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**Assessing the Framework for Information Literacy for
Higher Education through Effective Librarian-Faculty
Collaboration**

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Assessing the Framework for Information Literacy for Higher Education through Effective Librarian-Faculty Collaboration

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Abstract

Professional Communication for Engineers (ENG207) is a course offered at the American University of Sharjah (AUS), UAE and includes an engineering multidisciplinary project (EMDP) as the pedagogic tool that has agency in promoting students' attainment of professional communication skills and personal traits. It is university policy that engineering students study this course before conducting their senior design projects and usually prior to internship. Also significant in the course are the research skills that sustain the engineering multidisciplinary project, and which are essential for the students' final year Senior Design Project. The Information Literacy (IL) Competency Standards for Higher Education (ACRL, 2000) are an important part of the ENG207 course. IL preparation lectures are conducted at the outset of each semester in conjunction with the AUS Library. These sessions provide students with the competencies they need to conduct research throughout the semester in order to develop their multidisciplinary projects. However, recently the IL Competency Standards for Higher Education have been revised by the Association of College and Research Libraries (ACRL) and an updated Framework drafted. This paper will outline how the new Framework provided both librarians and faculty at the AUS an opportunity to move beyond simple bibliographic instruction. The overall aim was to work as a team to develop innovative, collaborative practices, developed specifically for engineering students that addressed three of the ACRL's new frames; Research as Inquiry, Searching as Exploration, Authority is Constructed and Contextual. Such collaborations, when fruitful, provide faculty and academic librarians with cooperative procedures that aim to improve student learning and performance in the academic and the workplace.

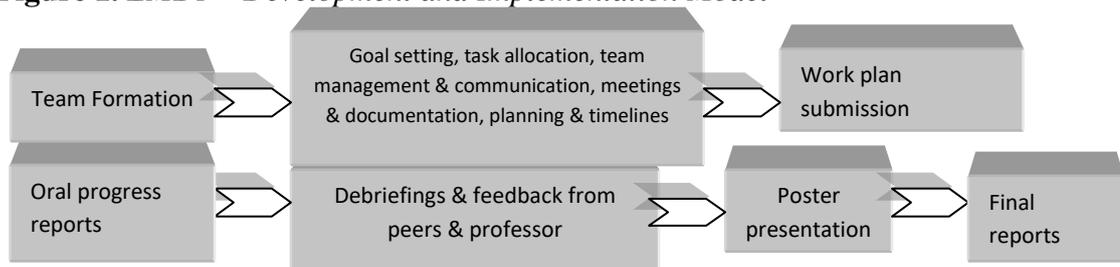
Keywords: Innovation, information literacy, multidisciplinary.

Introduction

New developments in undergraduate engineering programs have placed emphasis on communication and teamwork informed by attributes of self-management and problem solving, recognized as important needs by Accreditation Board for Engineering and Technology (ABET) in the United States. Furthermore, the importance of academic literacy, which incorporates critical thinking, reading and writing competencies, listening and speaking competencies and technology competencies, has also been deemed as essential for the academic success of engineering students. In this paper the authors will outline why and how the Engineering College at the American University of Sharjah (AUS) has attempted to meet these ideals through a process of curriculum change, by first, altering a technical writing course, for junior year engineering students, into a language and communication training course English 207 (ENG207), which emphasizes profession-oriented collaborative, communication and academic skills. Additionally, collaboration between library officers and ENG207 faculty has helped ensure that academic literacy plays a prominent role in this change process, prompting collaborative work designed to develop address two concepts incorporated in the Association of College and Research Libraries' (ACRL) Framework for Information Literacy for Higher Education.

In the course ENG207 Professional Communication for Engineers an engineering multidisciplinary project (EMDP) is the pedagogic tool that has agency in promoting students' attainment of professional communication skills and personal traits. It is university policy that engineering students study this course before conducting their senior design projects and usually prior to internship. The course contents cover communication and academic skills, these skill sets have been incorporated in the engineering multidisciplinary project (EMDP) as shown in Figure 1.

