Technical Writing as a Site for Assessing Information Literacy

**Judith Collins, Ph. D., Alysia Starkey, M.L.S., Beverlee Kissick, Ph.D.,
Jung Oh, Ph.D.**

Kansas State University-Salina

This paper describes indirect measures of significant gains in Information Literacy at Kansas State University-Salina's College of Technology and Aviation, as indicated by an annual library survey of users. The gains were achieved by faculty in technical writing (English) and librarians seeking to assess information literacy in a 300-level technical writing course for students in Engineering Technology, Aviation (professional pilot, airframe and power plant), and Technology Management. As other studies have found, tailored integration of course content with librarian partners causes significant differences in students' use of high-quality information resources. The results included an increase of over 200% in the search/retrieval numbers for a single database compendium, Infotrac. We also documented significant gains in search/retrieval ratios in the same database. Technical writing courses can be effective sites for implementing and assessing IL instruction, if tailored to the specific contexts of students' disciplinary programs.

Faculty/librarian partnership began with a joint review of literature in 2001, where we found support for our concerns: "Evidence is rapidly mounting that students cannot select appropriate sources of information, do not understand the structure or purpose of different sources of information, and cannot critically evaluate the information they retrieve"[1]. This trend appears in case studies of professional settings, as well. A poll in the journal of *Chemical Engineering Progress* documented Chemical Engineers' use of time to retrieve and use information on management, regulatory requirements, economic forecasts, and research methodologies. Respondents depended on personal collections or other engineers for information, because more than half were not able to find and use appropriate information[2]. Higher education may have assumed that corporations would train their employees in information retrieval, however, studies show that consulting others is the most common form of getting needed information on the job. Higher education must prepare its students for future professional demands, including knowledge-management capabilities, advocacy skills, resource investigation skills, and informal networking[3]. To participate in the knowledge-based economy, students should be skilled in "codified information and the competencies to use the information"[4]. Google is not enough.

Integrating IL into technical writing course objectives

Tailored instruction in specific courses is preferable to segregating IL instruction into a one-time, required, general education course. As other studies have found, the tailored integration of course content with librarian partners leads to significant improvements in students' use of high-

quality information resources[5].   In addition, the expansion of technical writing course outcomes to include IL is consistent with achieving objectives in TAC of ABET Criterion 2, h. ability to engage in lifelong learning; i. knowledge of contemporary professional, societal and global issues, and j. knowledge of contemporary professional, societal and global issues[6].

These TAC ABET criteria encouraged technical writing faculty/librarians to instruct database use beyond the offerings in Engineering Compendex and IEEE. Students were shown how to place technology issues in a broader social and industrial context, for example, by utilizing peer-reviewed journals in academic, business and industry fields in Expanded Academic Index or Business and Industry indexes. The technical writing faculty incorporated IL outcomes into her syllabus in the fall of 2002. (Other colleges, for example Arizona State University-East, have also experienced successful integrations of IL into a polytechnic curriculum by focusing on course outcomes in a technical writing course, where partnerships between technical communication and the library integrate "IL, information management, technology literacy, and writing"[7]).

Our course partnership emphasized technical writing as a site for two important outcomes involving IL:
- Professional *ethos*: improving students' rhetorical/communication strategies to embody professional *ethos*, or credibility, in their written communication. This requires that students exhibit technological literacy; the ability to speak and write in the language of their field, and development of IL skills retrieving and utilizing those sources of quality information.
- Pre-professional training: Exposure of students to a major, contemporary issue in their field as well as sources of quality information such as professional organizations, list serves, and professional journals, to provide students with practice preparing their documents for a job search in their field, including resume, cover letter, interview skills, online application processes, and portfolios of educational experiences.

Each of the objectives above is central to developing technical writing skills, yet each also requires high-level IL skills. (Assuming that students entering technical writing have already developed some library skills, basic information skills are distinguished from higher-level skills in that fundamental functioning entails knowledge and tool skills, whereas IL, literacy, requires the addition of cognitive strategies)[8].

IL is also a process: "attitudes and knowledge; the ability to learn, or complex of ways of experiencing information use"[9]. However, at our college, few faculty or students define IL in the same terms as librarians. In 2004, librarians polled faculty and students with a multiple-choice format question, "What does information literacy mean to you?". The survey allowed respondents to check as many of the provided definitions as they thought applied (possible responses were drawn from the Association of College and Research Libraries' definition of IL).

