument plays a key role in several assessment projects being conducted throughout the California State University (CSU) system and at the University of Central Florida (UCF). This paper, which supplements the 2008 Library Assessment Conference panel, is presented in three parts. The first section addresses the instrument's purpose and development and the latter sections detail how UCF and CSU are using iSkills to assess student learning and evaluate instructional efficacy.

The ETS iSkills™ Assessment

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Background

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. A consortium of seven college and university systems worked with ETS to tailor this international framework to the needs of higher education, refining the intended construct (skills to be assessed) in the process. Over a 2-year period, consortium members and other institutions collaborated in the design, development, and testing of the iSkills assessment.

Through development of the assessment, consortium members further refined and deepened the construct, tying it to established information competence standards (e.g., Association of College & Research Libraries, 2002) by identifying seven performance areas: 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).

Assessment Description

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 each task in the context of a simulation (for example, e-mail, Web browser, or library database) that has the look and feel of a typical application. In the assessment, for example, students might encounter a scenario requiring the use of a search engine to access information from a database (Figure 1). 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. The scoring for the iSkills assessment is completely automated. Unlike a multiple-choice question, each simulation-based task provides many opportunities to collect information about a test taker and allows for alternative solution paths. Scored responses are

produced for each part of a task, and a student's overall score on the test is an aggregation of the individual scored responses across all the assessment tasks.