Figure 1. *EMDP - Development and Implementation Model*



Other important aspects of the course facilitate the multidisciplinary team work. Students are trained to conduct meetings, to plan and document decisions, to set planning goals and meet deadlines, to manage themselves and their peers, to show leadership and to evaluate their peers. There is emphasis on responsibility at personal, inter-personal and community levels developing the sense of a community of professional practice. In keeping with recent research findings (Bowen, 2013; Crawford, 2012) the course emphasizes both

skills and traits and aims to develop leadership qualities anchored in moral and ethical principles. This reflects the need engineers have for competencies beyond possessing sound technical knowledge and engineering skills.

Background

ENG207, as described above is the result of transforming a standard technical writing course, into a language and communication training course for undergraduate engineers oriented to professional, collaborative, communication and academic skills. The change was driven by three factors; ABET recommendations, academic and professional research, employer and alumni feedback. In the case of professional research the concerns expressed by the United States Society of Manufacturing Engineers Education Foundation (2007) had named written and oral communication as “significant competency gaps among newly hired engineering graduates”. The texts available, typically technical communication texts, did not seem to offer the kind of writing that engineering students undertake in their university engineering courses or in engineering workplaces. Research by Wolfe (2009) reinforced this perception. She found four areas of conflict between advice in popular technical communication texts and “the knowledge practices and professional values that engineering students are likely to learn in their major course work” (p. 353). The four areas of conflict were: humanities-based advice on the use of active and passive voice; emphasis on humanities-based citation practices; failure to focus on research in fields relevant to engineering students such as data visualization; a disregard for numbers and data which are key elements in engineering discourse.

It was therefore important in the course revision to emphasize the research skills and communication skills that sustain engineering students’ major course work study. The engineering multidisciplinary project has enabled focus on skills essential to both the revised ENG207 course and relevant to the students’ final year Senior Design Project. The engineering multidisciplinary project research, the report preparation and other writing tasks in ENG207 (Project Proposal, Poster Presentation, Transmittal Letter, Executive Summary, Minutes of Meetings, Peer Evaluations) are significant components in the academic preparation of engineering students at AUS for their Senior Design work.

Until recently the Information Literacy Competency Standards for Higher Education (ACRL, 2000) have been an important part of the ENG207 course. Information literacy preparation and briefing sessions are conducted at the outset of each semester in conjunction with the AUS Library. These sessions aim to provide students with the competencies they need to conduct research throughout the semester in order to produce their multidisciplinary projects. However, it should be noted that the ACRL Information Literacy Competency Standards for Higher Education were developed over a decade ago and in the intervening years the “landscape” has changed. Recent research (Zilinski et al. 2014) emphasizes the fact that “undergraduate STEM students are increasingly

expected to have some data use skills upon graduation, whether they pursue post-graduate education or move into industry” (p. 1).

Literature Review

Consistent with the findings in Zilinski et.al the Association of College and Research Libraries (ACRL) has developed an updated, revised and reoriented Framework for Information Literacy for Higher Education, first released in 2014. The ACRL's new Framework for Information Literacy in Higher Education is a document intended to replace the Information Literacy Competency Standards for Higher Education. The standards, which have guided IL instruction for a decade and a half, were in need of revision and rethinking (Oakleaf, 2014). The new framework, developed by a taskforce assembled in 2012 (Oakleaf, 2014), is a significant departure from its predecessor. In contrast to the old standards, the new framework does not provide a set of competencies, skills and outcomes required for students to become ‘information literate’. Rather than an emphasis on a set of rigid and prescribed outcomes, the framework utilizes a set of interconnected core concepts called threshold concepts. Threshold concepts provide a flexible options for implementation based largely on context (ACRL, 2015).