A minority of selections, 36.7%, refer to library instruction, with the largest number of selections, 47.7%, falling into the computer literacy category. (computer literacy is the

most basic aspect of IL). The nearly even spread between computer literacy and critical thinking is an expected result; however, library instruction, lifelong learning, and communication were close seconds relative to the far-distant ethics. The Association of College and Research Libraries definition of IL, however, includes A through F. Our informal poll illustrates three challenges for faculty/librarian partnerships. (a) Librarians must educate students and faculty about the full meaning of competent information-seeking. (b) The difference between a Google search result (where there are no controls on search returns) and a library subscription database result (where peer-reviewed journals can be specified) must be explained, and (c) Plagiarism must be presented as an ethical issue of information use. (Number of respondents = 373; 51 faculty, 316 students, 6 other):

Table 1: Faculty and student perceptions of Information Literacy.

137	36.7% of responses	A. Library Instruction
178	47.7	B. Computer Literacy
152	40.8	C. Critical Thinking
135	36.2	D. Communication
71	19	E. Ethics
125	33.5	F. Lifelong Learning

Literacy has been defined by United States Congress in the National Literacy Act of 1991 as an individual's ability to "read, write, and speak in English, and compute and solve problems at levels of proficiency necessary to function on the job and in society, to achieve one's goals, and develop one's knowledge and potential[10]. Beyond reading and writing, literacy now encompasses the notion of life-long learning, the ongoing development of potential, associated with work, home, and community[10]. A definition of technological literacy would entail the generation of creative solutions for technological problems, acting through technological knowledge, but in addition, require individuals to view technology and its involvement with the human world critically[11.] These definitions are congruent with TAC of ABET criterion 2, leading to a re-writing of technical writing's major assignment to emphasize IL.

Faculty/librarian partnership in technical writing

In 2002, Faculty and librarians identified key subscription databases in addition to engineering databases such as IEEE. These included Infotrac (an compilation of several distinct journal collections such as *Advanced Materials, Aerospace, Business Forum, Engineering, Technology and Culture*, as well as *IEEE Transactions* and numerous computing journals). Lexis Nexis Academic Business and Economics indexes were added to instruction in 2005, with offerings in Industry and Market, company profiles, and financial statements.

An existing assignment sequence was modified to require a ten-page analytical report on an issue or need in one's field addressed to a specific audience within an industry. The research process requires:

- A minimum of 10 library subscription database journals as sources. Journals are to be discipline-specific and peer-reviewed.
- No Internet sources, including manufacturer's web sites, unless use of this information is clearly justified, based on the subject, purpose, scope, and audience for the report.
- A research plan including a topic and a specific audience gleaned from research in Industry and Market databases.
- A determination of the need for information, based on audience analysis.
- Strategic selection of information sources based on audience needs and quality of information.
- An annotated bibliography demonstrating the relevance of each selected source to the rhetorical situation (audience and purpose).

Overall, the assignment sequence and related skill-development require 10 weeks of a 16-week semester. After students receive this major assignment, the librarian provides two full-hour visits to technical writing sections to give specific instruction in skills for developing key words (the controlled vocabulary of a discipline), and for navigating subscription databases. After each visit, students are required to apply the demonstrated skills to their own major project and turn that work in as an exercise for evaluation and feedback.

Examples of student projects include a report on how the Airframe and Powerplant Maintenance personnel shortage will affect commercial aviation for a hypothetical audience of the Executive Committee, Southwest Airlines; the potential of predictive maintenance to reduce downtime at hypothetical EGY Manufacturing for an engineering supervisor; and an analysis of how to reduce the number of firefighter deaths as a result of traffic accidents, for emergency personnel supervisors at a local fire district.

The librarian was instrumental in identifying appropriate databases for each technology program, and in giving specific, tailored instruction for the college's majors and for their assigned task. Because students were managing their own writing/research project they developed proficiency in the major aspects of IL outcomes as defined by the Association of College and Research Libraries, which includes identifying the need for information, efficiently retrieving the information, incorporating the information into one's knowledge base, and ethically using the information. Students' use of subscription databases college-wide was documented through database use-annual summary reports. Technical writing students' database preferences were documented through the annual library survey of users in 2004.