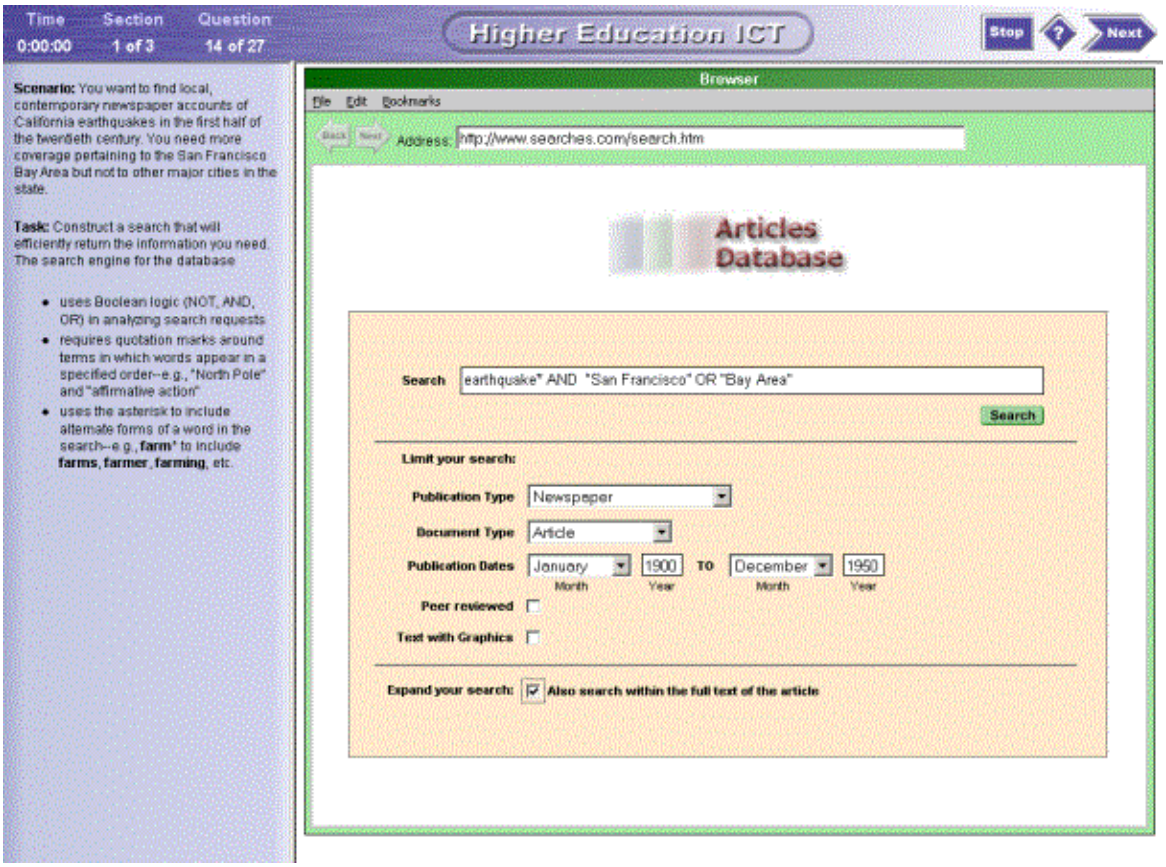

Figure 1. In the iSkills assessment, students demonstrate their skills at handling information through interaction with simulated software. In this example task, students develop a search query as part of a research assignment on earthquakes. © 2007 Educational Testing Service. All rights reserved.

The assessment differs from existing measures in several ways. As a large-scale measure, it was designed to be administered and scored across units of an institution or across institutions. As a scenario-based assessment, students become engaged in the world of the tasks, which are representative of the types of information competency assignments students should be seeing in their coursework. As a simulation-based, performance-based assessment, the iSkills assessment purports to elicit higher-order critical thinking and problem-solving skills.

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. Katz (2007) provided further details on the assessment, including its development, field testing, reliability, and validity research.

Using iSkills™ to Measure Instructional Efficacy: An Example from the University of Central Florida

Penny Beile

University of Central Florida

The University of Central Florida established an Information Fluency initiative in 2006, with the objective of integrating information fluency across the curriculum. Programs and departments across the institution applied to and were competitively selected to participate. The programs initially selected were Philosophy, Nursing, Honors and SLS, which is a student success program. Program faculty decided what the information fluent student in their respective disciplines would look like upon exiting the program as well as how they would assess whether students met those objectives. This section focuses on the Nursing program and discusses their assessment plan and results of the assessment to date. Baseline data were collected on a cohort of entering Nursing students at UCF to identify skill levels and student needs prior to instructional intervention. Nursing faculty and librarians are working together to develop and integrate information-intensive assignments and instruction to ameliorate identified deficiencies. Instructional efficacy will be evaluated by comparing the baseline data to assessment performance of future nursing cohorts. The baseline data have been collected and early results compared to demographic variables.

Background

With over 50,000 student enrollments the University of Central Florida (UCF) is currently the sixth largest academic institution in the United States. The regional accrediting body is the Southern Association of Colleges and Schools (SACS) and the university came up for reaffirmation in 2006. At that time SACS had recently instituted a new requirement for reaffirmation called a Quality Enhancement Plan (QEP), which is loosely defined as an opportunity for the institution to enhance overall quality and effectiveness by focusing on an issue the institution considers important to student learning. After a rigorous process that sought input from faculty, staff, students, business people and alumni UCF selected information fluency as its QEP.

Upon SACS approval of information fluency as the institution's QEP, a call for participation was extended to university programs and departments. The four programs selected for the first year of the plan included Philosophy, Honors, Nursing and SLS, a student success program. Early on it was evident that program faculty held differing conceptions as to what information fluent graduates from their programs should look like, so they defined what information fluent students exiting their programs should look like. Further, with student learning as the focal point of the accreditation-driven initiative, the QEP implementation team created an assessment committee to work with programs on selecting appropriate measurement techniques.

Librarians worked closely with the faculty at a weeklong professional development institute and multiple assessment methods and instruments were presented and benefits and challenges of the various approaches were discussed. Ultimately, the faculty from the participating programs selected the type of assessment that best fit their objectives or that was most congruent with their disciplines. For example,

Honors and Philosophy students are expected to produce a lot of papers, so those programs had the option of using rubrics to evaluate the quality of the literature cited and their use in developing and supporting their arguments. Conversely, the Nursing program has a tradition of using objective measures to assess student learning so they opted to use cognitive tests, including iSkills.

