AC 2011-2085: THE VALUE OF DIRECT ENGAGEMENT IN A CLASS-ROOM AND A FACULTY: THE LIAISON LIBRARIAN MODEL TO IN-TEGRATE INFORMATION LITERACY

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The Value of Direct Engagement in a Classroom and a Faculty: Using the Liaison Librarian Model to Integrate Information Literacy into a Faculty of Engineering

Introduction

This paper will update our earlier work on an integrated approach to information literacy [1]. Our initial goal was to integrate information literacy into a technical communication course in the Faculty of Engineering and to explore whether two pedagogical outcomes were achievable within this framework: first, instantiating the benefits of an engineering research report in a field where applications and design exigencies are paramount and, secondly, determining whether engineering research skills – far from being "short-term competencies," as some would suggest [2] – are valuable additions to a student's learning repertoire. This initiative centered on the standards required by the Canadian Engineering Accreditation Board, which (like the A.B.E.T.) demands that our graduates develop engineering professional skills such as information literacy and communication skills.

However, while that earlier study showed us that the integrated model worked well enough within a single course, we didn't know whether the model would work just as well if we applied it to an entire faculty. Therefore, we now needed to explore whether its introduction into the Faculty of Engineering at our institution would be possible, on the one hand, and, on the other, whether it would have a similar impact.

As a result of that earlier study, we have now adopted the "liaison librarian" model. Like the libraries at the University of Alberta, Queens, MIT, Rutgers, and many others [3] [4] [5] [6], the engineering librarian at our university serves as a liaison to the Faculty. In some ways, librarians at these institutions act as both embedded librarians and as liaison librarians. To illustrate how we have applied this model to our situation, we will first define what some of the literature says about each model. We will then explore the librarian's direct engagement in the technical communication classroom at our institution, followed by an overview of her direct engagement in the Faculty of Engineering itself; specifically, in the senior design or "capstone" projects.

The Embedded and the Liaison Librarian Models: A Quick Overview

There is a functional and sometimes subtle difference between embedded and liaison librarians. "The distinction between liaison and embedded librarians is essentially the degree of classroom collaboration and partnership with classroom instructors," as noted in a recent Purdue University newsletter [7]. Dewey states that "embedded librarians bring the learning process in closer to the scholarship on which the disciplines are based and to those that service it – librarians" [8]. Often, the embedded librarian is in a partnership with faculty in the delivery of online courses [9] or within an organization [9]. The embedded librarian is aligned within a course, equal with the instructor.

The liaison librarian, on the other hand, acts in a more traditional role, much like what Luce refers to as "middleware," bridging systems and users [10]. In this way, liaison

librarians have moved a library's focus from what Williams calls "a collection-centered model to an engagement-centered one" [11]. Our collections are not the focus any more, even though librarians have tried to hold fast to what we own rather than to what we can do beyond what is physically available. Our services now span the globe, providing tools that facilitate communication of ideas as fast as the speed of the Web. Users have come to rely on Google, which is good, but by no means complete, especially for academic research. Google answers questions for the dot com world, but it's not as good for the dot research world.

The Pedagogical Context: The Technical Communication Class and the Capstones

One of the dilemmas faced by those of us who teach engineering students is how best to fulfill the requirements mandated by the national accreditation board. In the case of technical communication, that means helping our students develop their so-called "professional" skills; that is, communication, team work and lifelong learning skills. Recently, the writing-across-the-curriculum (WAC) and writing-in-the-disciplines (WID) models have approached these requirements by integrating communication within various technical classes. In these models, the communication instructors have some input into both curriculum and assessment in order to ensure that students will be evaluated according to both their mastery of a technical subject as well as their competence in communicating it.