Results

The results here are preliminary and indirect, yet offer a clear depiction of change in students' use of subscription databases offered through our college library. (In the fall of

2006, librarians and faculty will evaluate student bibliographies on the major project in technical writing to assess whether the best available information was utilized, which will add to the portrayal of IL outcomes at our college). Two database services have provided us with data on numbers of retrievals, illustrating the effect of IL instruction (Figure 1).

The technical writing/librarian partnership did not focus on increasing Infotrac retrievals, yet the increased searches suggest that students on the whole are learning how to access, manage, and utilize peer-reviewed, discipline-specific information, to analyze and report on problems in an industry. (The 247% increase in Infotrac database use from 2002 to 2004 occurred when overall college enrollment declined from 1000 to 700 students).

Database Queries 02-05
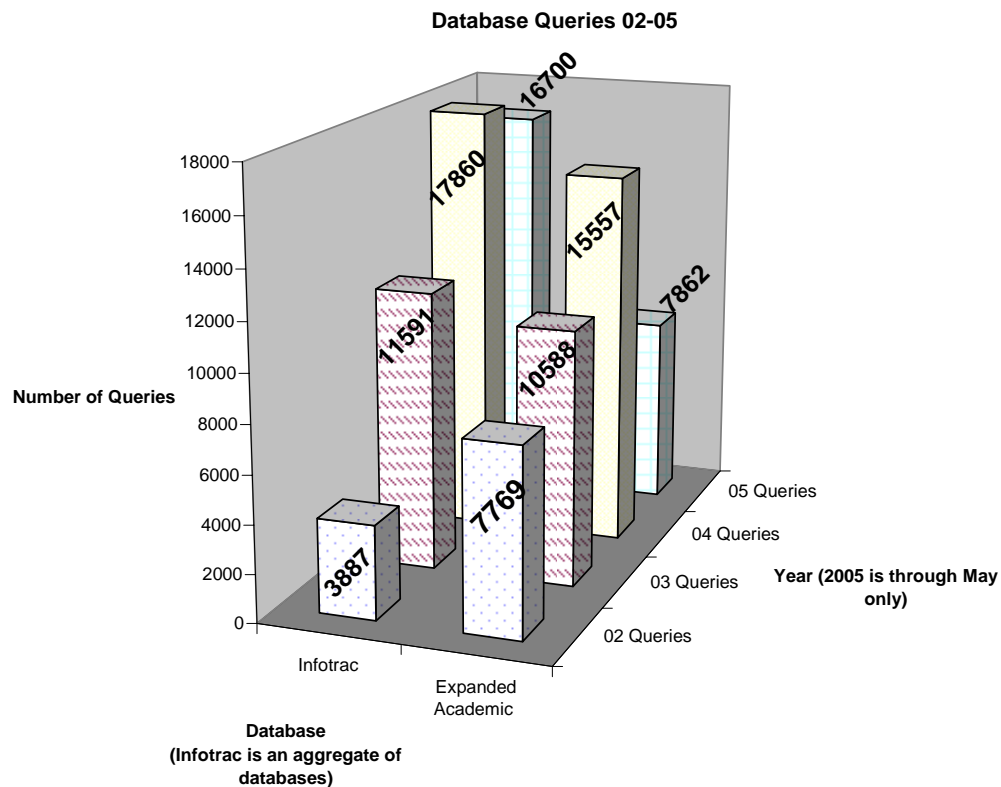
Figure 1: Database Query increases, 2002 to 2005

Data for Figure 1 were provided to the library directly from the database compendiums as annual summary reports. The bar graph shows the two databases most emphasized by the technical writing/librarian partnership. The increase in number of queries by library users from 2002 to 2005 is dramatic. 2002 provides a base-line number of queries recorded for Infotrac and Expanded Academic Index. (The figures for each database show number of queries by all users, college-wide).

Expanded Academic Index started in 2002 with a rate of use 5 times that of Infotrac, and between 2002 and 2004 saw a 47% increase in queries, from 7,769 to 15, 557. (The data for 2005 are through May only, meaning the figures for reveal a half-year of queries). Infotrac shows the strongest gains in queries, from 3,887 in 2002 to 17,860 in 2004. If

the half-year trend continues, Infotrac will finish 2005 with 33,400 queries, a record for our college, and a tenfold increase.