Although UCF has employed a variety of methods for assessing students' information fluency skill levels, the central point of this paper is to discuss how and why iSkills was developed and to share how CSU and UCF have respectively used iSkills. To that end, iSkills is the only assessment reported on in this paper. Further, because UCF is most interested in measuring student learning, the QEP assessment committee emphasized the use of direct measures that assess the cognitive domain, as opposed to indirect measures that look at feelings, beliefs, and attitudes.

Direct measures are often categorized as objective or interpretive. Typically, objective measures have a limited number of responses (e.g., multiple choice and true/false) and consequently are fairly easy to score. These instruments are designed to assess knowledge of a topic. Some information literacy tests that fall into this category are the Standardized Assessment of Information Literacy Skills (SAILS) test and James Madison University's Information Literacy Test (ILT). Interpretive measures are also referred to as authentic assessments because they assess actual performance or behavior. For programs that want their students to produce better researched and documented papers rubrics can be applied that assess the quality of citations used by students. The iSkills instrument can be conceived of as a hybrid, as it is the only information literacy instrument that has attempted to cross the knowledge/performance dichotomy.

Table 1 illustrates a few of the differences between objective and interpretive measures. For example, there is a difference in cost, both in dollars and time, with developing or purchasing an instrument as compared to the labor to score and analyze interpretive data. Generally, trade-offs are involved in any large scale assessment and the decision to use a particular method is often based on the type of information needed and the pragmatics of administration and scoring. These were some of the issues the initial four programs faced when developing their assessment plans.

Method

The BSN degree in Nursing is a two year program that accepts 120 students per year. Entering students begin coursework in the fall semester and matriculate through a set program of courses. Although the curriculum emphasizes information gathering and synthesis, there are few assignments that require extensive writing. The Nursing faculty's plan is to collect baseline data to assess student skills, design and implement curricular and instructional interventions at the program level, and then reassess to evaluate the effectiveness of these changes. Assessment will be carried out at both the cohort level and across cohorts and continue for at least five years. Specifically, iSkills will be administered to the cohort of Nursing students at the beginning of the program and again upon exit. Entry and exit test scores of the same cohort will be compared to measure student growth and to see how cohort scores have changed over the span of the program.

Table 1
Direct Measures: A Comparison of Objective and Interpretive Instruments

	Objective	**Interpretive**
Costs	$$ to purchase	Labor to score
Administration	Large scale	Smaller numbers
Results	Wide and thin	Narrow and deep
Domain	Knowledge	Performance

Baseline data will help determine whether students have the information and communication skills expected of rising juniors (i.e., if they are adequately prepared to enter the program). This data has implications for the general education program and the instructional design of the Nursing curriculum. Administering the assessment to the first cohort as they exit the program will reveal whether student scores have increased. This cohort will not have received any instructional intervention, so they are essentially acting as a control group. This will provide an indication of the effect of maturation or variables other than enhanced instruction on student scores, which can be controlled for in later analysis.

Scores across cohorts will also be compared to assess the effectiveness of instructional interventions at the program level. Examples of interventions include exposure to library instruction sessions, increased information-intensive assignments, and expressed information-related objectives as they relate to the Nursing profession. It is expected that instructional improvements will raise cohort scores over time. Table 2 offers a graphical representation of the assessment plan.

The project is entering its second year, and baseline data for Cohort 1 were collected in fall 2007. The iSkills assessment will be administered to entering Cohort 2 Nursing students fall 2008; in 2009 iSkills will be administered to entering Cohort 3 students and graduating Cohort 1 students. At that point we will begin to develop a more robust picture of where the Nursing students are at entry, what skills they have developed during the program, and how instructional changes have impacted their skill levels.