Threshold concepts were initially introduced by British Educators Jan Meyer and Ray Land as part of the Enhancing Teaching-Learning Environments in Under Courses research project (Meyer & Land, 2006). A threshold concept is essentially a learning experience which resembles passing through a portal from which a new perspective is revealed. As a result, the student who has passed through the portal gains a new fresh outlook or way of thinking about something (Burgess, 2015) and is transformed in order to facilitate progression, thereby gaining a new way of understanding, interpreting or viewing something. The change in the way a student thinks can be sudden or it may be prolonged, with the transition in understanding usually proving troublesome (Meyer & Land, 2006). Meyer and Land assert that a threshold concept is identified by the following five criteria: transformative, integrative, irreversible, bounded and troublesome (ibid.). Informed by the threshold concepts theory, the ACRL taskforce charged with replacing the old standards developed a new framework that includes bespoke threshold concepts specifically designed for teaching information literacy.

The new framework heavily drew upon an ongoing Delphi Study that identified several threshold concepts for information literacy. The framework was organized into six frames: authority is constructed and contextual, information creation as a process, information has value, research as inquiry, scholarship as conversation, searching as strategic exploration. Each frame consists of a concept central to IL, and also provides academic librarians and teaching faculty with a set of knowledge practices and dispositions.

A key characteristic of the new framework, and what differentiates clearly from the ACRL's original standards, is the emphasis on the core concepts as

flexible options, open to interpretation (ACRL, 2015). Moreover, the knowledge practices and the dispositions that support each concept are not intended to be prescriptive. The aim is to encourage Librarians and partners on campus to mold the frames to fit their own institutional needs and context. This includes the designing of unique learning outcomes for each frame.

Current Realities

Graduates of engineering and technology programs are now expected to use all available information to make informed decisions in order to be successful in graduate level study as well as in the workforce. According to the United States Center for Energy Workforce Development (2011), technical competencies relating to data consumption for an entry level engineer include being able to:

- identify problems through data collection and analysis
- apply logical processes to analyze information and draw conclusions
- identify inconsistent or missing information
- critically review, analyze, synthesize, compare and interpret information

These competencies resonate with the lifelong learning attributes identified by the Organization for Economic Co-operation and Development (OECD), which are incorporated in the engineering multidisciplinary project (OECD, 2004). These are the fundamental tools for enabling lifelong learning according to the OECD and they align with the AUS General Education Program Goals. For instance, Program Goal E. ‘reflect on the consequences of individual and collective human action’, Program Goal H. ‘develop the skills and abilities to thoughtfully seek information, critically analyze sources and clearly formulate complex ideas’, Program Goal I. ‘investigate how digital technology can facilitate inquiry and the advancement of knowledge’ (AUS Undergraduate Catalog, 2014-2015). The engineering multidisciplinary project (EMDP) is the pedagogic tool that promotes students’ learning processes and encourages the development of the skills, knowledge and values needed to become lifelong learners.

In addition, the ability to write accurately and in an appropriate academic and/or professional manner is an essential accomplishment for graduate students and young professionals. Engineering academics and professionals have responsibility for communicating existing knowledge and creating new knowledge in their disciplines. This requires understanding the dynamics and changes that characterize the world of information, and in using information, data, and scholarship ethically and effectively. Such views are in keeping with societal expectations. During his visit to the UAE in 2014 Andreas Schleicher, one of the architects of the OECD’s Pisa Examination and its special adviser on education policy pointed out that “skills are highly predictive of your future

success” (Skills are more important than formal qualifications, 2014). The data presented by Mr. Schleicher showed there is a high demand for problem solvers, effective communicators and creative thinkers. Students must be able to go beyond learning content as “the knowledge economy does not pay for what you know, but for what you can do with what you know.”