We cannot determine how much of this increase is the direct result of the technical writing partnership; however, no other writing courses at the college emphasize these particular databases. A similar trend is revealed in figure 2 by the Infotrac-reported "searches and retrievals producing results" for the years 2002-2005, where interesting patterns may be observed:
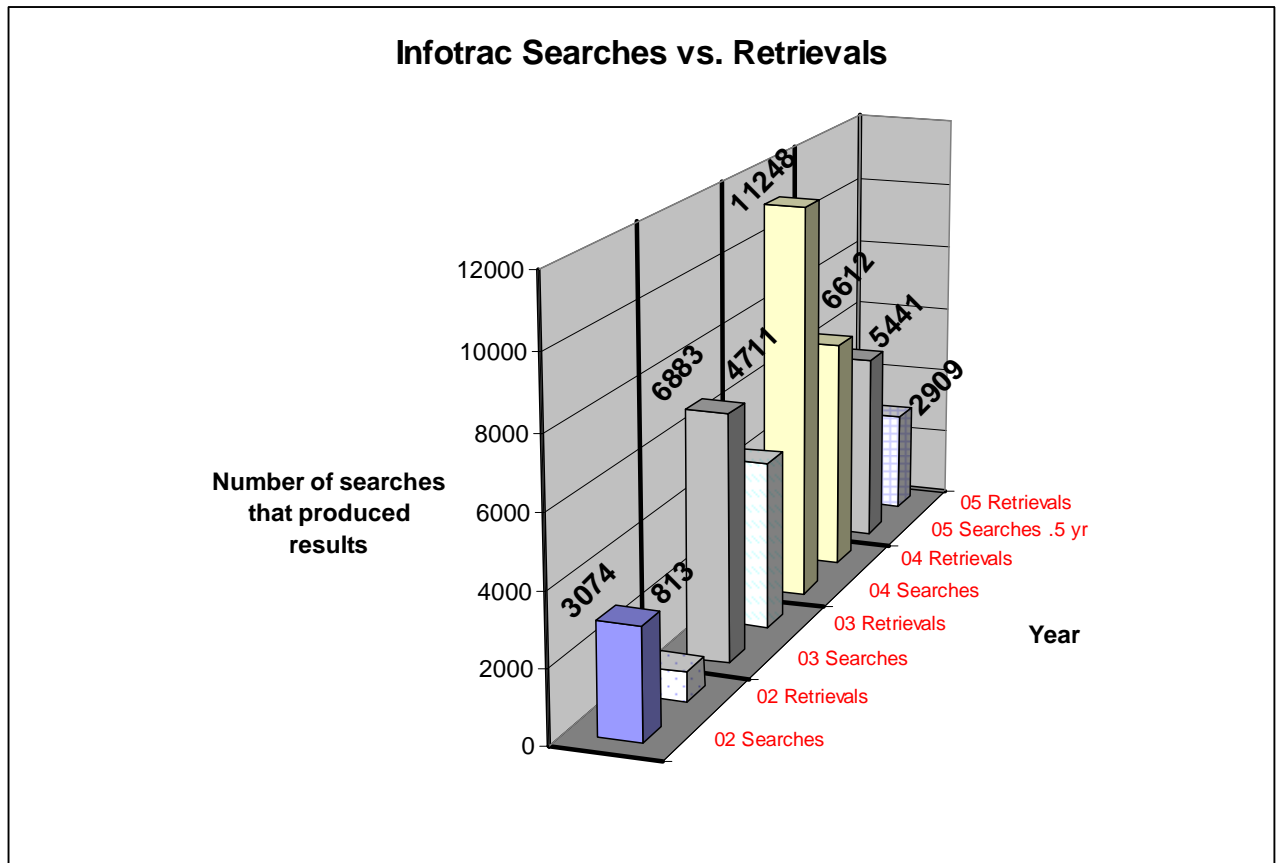
Figure 2: Ratio of Searches vs. Retrievals in Infotrac

College wide, the ratio of retrievals to searches increased over the period of technical writing/librarian instruction: Infotrac experienced a 5:1 search to retrieval ratio in 2002. This means that students searched, but only retrieved their results by email or printing articles or citations once for every five or six result hits. 2004 and 2005, however, show a nearly 2:1 ratio. Though we have no way currently to reveal the reasons for this shift in search/retrieval ratios, librarians plan to interview faculty who are making library assignments in 2005-06 to seek correlations between classroom assignments and student frequency of retrieval. (For example, an instructor may have decided to require full print or digital copies of articles students cited in their written work or presentations, which would lead to the increase shown here, if several instructors made the same requirement). Other possible factors influencing search/retrieval ratios include technical writing

faculty's insistence that all information be drawn from peer-reviewed, discipline-specific journals.