Table 2
2007-2012 Assessment Plan

	Program Entry		**Program Exit**
Cohort 1	Baseline, no intervention, design instruction to target deficiencies (2007)	⇨	Maturation, possibly control for that later (non-instructional variables) (2009)
⇩			
Cohort 2	Intervention effect (2008)	⇨	Growth in program (2010)
⇩			
Cohort 3	Intervention effect (2009)	⇨	Growth in program (2011)
⇩			
Cohort 4	Intervention effect (2010)	⇨	Growth in program (2012)

⇨ = cohort growth over span of program

⇩ = instructional efficacy/curricular interventions; continue to revisit the design with future cohorts

Results

At the time of this writing assessment data have been collected only for entering Cohort 1 students, therefore no comparisons can be made across or within cohorts. However, descriptive results from the baseline administration are informative. Of the 114 students enrolled in the program, 107 completed the

iSkills assessment. Scores for the 107 students ranged from 485 to 625 (M=561.36, SD=29.94). iSkills has an established cut score of 575 for rising juniors, which suggests this cohort is slightly below expectations for that level. These results have implications for the general education program and the academic preparation of students before they start work in their major, in addition to the Nursing faculty who may need to include instruction on basic skills they would expect students to have upon entering the program.

Scores were also correlated with SAT scores (r(96)=.443, p<.01), course grade (r(113)=.251, p<.01), and overall GPA (r(113)=.035, p=.72). iSkills scores correlated to SAT scores at .443 (p<.01) which indicates a moderate positive relationship; as scores on the SAT increase, so do scores on iSkills. The correlation with course grade (r(113)=.251, p<.01) is not as strong, but it is a positive one. Of course, the number of students in the sample and the correlation statistic prohibit making any claims, but it does constitute an interesting line of inquiry. Are students who have higher test scores (and therefore information and communication skills) more likely to be successful in their coursework? Is information literacy tied to academic achievement? It makes sense that students with higher information literacy skill levels will be better prepared to complete class assignments that require information gathering and use, but little evidence exists to support this claim. It is hoped that future analysis may shed some light on these questions. There was no apparent relationship between iSkills scores and overall GPA, which is the average grade achieved at general education level.

Discussion

Program level assessment can be used to identify where instruction is needed, to assess the efficacy of instructional interventions and models, and to provide evidence that academic institutions are meeting their instructional goals. Additionally, assessment can also help the library demonstrate its value as a contributor to the academic mission of the institution and position librarians as instructional partners with the teaching faculty. Assessing student learning can provide insight into the question of how effective are our current instructional models and possibly lead us to explore new frameworks, improve our own practice, and strengthen our research.

To close, this model – both the assessment plan and the use of iSkills as an assessment tool – has promise to meet the conference theme of assessment that is effective, practical and sustainable. With that said, assessment of student learning outcomes using objective instruments in general, and the use of iSkills in particular, is not without its challenges. Specifically, some things to consider prior to deciding on an assessment approach and instrument are the cost to purchase the test, the time it will take to secure testing labs, install software, and proctor the administration (a dry run is definitely suggested!), and perhaps the most challenging issue of all, how to recruit faculty and students. On the positive side, students report that they actually like taking iSkills, the score reports are informative, and iSkills has an established cut score for students who are exiting a two year program or entering into their program majors. Ultimately, iSkills is suggested as one assessment tool and indication of its use depends on a variety of factors.

Using iSkills to Measure Instructional Efficacy: Experiences from the CSU

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California State University

Background

The California State University (CSU), comprised of twenty-three campuses, is the largest university system in the country with nearly 450,000 students, many of whom are major contributors to the California workforce. Under the visionary leadership of the CSU Council on Library Directors (COLD), the CSU established themselves in the early nineties as pioneers in information competence, with the CSU Statewide Academic Senate endorsing information competence literacy as a critical skill for all graduates in 1999.

Subsequent to the 2001 International ICT Literacy Panel (International ICT Literacy Panel, 2002), ETS approached the CSU about a partnership to develop an assessment tool to measure information competence in the context of technology. In 2003, the CSU and ETS convened a group of charter institutions to develop an information competency assessment. Some CSU campuses participated in beta testing and all of the campuses administered this low-stakes test in 2005.

The CSU has sponsored an Information Competence Mini-Grant Program for discipline and library faculty partnerships since the late 1990s. Assessment and specifically use of the iSkills assessment was the focus of the 2006-2008 grant cycle. There were nine grants issued to California State University campuses which conducted research studies using iSkills: Long Beach, Los Angeles, San Marcos, Sacramento, San Jose, Sonoma, and the California Maritime Academy. This section provides a snapshot of use for two campuses of different sizes.