However, while the capstone courses at our institution are closer to these "integrated" models, our Faculty of Engineering introduced the "stand-alone" model many years ago. The Faculty continues to support it, primarily because, as Reave notes, a "well-designed" program begins with a "good foundation" that a stand-alone course can provide [12]. In this way, the technical communication course acts as a cornerstone upon which the capstone courses can then build. Integrating communication into the later capstone courses thereby becomes that much easier to do. And such is also the case with integrating information literacy into a course like technical communication and later the capstones.

As a mandatory, team-based course that students are encouraged to take in their second or third years, the technical communication course covers such topics as project and time management, team management, document design, textual illustrations and small group dynamics. The course also introduces students to the various engineering genres, such as proposals and progress reports. At the same time, however, the course – as a stand-alone course – is able to spend far more time on the processes of communication and on the various assignments than would normally be possible in the integrated model.

These assignments, of varying length and complexity, have been designed to demonstrate the convergence between engineering and communication design [13] [14]: while engineers solve problems, they must also communicate solutions [15] [16]. Thus, the assignments reflect the following essential elements: the technical elements, where students learn how to express the technical issues and the criteria in prose as well as to research the report topic; and the communication elements, where students learn how to define their

audience and purpose, organize their material, format their reports and practice effective writing and revision strategies. The course also includes another critical component, the team element, which more nearly reflects the environment in which a professional engineer will have to work; students must learn how to function as a team by planning the team's activities and the tasks associated with a project, all within the framework of milestones and the deliverables.

As we have discussed in our earlier paper [1], one of the major assignments has been the research-based final report – a necessity in a course where the students come from different disciplines and represent different levels of experience within an engineering program. While some, like Irish, might argue that such an assignment is an academic rather than an engineering genre, the final report is far more than just an exercise in "knowledge assembly" [17]. "Staged" assignments are, as Brent argues [18], critically important to any course, but especially so to team-based work and the production of an effective collaborative document.

For example, in the course, students first prepare a team proposal where they outline the topic they want to explore and justify why it is an important engineering –related topic. In the proposal, they must convince the reader that there are the resources available to complete the project and that the team is capable of finishing the project on time. They must therefore submit an annotated list of references, a detailed Gantt chart, a project outline, as well as other elements that will persuade the reader that the project will indeed lead to a "good" deliverable. The research component helps to demonstrate the overall strength of the proposal.

However, the value of doing research on their chosen topic extends much further than this. Doing research also allows teams to learn "new concepts" and to "apply information to new (and unfamiliar) situations" [19]. Concomitantly, students learn the discourse of their discipline by searching the databases using a controlled vocabulary and by reading more on their topic; in doing so, they begin the process of lifelong learning.

Later in a student's program, the senior design course (the capstone) continues building on this learning experience. The learning environment becomes even more interactive as engineering faculty and engineers from industry act as advisors to student teams. The communication specialists and the engineering librarian are also part of this team and, as such, are able to provide the necessary scaffolding between what has been taught in this earlier class and the capstone, where there are now the demands of an industry-based client.

In the capstone courses, students must design a solution for this client who has presented them with a "real world" problem; students must also design the communications, the "deliverables," that must accompany this solution. Students are able to work with the librarian and the communication specialists within this kind of environment where a focus on design enhances the communication activity while the communications themselves support the engineering work [12] [20]. Since these documents must go to both the client and the instructors, they also serve as more than just "vehicles for grades" [20];

they help in the exchange of the "necessary information" [19] that must be accomplished both in the classroom and in the workplace.

The Liaising Model in Practice: The Technical Communication Course and the "Capstones"

At our institution, information literacy is integrated into the technical communication course. In the course, the librarian is directly engaged in the more formal teaching of information literacy and, in some classes, when the students are working in their groups, the librarian is "embedded," actively assisting students with their research. So, in addition to teaching information literacy in the technical communication course and evaluating the research quality of two of its important milestones (the team proposal and the final written report), the librarian now assists with both assignment and curriculum development.

The engineering librarian has six classes each term with all of the course sections. The introductory class is an overview of the following 5 classes as well as a survey of what each student knows about using a university library, their learning styles and their favorite modes of communication (mostly Facebook and texting). The following 5 classes then build their research strategies.