A 2004 survey of students college-wide revealed their preferences when assigned a research project in any course. Librarians asked students in a multiple-choice format to check their first and second choices among several research options. "Print" refers to resources such as handbooks, dictionaries, and print journals like *Aviation Week.* "Internet" refers to free-access web search techniques, for example through internet-service provider portals such as MSN and Yahoo. Internet also refers to search and meta-search engines such as Google and Ask Jeeves, as well as direct access to sites such as IEEE, CNN, or manufacturer's web sites. "Subscription" refers to the library's limited access digital journal archives, offered through compilation-databases such as Infotrac and Expanded Academic Index where students find peer-reviewed discipline-specific journals. "Librarians" refers to the often-overlooked resource of the library staff, who are well-qualified to aid students in their research efforts.

The results of this survey reflect well-documented national trends. The first choice reference source for 57% of students, is the Internet. Only 24.1% select subscription databases holding peer-reviewed journals as a starting point for research. Few will consult print (7.7%) and fewer still will approach a librarian (5.9%) as a first choice. While the Internet plays an important role in undergraduate research, studies have revealed that most undergraduate students are not aware of other, often more appropriate resources.

40% of students select the subscription databases as their second choice, where they will access the quality journals. (A follow-up survey could ask how students actually compose the results of a search: primarily with first-choice information resources, or second-choice? The requirements of research assignments would also affect student choice of resource).
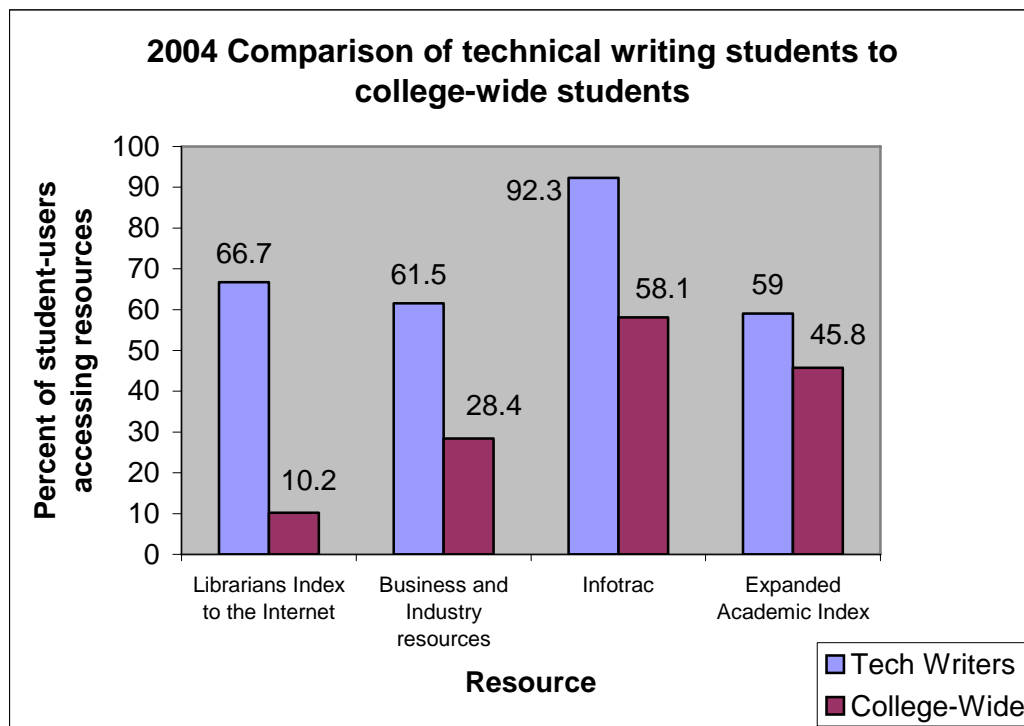
Table 2 2004 survey of student first-choice of reference resources

First Choice		Second Choice	
Print	7.7%	Print	23.6
Internet	57.7%	Internet	23.6
Subscription	24.1	Subscription	40.5
Librarians	5.9	Librarians	8.2