California Maritime Academy (CMA)

California Maritime Academy (CMA). The California Maritime Academy, with approximately 850 students, has a small, specialized bachelors program in global studies and maritime affairs, facilities engineering technology and other marine-related studies. As Mindy Drake, library faculty and project director describes, this studies' goals were to:

- Establish a pre-test baseline of information competency of incoming freshmen and current seniors using 2006-2007 data; and
- Create information fluency and communication literacy learning objectives, a rubric, and new assignments to be embedded into freshmen courses, using pre-existing data from 2005-2006.

Method

The CMA used the advanced version of the iSkills assessment to test freshmen in Computing 100: Introduction to Computing and Engineering 120: Engineering Communications, as well as seniors in capstone courses. Additionally, they added nine additional questions relating to computing familiarity to

the Demographic Profile Survey, thus providing for the opportunity for the individual campus to gain extra data relevant to their program.

In addition to iSkills scores and data, the results of this pre-test survey informed instructional interventions. Freshmen and seniors were tested early in the fall, prior to information literacy instructional activities, to create a baseline for freshmen and a clear picture of current senior abilities in this area.

Of the 151 freshmen tested, 137 tests provided analyzable data, constituting fifty-seven percent of the incoming freshmen. Similarly, of the eighty seniors tested, 49 were analyzed, representing thirty-two percent of the senior population.

Summary Results

Below is one of the many charts the CMA produced to analyze student performance. This graph depicts the average score of CMA incoming freshmen and seniors in 2006-2007. In the Advanced version of iSkills, each test-taker is assigned a score ranging from 400 – 700 points. Freshmen and seniors earned scores of 554 and 561, respectively. The red line represents the mean national score, based on approximately 1,200 early 2006 test takers. The freshmen scored roughly the same as the national test takers and the seniors did only slightly better. In early 2008, the National ICT Literacy Policy Council established foundational ICT Literacy (information competence in the context of technology) expectations for students taking both the Core and Advanced iSkills (Tannenbaum & Katz, 2008). Students entering upper-division coursework (Advanced iSkills) are expected to score at least 575. While it is not surprising that CMA freshmen do not yet meet this upper-division expectations, it is disappointing that both the CMA seniors and the national reference group fell short of the foundational level expectation.