The classes are as follows:

Class 2 is an introduction to doing engineering research as a team and offers practical strategies on formulating a cogent research question and on developing an outline. In addition, students are given the IEEE citation guide that will ensure that they collect the right data to cite any materials that they use. This is to start them off on a front-end analysis of their topic and search strategy, and planning their broad topic search strategy.

Class 3 focuses on searching Google and Google Scholar so that they understand how Google works; in this way, their searches can be more precise. Google Books and Google Alerts are also demonstrated. This is important since Google is usually the first place students will look for their topics and they need to understand how important their words are in manipulating the search results.

Class 4 is a "search lab" in using the Engineering Village. Students are shown the database with an exemplar search, a demonstration of document delivery and RefWorks. Then they have the remainder of the class to search the database while the librarian circulates.

Class 5 is the "law and order" class dealing with plagiarism and copyright. At the beginning of the class, each student is given an index card and instructed to disclose anonymously if they or anyone they know has ever plagiarized (the results are quite high). After a presentation, the students are given an online plagiarism test developed by T. Frick, a professor at Indiana University [21], that challenges them in many ways.

Additionally, the students are first sent an IEEE article on plagiarism to read before class and which they annotate and discuss in class [22].

Class 6 introduces students to the more specialized sources for engineering information: patents, standards, technical reports and theses.

So, from initially thinking about a topic, the students' searches have grown from general Google searches into more specialized engineering information sources. In this important way, these classes also form the pedagogical basis for the students' capstone and theses explorations, both of which have a lecture on more in-depth research, citing, and plagiarism while the thesis classes have an additional class on literature reviews.

Assessment and Accreditation

Thomas sets out stages for the integration of information literacy into a department and the incorporation of assessment measures [23]. For engineering librarians, assessment measures are especially applicable since engineering programs are accredited regularly by ABET or CEAB, each with their own assessment criteria. Combining those engineering criteria with ACRL IL standards makes for a powerful tool in both the acceptance of information literacy instruction within the engineering faculty and with the students – they all "get" it.

In the technical communication course, the grading of the team proposals and final reports is done using the rubric (Appendix 1) and the grading sheet (Appendix 2). The grading sheet instantiates the rubric criteria. Each member of the team fills out a search strategy page (Appendix 3) which the engineering librarian marks, giving suggestions for changes in the search terms, advice on the databases or suggesting experts to meet with.

This form not only reveals how effectively each student has searched for information, but also informs the librarian how well her teaching has been and where clarification is needed. Knight says that, "for library instruction to be effective and credible, librarians should continue to develop assessment methods that measure student progress and inform the process of instruction" [24]. Teaching and assessment are inseparable.

 Originally, the search page was a strict listing of terms searched and databases used, whereas now it has evolved into a more formative dialog of what the student has learned by searching for engineering information in three places: Google, Google Scholar and databases.

Conclusion

In all these classes, the librarian liaises between the myriad sources of information and the end users. At the same time, the librarian is now actively engaged in a faculty-wide promotion of information literacy and lifelong learning, two attributes that will go far toward meeting the Canadian accreditation standards. Indeed, in her consultations with them the capstone students have told the librarian that these earlier information literacy classes in the technical communication classes have helped them in completing the

requirements of their more sophisticated engineering reports in the capstone. However, in some ways, it is still too early to tell how well our model works beyond the confines of the technical communication course; we simply have not been involved in the capstones long enough to measure our success beyond the level of the anecdote.

Nevertheless, the technical communication class does fulfill a necessary function: introducing students to the kinds of strategies, searches and sources they will need once they are in their capstone courses and, later, in the world of the professional engineer. One other outcome is significant in terms of a student's journey of lifelong learning as a professional engineer – engineering students will never again see Google or the library and its resources in quite the same way. For example, students have commented on their search pages that Google cannot give them the kind of scholarly sources they need to understand engineering concepts. Because of the librarian's direct engagement in first a classroom and then a faculty, the perception has changed – and for the better.