The six Threshold Concepts of the Association of College and Research Libraries (ACRL) Framework for Information Literacy for Higher Education are a set of proficiencies and skills that are common to all of the STEM disciplines. These concepts are “a set of abilities to identify the need for information, procure the information, to evaluate the information ... and to use it in an ethical and legal manner, and to engage in lifelong learning” (ACRL, 2012). Information literacy is increasingly highly valued in the sciences and engineering/technology disciplines, where students have access to a wide variety of digital information sources and where the disciplines are rapidly changing. In the academic and professional context of today vast amounts of information are available so it is vital that practicing scientists and engineers know how to keep up with new developments and new sources of experimental/research data.

The way information is accessed, stored and retrieved is rapidly and constantly evolving; to succeed in this complex environment senior and post graduate AUS engineering students need to develop critical information literacy skills that will allow them to navigate the vast array of information available. Additionally, emphasis on higher order cognitive skills; analysis, synthesis and evaluation of information and data, gives students the opportunity to develop the critical thinking and analytical skills they can use beyond their academic careers when working as engineering professionals. Without these important skills students’ abilities to read and write effectively can be severely restricted.

It is for these reasons that academic faculty and library officers trialed aspects of two of the new Frames; Research as Inquiry and Searching as Exploration during the Summer Semester 2015. In the same way that the Association of College and Research Libraries has revised their approach to Information Literacy to realize a greater potential through “a richer, more complex set of core ideas” (2012) faculty and library officers have come to realize that students need to have a considerably greater focus on information literacy than the preparation and briefing sessions which are conducted at the outset of each semester. Both responses reflect the need to remain relevant to the realities of changes in Higher Education and in the workplaces in which engineers will build their careers.

Background to Innovation

In this section of the paper innovations addressing two of the new Frames; Research as Inquiry, Searching as Exploration are discussed.

The significance of the Engineering Multidisciplinary Project (EMDP) in the course under discussion has already been made clear. The EMDP culminates in a final report preparation incorporating the two specialist texts Transmittal Letter and Executive Summary. Continual research throughout the semester is essential to the development of a substantial and credible EMDP report and it is important that students use constructively the feedback they receive from peers and professors at each stage of the project development. One way of enhancing this development process for students is by embedding specific data information discrimination tasks into the syllabus to provide specific opportunities for students to build capacity as effective, discerning researchers.

A strength of the ENG207 course is that it already leverages on interdependent technologies; iLearn (the AUS course management system), the Springshare online guide software LibGuide, an Active Learning Space classroom, the AUS Library Engineering and Science focused databases (IEEE Xplore, ASCE Library, ASME Digital Collection, ProQuest Science Journals, Science Direct). Embedding data information discrimination tasks was not an issue of radical innovation but rather integration into an existing pedagogic model. The tasks addressing the two Frames, Research as Inquiry (research logs), Searching as Exploration (keywords, identifying important databases) were trialed during the short Summer Semester 2015. The trial built on the already close links between the AUS Library and ENG207. A further assignment which built on the research logs, keywords and data base tasks was the use of annotated bibliography work.

As an integral part of the EMDP work students in ENG207 work in teams drawn from different majors, to prepare a project proposal, to make a succinct, collaborative oral progress report, conduct a poster presentation and produce a written report on their multidisciplinary projects. Sound academic and information literacy are essential tools to aid the development of a meaningful and appropriate EMDP. Research supports the notion that these tools cannot be assumed; Lea and Street (2006), for instance, have shown that students will almost certainly enter university with a deficit of appropriate academic and information literacy skills. It is also the case at the American University of Sharjah that the majority of students studying engineering are studying in a language (English) which is not their mother tongue and that many come from school systems which value rote learning habits in keeping with the prevalent transmission model of education in the Middle East North Africa (MENA) region. A problem that students often carry over from this background is passivity (Hatakka, 2013), coupled with a belief that facts are more important than the ability to analyze information. Many writers Quarton (2003), Prescott (2007), Choo (2007) and Prescott & Prescott (2008) have cautioned against expecting that tertiary students will be able to develop unaided effective higher order critical thinking skills as they progress through university.