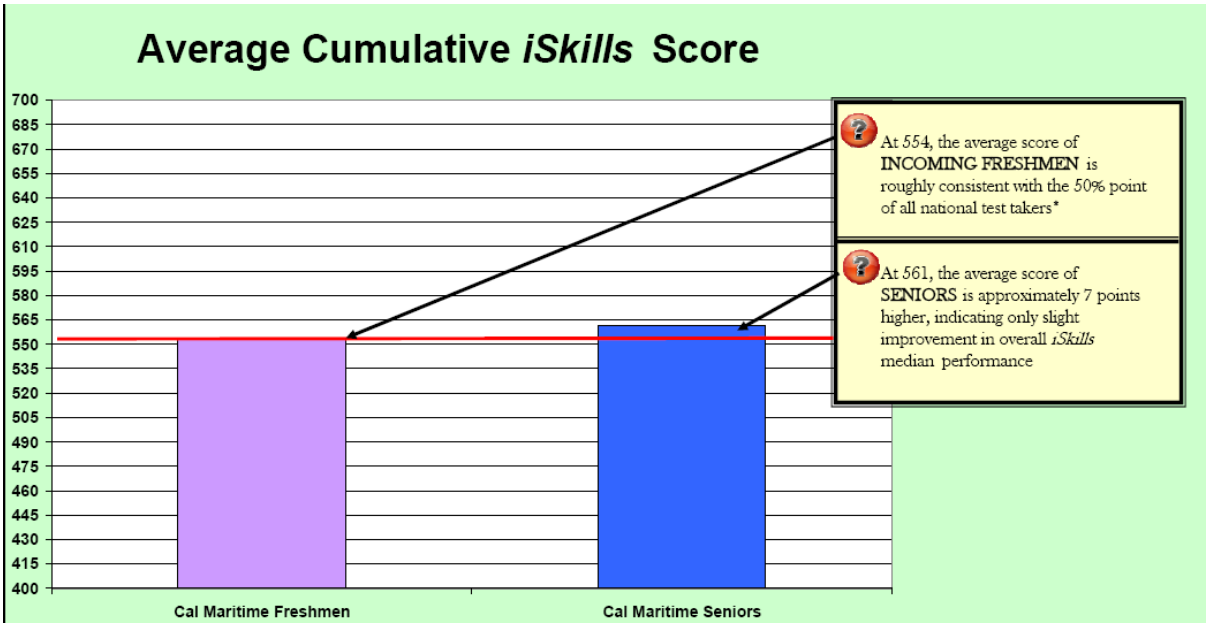

Figure 1: This chart demonstrates the performance of CMA incoming freshmen and seniors as compared to a group of national test takers.

Faculty at the California Maritime Academy used iSkills data in four meaningful ways: (1) to develop learning objectives for their information fluency program; (2) to establish a baseline of information competency for incoming freshmen; (3) to determine the information competency skill-set of current seniors; and (4) as a catalyst for innovation in design of information competency instructional activities for freshmen.

With the fruitful collaboration of Dr. Julie Chisholm, Dr. Paul Jackson, and librarian Mindy Drake, and robust iSkills data, this team was able to accomplish much during their year-long grant cycle. Deliverables included Information Fluency and Communication Literacy Learning Objectives; a rubric for assessing the development of information and communication technology skills within course assignments; modified assignments for Computing 100 and Engineering 120; and a syllabus for LIB 100: Information Fluency in the Digital World, a newly developed course with iSkills-influenced learning objectives taught this past academic year by Mindy Drake.

CSU Los Angeles (CSULA)

California State University Los Angeles is a medium-sized campus with approximately 21,000 students. A major goal of this study was to evaluate information competency-related instructional interventions. The motivating question for this research study was the following: Do the additional workshops in which some of the students participated result in measurable improvements in the students' information competence, as measured by iSkills scores? CSULA used the iSkills Advanced version as a pre-post test for nine sections of juniors and seniors (n=229) enrolled in Business Communications, an upper-division writing requirement for the College of Business and Economics, over the course of three quarters (Fall, 2006, Winter, 2007, Spring, 2007). Of the 229 students, approximately sixty percent were transfer students and seventy percent ESL students.

Method

Each quarter, there were two sections of the treatment group and one section of the control group, with instructor A teaching one control and one treatment section. The control group received the business 305 curriculum and a one and one-half hour lecture on library skills. In addition to the content received by the control group, the treatment groups also received two library workshops. Finally, one of the instructors for the treatment sections provided additional information literacy instruction in the form of an information literacy project.