In this way, we are able to approach the outcome that Brent argues for: learning a research process and "learning by inquiry in a collaborative environment" [18].

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APPENDIX 1 - ENG 2010 Technical Communications
SEARCH STRATEGY & BIBLIOGRAPHY MARKING RUBRIC
Donald W. Craik Engineering Library

←-- Competency Level --→

	Strong (4) *Applies outcome in multiple contexts. Many strengths present.*	Competent (3) *Shows skill in this outcome. Improvement still needed.*	Developing (2) *Strengths and need for improvement still needed.*	Emerging (1) *Need for improvement outweighs apparent strengths. Evidence of outcome present.*	None (0) *No evidence of outcome present.*
Finding Information (*Search strategy*) **CEAB Criteria 3.1.1, 3.1.2, 3.1.3; ACRL 1, 2.2, 3.1.4; ABET 3.e, 3.k**	Able to clearly and succinctly articulate a topic, to formulate, refine, and implement a complex search strategy, making use of Boolean operators and controlled vocabularies. (Information from *Search Strategy Page*)	Able to articulate a topic, but not able to formulate or implement an effective focused search strategy. May use controlled vocabularies. (*Search Strategy Page*)	Able to articulate a topic, but the ability to formulate & implement a search is limited to simplistic approaches. Searches return unacceptably large numbers of hits. Does not use controlled vocabularies. (*Search Strategy Page*)	Able to articulate a topic, but not clearly or succinctly. Unable to formulate simple searches effectively. Performs very basic keyword searches (single words and/or simple phrases) which retrieve unacceptably large numbers of hits. (*Search Strategy Page*)	Unable to articulate topic at all. Has not attempted searching or the *Search strategy page* is missing. (*Search Strategy Page*)
Locating Information (*Search sources*) **CEAB Criteria 3.1.1, 3.1.2, 3.1.3 & 3.1.5; ACRL 1, 1.3; ABET 3.h, 3.k**	Able to recognize and navigate information systems at **micro (e.g. engineering databases)** and **macro (e.g. related databases)** levels. Thoroughly understands the differences between available search tools. Uses search engines in a balanced manner. Appreciates the importance of print and/or historic resources and knows how to access them.	Able to recognize and navigate information systems at a **micro** level, but has some trouble doing it at a **macro** level. Is familiar with the major databases engineering, but not those of other relevant areas. Uses search engines adequately. Somewhat appreciates the importance of print and historic resources, but does not always use them.	Unable to recognize and navigate information systems at a **macro** level; somewhat able to do this at a **micro** level. Many sources retrieved through search engines. Aware of historic resources but tends to use newer electronic resources for their ease of access instead.	Is barely able to recognize and navigate information systems at a **micro** level. Unaware of historic resources and avoids using print resources. Does not clearly understand the difference between search tools and consequently has difficulty selecting appropriate databases for searching or using controlled vocabularies. Relies mostly on search engines for sources.	Completely unable to recognize and navigate any information system. Unable to perform even basic searches and does not know how to access information sources after completing a search. Does not consider historic resources at all. Only uses search engines for searches. Or the *Search Strategy Page* is missing.
Analyzing Information (*Quality of sources*) **CEAB Criteria 3.1.3 & 3.1.4; ACRL 3; ABET 3.b, 3.k**	Able to analyze information sources based on reliability, validity, accuracy, authority, purpose, currency, and relevance as demonstrated through sources cited in the team bibliography. Sources are balanced and mostly authoritative resources.	Demonstrates the ability to distinguish between relevant and irrelevant information (based on the topic). Does not always evaluate sources for reliability, validity, accuracy, authority, purpose, currency, and relevance. Sources not always balanced.	Is able to find some relevant sources, but includes irrelevant sources in the team bibliography. Rarely evaluates information for reliability, validity, accuracy, authority, purpose, currency, and relevance. Many sources are not authoritative. Sources not balanced.	Sources cited are not clearly related to the topic, and/or show very little breadth, i.e. many sources are from the same journal or web site or are from very general web sites and/or non-refereed articles. Reliability, validity, accuracy, authority, purpose, currency, and relevance are not considered.	Unable to differentiate between relevant and irrelevant information sources. Sources are mostly from general web sites.