Methodology- Research Logs, Keywords, Databases, Annotated Bibliographies

The research log is an effective tool for assisting the early stages of student investigation, especially when they are working in teams. Individual team members can use the structure of the research log (from author(s), through title, publication date, data base to notes about important, relevant content) and present this at a team meeting. This way members in a team can investigate widely and present findings in a common format to support the decisions that the team will need to make about topic choice and suitable resources. Students in the summer, 2015 semester pointed out that the method helped them “analyze and evaluate our findings/sources and selectively choose sources based on abstract, subject headings, figures and tables” (student team feedback). The research log is often utilized as an identification and selection tool, but it can be used throughout a course to help students develop critical reading skills and reflect on what they have learnt about their EMDP topic.

The Research Log used in the work described here is divided into three sections, reflecting three stages of student research progress and development of information literacy and academic skills. In the initial stage (Identify Resources) students are focused on locating material potentially relevant to their EMDP topic, dealing with general topic area(s), and possible resources that relate to these topic area(s) and using basic selection criteria (abstract, citations, subject headings and so forth). In the second stage (Read) students are required to evaluate their selections using critical indicators (reliability, accuracy, validity, authority, currency) and then to evaluate the content. In this part of the research log they focus on purpose, scope, methodology, presentation of findings and look for gaps or weaknesses. This is a useful task after the initial research has concluded as it provides tools to aid informed, selective decision-making. Finally, the students are asked to reflect on their EMDP topic (Incorporate New Learning) and discuss how their work has changed the way they view or think about their topic. This stage is effective as consolidation of the information literacy and academic skills development that occurs in the previous two stages.

As part of the course integrated IL program at the American University of Sharjah all students enrolled at AUS are required to attend two IL sessions as part of two separate courses offered by the Writing and English departments respectively. Following the completion of these IL sessions the Library has little contact, in the way of instruction with students at AUS. However, this has not been the case for the department of Engineering. In a unique set of events, through a mutual agreement between the library and the English and Engineering departments, Librarians provide a single course integrated information literacy session to engineering students enrolled in ENG207. This session is specifically designed for engineering students.

Unlike the two general required course integrated IL sessions, the IL session for ENG207 aims to guarantee that engineering students have adequate access to the information, tools and resources that support IL within an engineering context. Effective collaboration between the AUS Information

Literacy Librarian and the ENG207 Faculty has helped ensure that information literacy plays a prominent role in ENG207. In the past, the development of a course specific LibGuide and a course-integrated IL session executed by an IL Librarian were the two main avenues by which to insure IL comprehension. The IL session focused on three learning goals. Firstly, to instruct students about how and why to access engineering and STEM specific databases (e.g. IEEE Xplore or Web of Science). The aim is to explain to students the differences between the Library's discovery tool, Summon and the various subject specific databases. The second goal was to teach students about how to use properly the databases with advanced searching techniques (e.g. Boolean operators, subject and or keyword searching, facets etc.). The final goal was to teach students about the importance of evaluating academic sources for quality.

Results/Discussion

In the spring semester of 2015 discussions between ENG207 Faculty and the IL Librarian at AUS, revealed that students enrolled in ENG207 could benefit from increased and innovative collaboration between the Librarian and Faculty. However, this collaboration could not take place in the form of an additional IL session, as ENG207 is a course with an intensive syllabus that occupies the majority of classroom time. Thus, it was evident that alternatives in the form of IL exercises, activities and assignments would have to be explored.

Through a number of consultations between one ENG207 faculty member and the IL Librarian, it was quickly established that the outcomes of this collaboration had to go beyond the conventional strategies (i.e. bibliographic instruction) and tools previously used to encourage information literacy. Discussions quickly determined that an approach targeting specific IL needs might allow for the creation of unique IL assignments and exercises. The intention was to first trial the assignments and exercises developed through the collaboration in the trial section of ENG207. Later, after the completion of the trial phase and some fine-tuning, the final products of the collaboration would be offered to other faculty teaching ENG207.