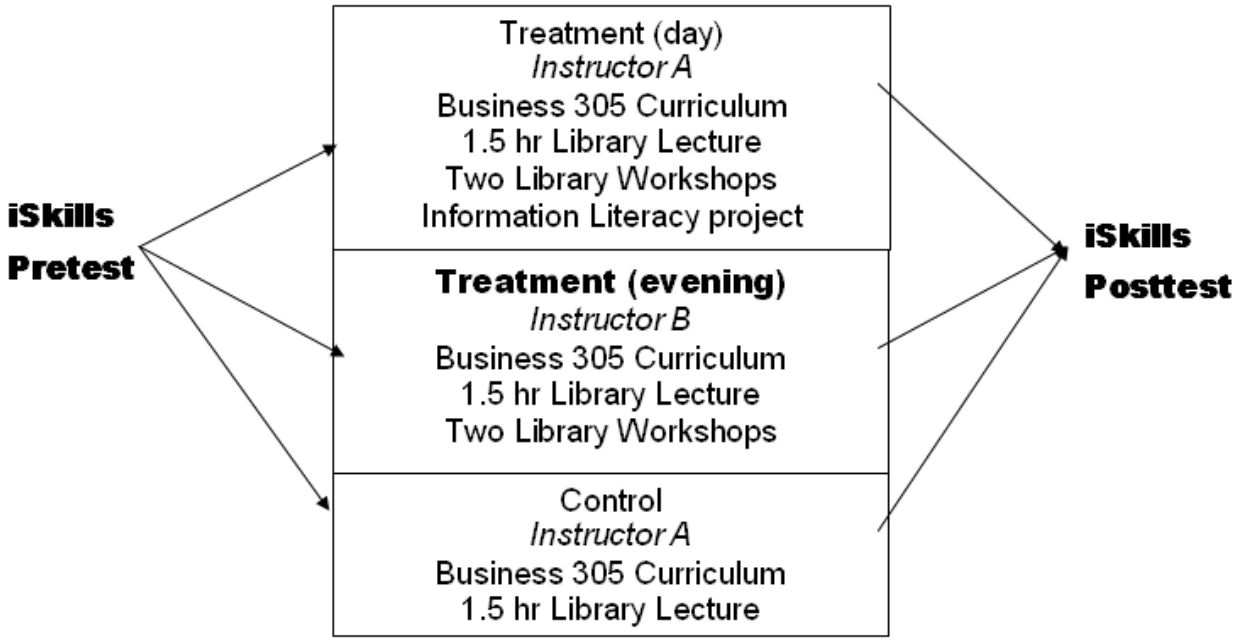

Figure 2: CSU Los Angeles Methodology

Summary Results

Results from fall, winter, and spring were combined for this statistical analysis. Of the 229 student test-takers, this comparison includes only those 159 students who completed both the pre-test and post-test. Figure 3 provides a comparison of pre-post test scores for the three groups. The workshops did not appear to have the intended effect in that students in the Treatment (DAY) and Control conditions showed similar improvement in iSkills scores. Thus, increases in scores cannot be uniquely attributed to the library workshops. Increases in Treatment (DAY) and Control groups might be due to factors such as instructor, time-of-day, or full-time status. The Treatment (EVENING) class showed no improvement in scores. The aforementioned factors could also contribute to the lack of effect for the this group.

Another feature of the CSULA study was its comparison of student performance by differing English proficiency. Texts for the iSkills tasks are targeting a tenth-grade reading level. Completing the iSkills assessment involves a large amount of reading. The degree of reading brings into question the validity of the assessment for non-native English speakers. Because of the timed nature of the test and dictionaries or other supplementary materials being prohibited, this may cause an unfair disadvantage to students whose first language is not English. Figure 4 presents data based on students' self-reporting of their English language skills. Students were asked whether they know English best, English and another language about the same, or another language best. In the figure "Another" refers to students who selected one of the latter two options.