Bibliography Marking Rubric cont'd…

	Strong (4) *Applies outcome in multiple contexts. Many strengths present.*	Competent (3) *Shows skill in this outcome. Improvement still needed.*	Developing (2) *Strengths and need for improvement still needed.*	Emerging (1) *Need for improvement outweighs apparent strengths. Evidence of outcome present.*	None (0) *No evidence of outcome present.*
Synthesizing Information (*Annotations and relevancy to topic*) **CEAB Criteria 3.1.7 & CEAB 3.1.10; ACRL 3, 4; ABET 3.b, 3.f, 3.g**	Condenses and summarizes information well. Grammar and syntax are excellent. Relates the relevancy of each source to the topic and how it is used in the paper.	Able to summarize most sources in one's own words. Grammar and syntax are very good. Relates the relevancy of most sources to the topic.	Able to summarize several sources, but has difficulty making the connections necessary to support the team's argument or discussion. Grammar and syntax are average. Some incomplete and/or brief annotations.	Has difficulty condensing and synthesizing information from many sources or few are annotated. Tends to either quote directly from sources (**plagiarism**) rather than use their own words, very brief annotations or the annotations do not show the relevance to the team's topic. Grammar and syntax are below average. Many incomplete sentences.	Completely unable to summarize information. Does not make connections between the sources and the team's topic. Grammar and syntax are poor. Annotations missing or some are **plagiarized**.
Presenting Information (*Citation style*) **CEAB Criteria 3.1.7 & 3.1.10; ACRL 2.5.c 4.3; ABET 3.f, 3.g**	Communicates findings in the appropriate style and format. Sources are cited appropriately.	Sources are mostly cited appropriately.	Is not always sure how to cite sources. Inconsistent citation method.	Sources are often cited incorrectly.	Does not cite sources.

Accreditation Key:

CEAB 3.1.1 is demonstrated competence in university level mathematics, natural sciences, engineering fundamentals, and specialized engineering knowledge; **CEAB 3.1.2** is the ability to use appropriate knowledge and skills to identify, formulate, analyze and solve complex engineering problems. **CEAB 3.1.3** is the ability to conduct investigations of complex problems. **CEAB 3.1.4** is the ability to design solutions for complex, open-ended engineering problems. **CEAB 3.1.5** is the ability to create, select, apply, adapt, and extend appropriate techniques, resources, & modern engineering tools. **CEAB 3.1.7** is the ability to comprehend and write effective reports and design documentation, and to give and effectively respond to clear instructions. **CEAB 3.1.10** is the ability to apply professional ethics and equity.

ACRL 1 is the determination of the nature and extent of the information needed; **ACRL 1.3** is developing a working knowledge of the literature of the field and how it is produced; **ACRL 2.2** is constructing and implementing effectively designed search strategies. **ACRL 2.5.c** is differentiating between the types of sources cited and understanding the elements and correct syntax of a citation for a wide range of resources. **ACRL 3.** is evaluating the procured information and its sources, and as a result, decides whether or not to modify the initial query and/or seek additional sources and whether to develop a new research process. **ACRL 3.1.4** is refining search strategies as necessary. **ACRL 4** is understanding the economic, ethical, legal, and social issues surrounding the use of information and its technologies and either as an individual or as a member of a group, uses information effectively, ethically, and legally to accomplish a specific purpose. **ACRL 4.3** is using the appropriate documentation style for each research project.

