Creating a Library Instruction Session for a Technical Writing Course Composed of Engineering and Non-Engineering Students

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Abstract

This paper provides a framework of ideas for librarians and technical writing instructors interested in developing library instruction programs to enhance students' performance in technical writing courses. A new library instruction program for *ENGL 3323: Technical Writing* addresses a concern of engineering faculty that engineering students, the largest student population enrolled in this course, are not locating the high quality resources needed to round out the development of their assignments. In addition, workplace expectations for new engineering graduates, as well as information literacy guidelines which correlate with ABET (Accreditation Board for Engineering and Technology) accreditation criteria justify the need for the program. In the instruction sessions, librarians teach students how to search by subject category rather than by a specific keyword, as well as how to utilize critical thinking skills, make use of discipline-specific databases, consult government documents and technical report collections, and utilize subject experts as a means of increasing the pool of useful information for the development of final project reports. Students are exposed to a range of discipline-oriented databases and print sources in a single instruction session designed to cover business, engineering and agriculture sources in article, technical report, and government document formats. Librarians manage the broad scope of material by focusing on a limited number of subject-discipline library resources and by referring students to additional resources described on print handouts. Librarians found that customizing instruction by searching with students' topics, rather than by using canned examples, helped focus attention and increase the participation of the audience, and reduce lecture content in some cases. Technical writing instructors reported a positive relationship between library instruction and quality of citations in student reports. The program continues as a work in progress.

Introduction

The goal for the library component of *ENGL 3323* is to address the following:

> 1) Engineering faculty recognized that their students in *ENGL 3323: Technical Writing* needed an instructional component highlighting library resources because they were not locating the print and electronic resources that would yield the citations needed to round out the development of their papers. The same students displayed a deficiency in the skills needed to utilize the library effectively, specifically those pertaining to searching and using a variety of resources. The College of Engineering, Architecture and Technology enrolls 3,500 of the 23,000 students enrolled at Oklahoma State University.

2) This instruction addresses a lack of equity experienced by engineering students. Engineering students who take this technical writing course as an elective in place of English composition are not exposed to library instruction that composition students receive. Prior to the new program which began in summer 2004, *ENGL 3323: Technical Writing* had not had a library instruction component for fifteen years.

3) Expensive subject-specific databases in engineering, business, and agriculture are under-utilized. Promoting resources to end-users has always been a role of the library. Librarians feel obligated to promote the resources available to their client base; however, cost is not the exclusive issue[1].

4) The expectation in the workplace is that the new engineer will have a mastery of library and information management skills, in addition to his or her technical expertise. The university library experience provides the engineering student, in nearly every case, with a better context for learning library skills than does the context available in the corporate workplace library. In contrast to their corporate counterparts, university libraries usually have staffing and resources designated for teaching library skills[2].

5) Information literacy guidelines developed by the ACRL (Association of College & Research Libraries) correlate with ABET (Accreditation Board for Engineering and Technology) accreditation criteria. The revisions to Criterion 3 that appear in ABET's Engineering Criteria 2000 (also known as EC2000) show an emphasis on further development of assessment methods for an engineering program's learning outcomes. Three of eleven outcomes for Criterion 3 are as follows: 3i) A recognition of the need for an ability to engage in lifelong learning, 3j) A knowledge of contemporary issues, and 3k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice[3]. Standard 2 of the ACRL's Information Literacy Competency Standards for Higher Education indicates that a student will be capable of accessing information effectively and efficiently[4]. This means he or she possesses the skill to select methods and systems to locate information, including an ability to create a search strategy and identify and retrieve relevant results. An engineering student with those skills is positioned to remain abreast of current issues in the engineering field (Criterion 3j), be versed in modern engineering tools and practices (Criterion 3k), and engage in lifelong learning (Criterion 3i)[5].

Enrollment in the course includes engineering, business, agriculture, and physical science majors, with the largest percentages in the range of 40 percent for engineering and 25-30 percent each for business and agriculture. A class rank of junior level or greater is a prerequisite. As part of their coursework, students submit a proposal outlining the problem of a client audience, at which point library instruction is offered. Students describe the solution to the problem in a final project report, which also describes the bulk of the respective literature obtained using the library's resources.

Today's student population is largely composed of Generation Y, known for a high degree of technology and computer literacy, but often lacking in library and information literacy skills[6].