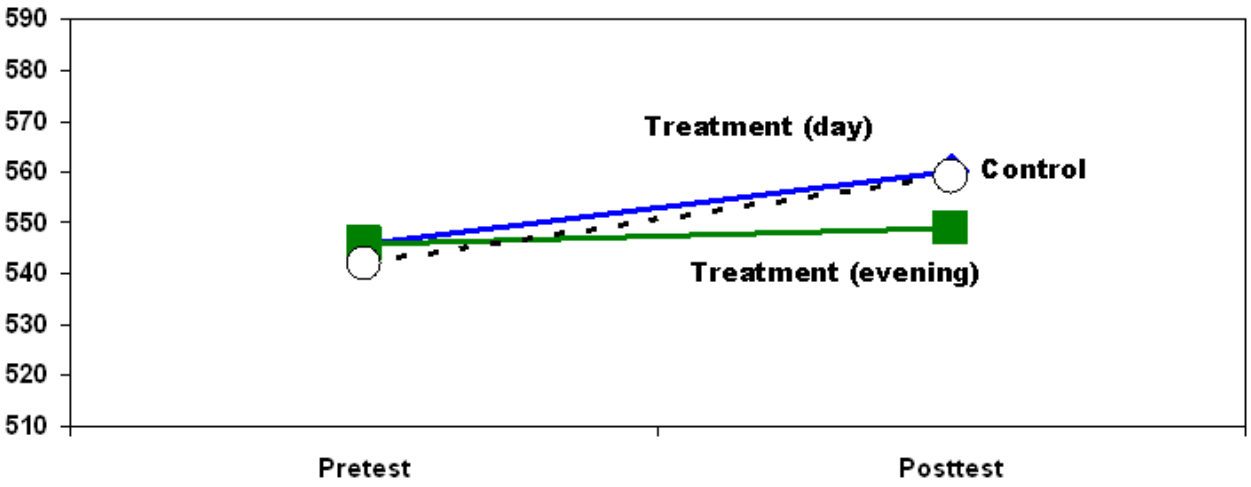

Figure 3: Summary iSkills Pre-Post Score results of Treatment and Control groups. Dashed line represents control group.

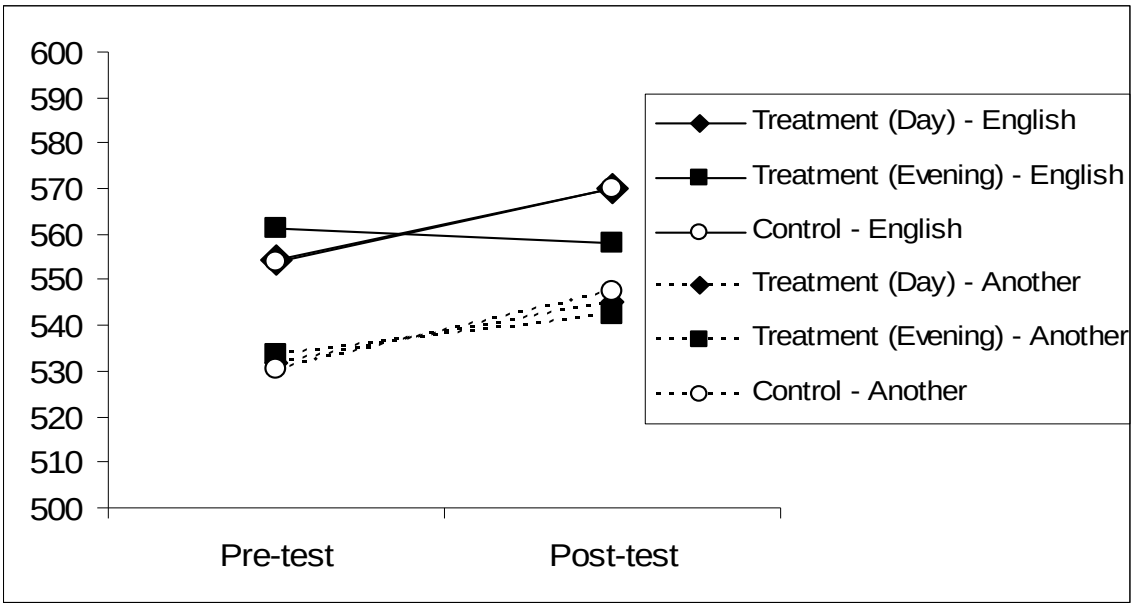

Figure 4: Solid line represent students reporting that English is their best language. Dashed lines represent students reporting that they speak a language other than English as well or better than they speak English. This chart demonstrates the performance of English-Best and Another-Best students across three experimental conditions.

Overall, students who reported knowing English best scored higher on the iSkills assessment than did other students. However, both English-Best and Another-Best groups showed similar increases in iSkills scores between the beginning and end of the business writing course, suggesting that they gained similarly from the combined experience of taking the iSkills assessment and completing the business communications course, regardless of receiving additional information literacy instruction.

Project directors Dr. Carol Blaszczynski and Catherine Haras will use the results for accrediting purposes and to provide evidence and rationale for a business course targeting information literacy skills (Blaszczynski and Haras, 2008).

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