ABET 3.b is the ability to analyze and interpret data. **ABET3.e** is the ability to identify, formulate & solve engineering problems. **ABET 3.f** is an understanding of professional and ethical responsibility. **ABET 3.g** is the ability to communicate effectively. **ABET 3.h** is understanding the impact of engineering solutions in a global, economic, environmental, and societal context; **ABET 3.k** is the ability to use ... engineering tools.

Note: All sections above use CEAB 3.1.6, "Individual and Team Work," and CEAB 3.1.12, "Lifelong Learning."

Last updated: 01/05/2011 sng

Topic _____ Date _____ Group AO1 ___ AO2 ___ AO3 ___ AO4 ____ Team # ___

	←-- Competency Level --→					**x**
	Strong (4) *Applies outcome in multiple contexts. Many strengths present.*	**Competent (3)** *Shows skill in this outcome. Improvement still needed.*	**Developing (2)** *Strengths and need for improvement still needed.*	**Emerging (1)** *Need for improvement outweighs apparent strengths. Evidence of outcome present.*	**None (0)** *No evidence of outcome present.*	**Comments**
Finding Information *(Search strategy)*	☐ Able to clearly and succinctly articulate a topic, to formulate, refine, and implement a complex search strategy, making use of Boolean operators and controlled vocabularies. (Information from the *Search Strategy Page*).	☐ Able to articulate a topic, but not able to formulate or implement an effective focused search strategy. May use controlled vocabularies. (*Search Strategy Page*)	☐ Able to articulate a topic, but the ability to formulate & implement a search is limited to simplistic approaches. Searches return unacceptably large numbers of hits. Does not use controlled vocabularies. (*Search Strategy Page*)	☐ Able to articulate a topic, but not clearly or succinctly. Unable to formulate simple searches effectively. Performs very basic keyword searches (single words and/or simple phrases) which retrieve unacceptably large numbers of hits. (*Search Strategy Page*)	☐ Unable to articulate topic at all. Has not attempted searching or the "*Team Searches*" sheet is missing. (*Search Strategy Page*)	The team average is
Locating Information *(Search sources)*	☐ Able to recognize and navigate information systems at **micro (e.g. engineering databases)** and **macro (e.g. related databases)** levels. Thoroughly understands the differences between available search tools. Uses search engines in a balanced manner. Appreciates the importance of print and/or historic resources and knows how to access them.	☐ Able to recognize and navigate information systems at a **micro** level, but has some trouble doing it at a **macro** level. Is familiar with the major engineering databases, but not those of other relevant areas. Uses search engines adequately. Somewhat appreciates the importance of print and historic resources, but does not always use them.	☐ Unable to recognize and navigate information systems at a **macro** level; somewhat able to do this at a **micro** level. Many sources retrieved through search engines. Aware of historic resources but tends to use newer electronic resources for their ease of access instead.	☐ Is barely able to recognize and navigate information systems at a **micro** level. Unaware of historic resources and avoids using print resources. Does not clearly understand the difference between search tools and consequently has difficulty selecting appropriate databases for searching or using controlled vocabularies. Relies mostly on search engines for sources.	☐ Completely unable to recognize and navigate any information system. Unable to perform even basic searches and does not know how to access information sources after completing a search. Does not consider historic resources at all. Only uses search engines for searches. Or the *Search Strategy Page* is missing.	The team average is
Analyzing Information *(Quality of sources)*	☐ Able to analyze information sources based on reliability, validity, accuracy, authority, purpose, currency, and relevance as demonstrated through sources cited in the team bibliography. Sources are balanced and mostly authoritative resources.	☐ Demonstrates the ability to distinguish between relevant and irrelevant information (based on the topic). Does not always evaluate sources for reliability, validity, accuracy, authority, purpose, currency, and relevance. Sources not always balanced.	☐ Is able to find some relevant sources, but includes irrelevant sources in the team bibliography. Rarely evaluates information for reliability, validity, accuracy, authority, purpose, currency, and relevance. Many sources are not authoritative. Sources not balanced.	☐ Sources cited are not clearly related to the topic, and/or show very little breadth, i.e. many sources are from the same journal or web site or are from very general web sites and/or non-refereed articles. Reliability, validity, accuracy, authority, purpose, currency, and relevance are not considered.	☐ Unable to differentiate between relevant and irrelevant information sources. Sources are mostly from general web sites.	