This same generation of students often exhibits a preference for searching the Web over using library resources, not realizing that many of the library's resources are available over the Web via the library's homepage. Also, students, regardless of generation, have a tendency to pay attention to material that they perceive to be relevant. This means they tend to focus better on material that addresses an assignment, lab exercise or test on the immediate horizon and courses that pertain to their majors. For Generation Y, the issues of relevance, values, and goal-directed behaviors exhibit themselves in a dominant manner[7,8] and play a role in getting this generation of students interested in library instruction.

Instructional content

Subject versus keyword searching

A technical writing instructor suggested that instruction highlight the difference between keyword and subject searching. An example of a keyword search is to search by company name, and an example of a subject search is to search by the respective industry that the company belongs to or a product type. The results of a subject search might contain the desired information, which the student otherwise would have missed had he or she stopped after searching by keyword. Or, the subject search might produce industry data from which one might extrapolate information about the company in question. Students in this technical writing course often do not know what to do after a failed keyword search[9], a common scenario affecting students across all disciplines at Oklahoma State University. Synonyms for "keyword" include "targeted," "exact," and "specific." Synonyms for "subject searching" include searching by "classification" or "category," as well as "general" or "broadened searching."

Students are taught a number of subject searching techniques:

> 1) One way to search by subject is to use a broader term (the broader classification of the topic), a synonym, or a related term that describes it. Consider the following broad to narrow classification scheme using engineering terminology: mechanics, fracture, ductile fracture, and shear. Modifying a search by adding synonyms separated by Boolean OR will increase the number of results. While not synonymous with the original, a related term will produce different, yet possibly useful, results.
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> 2) Another way to search by subject is to search with the hyperlinked subject descriptors found in many databases and online library catalogs. These terms tell the reader what the article is about and are usually found adjacent to a citation and abstract of an article. Subject descriptors (thesaurus terms) result from a classification scheme specific to a database or professional society. Some classification schemes use a broad to narrow structure (hierarchical classification). Understanding the broad to narrow structure can help focus a paper–via searching via narrow or broadened terms.
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> 3) Dropping a search term increases the number of results obtained because the search is less specific. Relevant material may be found using this approach.

4) Browsing is another way to search by subject. Browsing the citations found in bibliographies of articles and books might yield additional material on a topic. After using the catalog to identify call numbers for books of interest, browse the circulating and reference shelves in the same call number range for relevant material.

Critical thinking

Students in this course are reminded of the difference between popular press magazines and academic journals, including the peer-reviewed variety. Additionally, they are reminded how those sources differ from books and encyclopedias. Articles in popular press magazines report on a given event or activity soon after the event occurs, possibly within a week depending on the publishing frequency of the magazine. Magazine articles are usually written by staff reporters, not specialists. Academic journal articles reporting on the same event can appear anywhere from one to several months after the same event. Academic journal articles are usually written by persons trained in the respective academic discipline. Those articles are subject to an editor who again is someone in the respective field. Peer-reviewed journal articles are subject to the additional scrutiny of review by members of the same profession: thus the term, peer-review. Articles describing a given event usually take longer to publish for a peer-review academic journal than for an academic journal that is not peer-reviewed. The time between a given event and the date of publication might range from several months to two years for a peer-reviewed journal. Books usually take more than a year to publish and encyclopedias may not report on an event for as long as two or three years after the event has occurred depending on the nature of the event and the encyclopedia. The discussion regarding an event and its publication in a given format is commonly referred to as the "information cycle"[10]. Because the discussion of the information cycle could be the subject of an entire instructional session, one would save time by giving a quick summary and referring students to a detailed handout provided during the session.

In addition to the information cycle, students should understand what is meant by primary and secondary sources. A primary source is the verbatim text of what was said, as found in an original paper, research report, speech, or hearing, detailing how ideas were developed or research was conducted and conclusions were drawn. A secondary source provides a summary of the original work, and may provide an analysis of the original work in the context of an academic discipline, and the impact of the original work on that discipline. Analysis of an academic nature is suitable for writing college papers, and is usually more reliable than popular press books and newspaper articles, although they may also be useful for background material[10]. For example, for a student project on an environmental issue that has a history of involvement by the federal government, a search for a primary source might involve locating the transcript of a hearing that one might find in *LexisNexis Congressional* . The availability of secondary sources, such as newspaper or journal article summaries of the hearing, could be determined by searching the databases that index those sources[11]. For a project involving the design of a building so that it matches the theme of other structures on a university campus, examples of primary sources include blueprints or autobiographical accounts of those involved in the design and construction of existing buildings. Secondary sources such as summary descriptions of individual buildings or the architectural layout of the campus may or may not entail an analysis in regard to architecture as a discipline.