Because the technical writing faculty had eliminated the Internet as a primary student resource in 2002, data from her course sections shown in Figures 3 and 4, reveal a more even distribution of preference across numerous peer-reviewed research options. The figures are drawn from a 2004 library survey of users where technical writing student surveys are identified for later comparison to overall college numbers. The horizontal axes in the charts list available database resources, and reveal a pattern consistent with technical writing faculty expectations: Figure 3 demonstrates the effect of faculty/librarian partnership on student choice of research sources. The Librarians Index
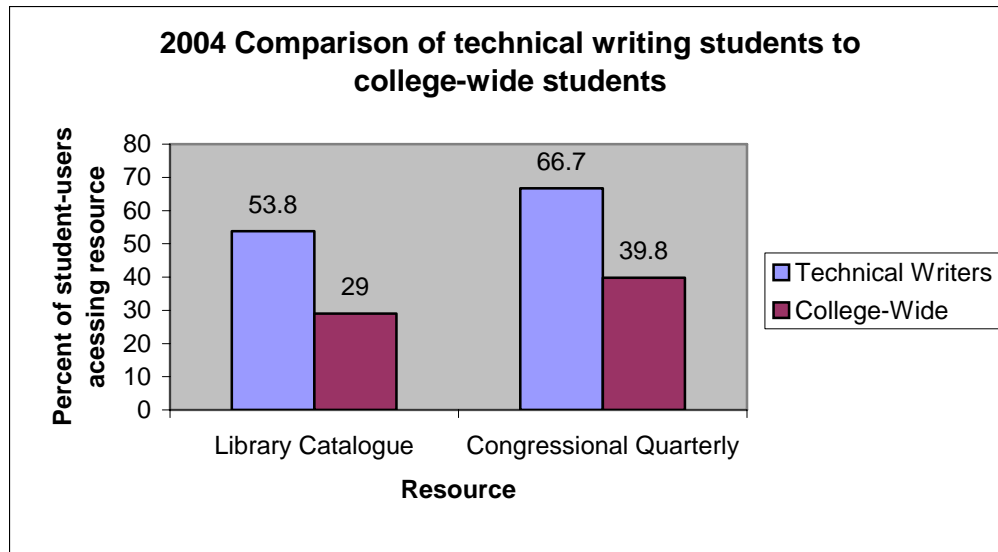
to the Internet is a university-administered collection of links to Internet sites (financed by the U.S. Institute of Museum and Library Services) that have been reviewed by librarians for quality of information. It provides convenient access to a significant range of web sites in many disciplines and is used by 66% of technical writing students. Only 10% of college-wide students utilize the Librarian's Index.   Business and Industry Resources allow students to profile an industry, and a company within an industry, in terms of history, sales volume, market position, and key market strategies. In percentage, twice as many technical writing students access this high-quality information as compared to college-wide student users. Infotrac and Expanded Academic Index, as described earlier, are the primary means to access quality, peer-reviewed journals in many disciplines, and are well-utilized by technical writers.

Figure 4 illustrates the breadth of technical writers' information-access strategies. "Library Catalogue" refers to the online catalogue of print and reference resources held by the library. *Congressional Quarterly* is an online version of a high-quality source of information on a range of current issues before Congress, such as the exportation of engineering jobs, or aviation safety. Both of these options show a higher percentage of use by technical writers than college-wide students.

2004 Comparison of technical writing students to college-wide students

Figure 3 **Appropriate spread of information access**

2004 Comparison of technical writing students to college-wide students

Figure 4 data:
- Library Catalogue: Technical Writers 53.8, College-Wide 29
- Congressional Quarterly: Technical Writers 66.7, College-Wide 39.8

Y-axis: Percent of student-users acessing resource
X-axis: Resource

Figure 4 Appropriate spread of information access

Conclusion

These results demonstrate that technical writing students on the whole, are using important tools to construct professional ethos in their written communication. Their project bibliographies will demonstrate their knowledge of contemporary professional, societal and global issues. While the results in Figures 2 and 3 refer in the aggregate to college-wide users, they clearly demonstrate that faculty/librarian partnership leads to improved student IL as measured by user choice of database. Technical writing courses can be effective sites for implementing and assessing IL instruction, if tailored to the specific contexts of students' disciplinary programs.