	Strong (4) *Applies outcome in multiple contexts. Many strengths present.*	Competent (3) *Shows skill in this outcome. Improvement still needed.*	Developing (2) *Strengths and need for improvement still needed.*	Emerging (1) *Need for improvement outweighs apparent strengths. Evidence of outcome present.*	None (0) *No evidence of outcome present.*	**Comments**
Synthesizing Information *(Abstracts and relevancy to topic)*	☐ Condenses and summarizes information well. Grammar and syntax are excellent. Relates the relevancy of each source to the topic and how it is used in the paper.	☐ Able to summarize most sources in one's own words. Grammar and syntax are very good. Relates the relevancy of most sources to the topic.	☐ Able to summarize several sources, but has difficulty making the connections necessary to support the team's argument or discussion. Grammar and syntax are average. Some incomplete and/or brief annotations.	☐ Has difficulty condensing and synthesizing information from many sources or few are annotated. Tends to either quote directly from sources (**plagiarism**) rather than use their own words, very brief annotations or the annotations do not show the relevance to the team's topic. Grammar and syntax are below average. Many incomplete sentences.	☐ Completely unable to summarize information. Does not make connections between the sources and the team's topic. Grammar and syntax are poor. Annotations missing or some are **plagiarized**.	
Presenting Information *(Citation style)*	☐ Communicates findings in the appropriate style and format. Sources are cited appropriately.	☐ Sources are mostly cited appropriately.	☐ Is not always sure how to cite sources. Inconsistent citation method.	☐ Sources are often cited incorrectly.	☐ Sources are not in the appropriate style and format..	

Sources				
# refereed online =	# non-refereed online =	# books =	# quality web sites =	# general web sites =
# other =	# illustrations =	# interviews =	#? =	Total =

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APPENDIX 3 - ENG 2010 Technical Communications --- Search Strategy Worksheet

Topic: _____ Name: _____

Date: _____ AO1 _____ AO2 _____ A03 _____ Team # _____

Outline your search steps (note databases and search engines that you used. Indicate where you have used Boolean logic (AND, OR, NOT). Use the back of the worksheet if necessary. How did you combine your concepts?

1.) ==State your research topic== **and indicate the key concepts by** <u>underlining those words</u> **(this can be from your purpose statement). Indicate** ==what aspect of the topic <u>YOU</u> are focusing on== **(each member has a specific focus)?**

2.) ==<u>GOOGLE SEARCH</u>==**: Give an example of how you searched Google successfully for your topic (identify the concepts and your limits).** <u>Describe the results</u> **and relate what you have learned about searching Google for an engineering topic.**

3.) ==<u>GOOGLE SCHOLAR SEARCH</u>==**: using the same concept,** <u>describe your Google Scholar search</u>**. What did you learn about searching Google Scholar? Is Google Scholar better than Google for engineering concepts? If so, how?**

4.) ==<u>DATABASE SEARCH</u>==**: Give an example of a successful database search (identify the concepts and your limits).** <u>Describe the results</u> **and relate what you have learned about searching a database as opposed to using a search engine. Try to use a controlled vocabulary for more a precise search. Did you search more than one database (name them all). Did you search Bison?**

5.) ==**For ONE article found in Google or in Google Scholar, cite the title below, and find it in the database Compendex or IEEE**== **(HINT: search for the article title using quotation marks). List two controlled terms for the article:**

Article Title: _____
Controlled terms: 1. _____ 2. _____