In general, critical thinking involves making decisions about the types of formats which are appropriate for inclusion in a given written assignment. For students in *ENGL 3323,* decisions involving critical thinking for their project reports are governed largely by audience analysis. In this course, audience analysis is an assessment of the abilities and academic training of the intended audience for the project report. A report to business people regarding a new technology might read like an article in *The Wall Street Journal,* with a description of the technology in lay terms followed by the financial, marketing and sales information that correspond to the implementation of the technology. A report to scientists and engineers regarding the same technology would likely read like a an academic journal, complete with data, calculations, diagrams, and literature citations necessary to convey the concepts involved so that the technology might be implemented successfully. Students learn that the project report is written so that the intended audience can make sense of it. Instructors for *ENGL 3323* provide instruction regarding audience analysis. There is an expectation that students understand that scholarly sources provide the content needed to build a strong case for a solution proposed for the problem of the client audience.

Discipline

A discipline refers to an organized body of knowledge from which future professionals are trained, professional services are derived, and new ideas are tested and incorporated as new knowledge. For this technical writing course, librarians identify both discipline-specific and multidisciplinary databases in business, engineering, and agriculture, and teach students database searching skills so that students have an opportunity to obtain relevant material. Most students lack an appreciation for the quality of material available in subscription databases, a situation that is addressed by this instruction.

Government documents and technical reports

The role that librarians play in locating government information for patrons is largely beyond the experience of most students, as are the scope and output of the information available from government sources. The federal government's numerous agencies, regulatory bodies, and departments provide a record of their activities, the content of which pertains to topics ranging from agriculture to zoology and impacts on all academic disciplines. Authorship by agency, a unique classification system, and a variety of output formats often confound users, and call for intervention by librarians. Primary source materials readily available from government sources include verbatim testimony obtained from congressional hearings as well as environmental impact statements. Much of the scientific and technical research funded by the federal government is published in the form of technical reports. Technical reports provide the funding agency with an account of how research within corporations, universities and government agencies was conducted[12]. The extensive description found in the technical reports is often of interest to scientists and engineers; hence an inclusion of these materials in the instruction is warranted.

Knowledge of subject experts

Knowledge exists in two forms: explicit and tacit. Explicit knowledge is the codified, rules-based knowledge which is contained in documents and databases. Tacit knowledge is the

knowledge internalized by the practitioner over a long period of time. Tacit knowledge is also the rich intuitive knowledge of a subject expert. It is also referred to as "working knowledge."[13] The use of subject experts for tacit knowledge can help one capture the lay of the land, and properly frame the problem and its context so that the solution is on target. In a project for a technical writing class, the appropriate use of a subject expert is one in which the expert provides insights that stimulate the student's thinking so that he or she develops his or her own approach to the problem, rather than asking the expert for a ready-made solution.

For example, an engineer (subject expert) working for the city addressed students' questions regarding drainage issues by referring the students to a drainage report on file with the city and fielding questions about the document, using experience (tacit knowledge) and explicit knowledge to explain drainage issues. The respective report is a primary source. Federal government documents specifying drainage regulations for municipalities serve as a secondary source, in the sense that these are more general, and local governments revise them to suit their respective issues.

Approach to the sessions

In any course, library instruction is more effective when it is offered after the students have chosen a topic because at that point students perceive a purpose for the instruction. As indicated earlier, instruction is offered for this course after the students have identified their topics and submitted their proposals.