The faculty/librarian partnership extends to further cross-curricular initiatives. As part of a comprehensive assessment plan, upper-level courses in the major programs can assess for writing and IL proficiency. Do students transfer the IL and communication skills developed in the 300-level course to their capstone courses? Published self-studies indicate that the transfer can take place only if faculty expect it. Our presentation at college-level professional meetings encourages other faculty at our college to learn about what we have done, so they may encourage students to use these skills in any research assignments they make, for example in the Aviation Program's Human Factors course, or Technology Management's Business Management course.

References

[1] Leckie, G./, Fullerton, A. (January 1999). Information literacy in science and engineering undergraduate education: faculty attitudes and pedagogical practices. *College and Research Libraries* 60 (1), 9-29. Retrieved from Periodical Abstracts 11 February 2004.

[2]Leckie, G./, Fullerton, A. (January 1999). Information literacy in science and engineering undergraduate education: faculty attitudes and pedagogical practices. *College and Research Libraries* 60 (1), 9-29. Retrieved from Periodical Abstracts 11 February 2004.

3 O'Sullivan, C. (2002). Is information literacy relevant in the real world? *Reference Services Review*. 30 (1), 7-14.

[4] Office of Economic Cooperation and Development. (1996). The knowledge-based economy. Retrieved 20 June 2004 from http://econ.snu.ac.kr/~kl/knowledge.html.

[5] Black, C., Crest, S., and Volland, M. 2001. Building a successful Information Literacy infrastructure on the foundation of librarian-faculty collaboration. *Research Strategies*. 18 (3), 215-25.

[6] ABET Technology Accreditation Commission. 29 November 2004. 2005-2006 Criteria for accrediting Engineering Technology programs. Retrieved from http://www.abet.org 8 July, 2005.

[7] D'Angelo, B.J. and Maid, B.M. 2004. Moving beyond definitions: Implementing Information Literacy across the curriculum. The *Journal of Academic Librarianship* 30 3 212-17.

[8] Johnston, B. and Webber, S. (2003). Information literacy in higher education: a review and case study. *Studies in Higher Education* 28 (3), 335-52.

[9] Behrens, S. J. 2003. Information Literacy and the academic library: A critical look at a concept and the controversies surrounding it. *The Journal of Academic Librarianship*. 29 4 219-30. Retrieved from Education Full Text on 20 June 2005.

[10] National Literacy Act of 1991, 102nd Congress, First Session, H.R. 751. Retrieved 8 July 2005 from http://www.nifl.gov/public-law.html

[11] Gagel, C.W. (1997). Literacy and technology: Reflections and insights for technological literacy. *Journal of Industrial Teacher Education*. 34 3 6-33.

JUDITH COLLINS
Judy Collins is an Assistant Professor of English at Kansas State University-Salina's College of Technology and Aviation. She earned her Ph.D. in English: Rhetoric/Composition-Linguistics from Arizona State University Tempe, in August 2000. She has taught Technical Writing at KSU-S since 2001, and has given a number of presentations about hybrid online instruction. Her other interests include assessment and cross-curricular innovation.

BEVERLEE KISSICK
Beverlee Kissick is a Professor and Director of Libraries at Kansas State University-Salina. Beverlee earned three degrees from Kansas State University at Manhattan: B.S. in Sociology, MS in Curriculum and Instruction, and a Ph.D. in Educational Technology Library/Media. Beverlee taught at Virginia Commonwealth University, Richmond, Virginia, Fort Hays State University, and in Kansas public schools. Beverlee is known for her presentations on Practical Humanities and Information Literacy.

JUNG OH
Jung Oh is an Associate Professor of Chemistry at Kansas State University's College of Technology and Aviation in Salina. She earned her B.S. with teaching credentials from Sogang University in Korea and obtained a Ph.D. in Inorganic/Organometallic chemistry from UCLA and was an ASEE postdoctoral fellow at Naval Air Warfare Center Weapons Division. She was one of KSU contingent for the 2004 Wakonse Conference on College Teaching.

ALYSIA STARKEY
Alysia Starkey is an Assistant Professor and the Technical Services/Automation Coordinator at Kansas State University-Salina. She earned her B.S. in Psychology from Fort Hays State University and obtained a MLS from the University of North Texas. Alysia develops instructional programs for the Kansas State University-Salina library.