Brevity ruled the development and delivery of this instruction. No instructor would cover all of the material described here in a fifty-minute instruction session. Librarians manage the broad scope of material in these one-shot instruction sessions by focusing on a limited number of subject-discipline library resources and by referring students to additional resources described on print handouts. Students are encouraged to make contact with general reference and government documents librarians for additional assistance. Librarians found that customizing instruction by searching with students' topics rather than by using canned examples helped focus attention and increase audience participation. Customizing allowed librarians to reduce lecture content by eliminating the discussion of resources for those disciplines which were not represented by a student project in a particular session. There was a tremendous difference in terms of increased attention and interaction with students and faculty during the sessions, when relevant topics were searched in place of canned material. Student interaction at this point included ways to refine searches. Having the topics in advance allowed librarians to identify and bring relevant print sources, both reference and circulating, to the sessions. Also, by having the topics in advance, librarians could provide referrals to materials which might not be in the university library collection, such as those materials commonly found at the public library or local municipal body. Such materials might include property tax rates, flood plain records, and the local adaptation of fire and construction codes. An additional value in showing searches of specific relevance is that this allows the librarian to conduct brief reference transactions with each of the groups in a class, and these transactions might include reference materials relevant to the topic. The danger of giving students too much assistance via a customized search is balanced against the likelihood that students will work on their own to locate additional material.

In summer 2004, librarians taught business and engineering sources and technical report and government document formats. Fundamental skills such as using the catalog and determining the availability of journals and library services were also covered. Students received handouts showing the instructional content, including appropriate databases. A discussion of the electronic business sources using *Hoover's*, *Factiva*, and *EDGAR* included searches with keyword and subject terms and was followed by a discussion of print business sources. Searches with *Compendex* followed by a reference to other sources of engineering content, *Academic Search Elite*, *Applied Science and Technology Abstracts*, *Biological Abstracts*, *Medline*, *Inspec* and the *IEEE/IEE Electronic Library* constituted the instruction on engineering databases. Instruction identified *Inspec* as an index to the *IEEE/IEE Electronic Library*. Instruction for technical reports and government documents included using the catalog, government agency websites, and the government documents department in the library. Additional emphasis was placed on visiting the government documents department and interacting with librarians there to determine if additional materials might be located.

In fall 2004, agricultural sources were added to the instruction based on a recommendation from the technical writing faculty. For agriculture the following sources were identified, with searching limited to one database due to time constraints: *Agricola*, *Biological & Agricultural Index*, and *Biological Abstracts*. Business and engineering sources and technical report and government document formats were covered as before, and librarians continued to teach fundamental skills such as how to use the catalog, locate journals, and locate library services. At mid-semester two librarians discovered that customizing the sessions with searches from student projects had a positive impact on instruction, and from there on all three librarians participating in this instruction employed this technique. Librarians demonstrated searches on students' topics in the respective databases or the catalog depending on the topic. Comments from individual instructors from the fall semester included the usefulness of searching on project topics and the positive impact of instruction on the quality of citations in student reports for the fall semester. Also, in the fall, librarians in the government documents department indicated an increase in traffic corresponding to students from this course. Librarians assisted students searching for information in the form of government documents and technical reports.

Summary/Recommendations

The plan is to continue to collaborate with the Engineering College and the English Department to further develop this instruction. As indicated above, the use of search examples relevant to students' topics helped focus the audience, increase their participation and reduce some of the lecture content. The intention is to continue in this direction. For the spring 2005 semester, one instructor indicated her intention to assign a fact-finding exercise using print reference sources in addition to the session taught by a librarian. Another idea is to have students formulate a search strategy for online resources with a librarian's assistance.

To develop an instructional program for a technical writing course, work with the technical writing faculty for whom instruction is provided. Their suggestions and feedback will contribute to the effectiveness of instruction. Consult with librarians in the subject disciplines represented in the course. Their knowledge of resources in their respective areas will also be of use. If possible, invite other librarians to assist with instruction and provide feedback about their

experiences. Also, use handouts to provide additional detail, especially for the resources that will not be covered during the sessions but are nevertheless important.

References

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[9]Leslie Fife, personal communication to author, June 2004. Professor Fife used the terms secondary and lateral searching interchangeably to denote categorical searching, and primary searching to denote specific searching.

[10]Barbara Miller, personal communication to author, June 2004. Barbara Miller's comments are based on the "Information Cycle" developed by David Oberhelman for use in the course, LBSC 1011: Library and Internet Information Competencies. Barbara Miller is a government documents librarian and David Oberhelman is a humanities/social sciences librarian. Both Miller and Oberhelman are employed at Oklahoma State University.

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Biographical Information

KEVIN P. DREES has been an engineering librarian in the Science and Engineering Division of Edmon Low Library, since 2002. He holds the rank of Assistant Professor. He received his BS in Mechanical Engineering from the University of Kansas and his Master's in Library Science from Emporia State University. He worked at the Illinois Institute of Technology prior to joining the OSU library.

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