During this crucial stage the ACRL released its second draft of the new Framework for Information Literacy in Higher Education. The draft's release was timed well with the upcoming plan for developing new IL initiatives for ENG207. The IL framework was provided to the ENG207 faculty member concerned and through a series of meetings and consultations it was determined that the framework provided a good base for developing assignments that would challenge students to look at academic resources with a more critical eye.

One of the key characteristics of the second draft of the framework that distinguished it from the various drafts and later the final edition released by the ACRL, was its inclusion of sample assignments that support the framework. In addition to providing librarians and faculty with ideas of how to

teach IL threshold concepts, the examples provided librarians with a tangible method for conveying and explaining the IL concepts and theories in the framework, to faculty for whom information literacy is not an area of expertise. However, it should be noted that the final edition of the framework omitted sample assignments, despite its practicality, in an effort to ensure that the framework remained a document that was context driven and not prescriptive.

It was readily determined that students in ENG207 would benefit from assignments and exercises that focused on two of the six frames in the ACRL's IL framework. The frames selected were: Authority is Contextual and or Constructed, and Searching as Strategic Exploration. These two frames were selected because students in ENG207 regularly demonstrated that, although they were aware of methods for searching for academic resources, as result of the IL instruction sessions, they lacked the knowledge to determine what made a specific engineering database useful and why and how to look at academic resources and scholarship with a more critical eye. These two important higher order components of IL, required more emphasis that was occurring in the ENG207 IL sessions.

To facilitate the comprehension of these frames, the Librarian developed a two part IL exercise with the intention of integrating them into the array of tasks students complete as part of the engineering multidisciplinary project in ENG207. The first part of the exercises had students evaluate a specific Engineering database with an emphasis on determining various attributes of the database that made it a useful tool for students' needs. Here students were asked to go beyond simple searching and analyze why they considered the database to be an effective resource for their research, and to compare the database to others in terms of: quantity, types of sources, results, and relevance.

Students were also asked to develop an annotated bibliography, with a critical eye for authority within their areas of study. Rather than simply create an annotation that summarized the contents of an article, students were required to find several scholarly sources on the same topic and analyze their usefulness, the author's stance, biases and how the articles added to the scholarly conversation in the field. The process required summary, assessment and reflection on sources *possibly* relevant to their EMDP projects in addition to critical reading as opposed to simply collecting information. In this regard, it encouraged depth and quality in research, it took account of the scope of sources available and provided a platform for exploring and organizing sources for further research. As such it integrated well into the Research as Inquiry frame of the ACRL IL framework.

Students in the summer, 2015 semester used the two part IL exercise in addition to the Research Logs described earlier, to provide critical information about sources with potential relevance to their EMDP topics both for immediate needs and as alternative or future possibilities.

One of the features of an EMDP project is the dynamic nature of team topics which frequently change focus and direction as the result of a number of influences. One clear influence is the work of the individual team members searching for information about the team's project topic from the perspective

of different engineering disciplines. It is a requirement of the EMDP work that the topics must accommodate roughly equal input from each of the disciplines in a team. This constraint often forces a team to revise topic choice several times until suitable subject matter is identified and agreed on by the team. The annotated bibliography is helpful to this negotiation process as it assists students to summarize content/scope of a source, outline significant argument or thesis, identify research methods and conclusions and comment on the reliability of the text and the authority of the authors. The standardized structure of the annotations allows team discussions and negotiations to be conducted within a framework that all are familiar with, one which facilitates the comparison and selection process.

Another set of influences that may instigate change involves the assessment tasks, written presentation of the project proposal and oral presentation of a progress report. In both these tasks there is built-in capacity for scrutiny and responsive feedback. In the case of the project proposal a 3 page submission is required in which the team states the context or situation of their topic, identifies the problems they will seek to resolve, states some possible solutions, makes some preliminary statements about how these solutions might be evaluated and includes a short reference list as evidence of searching and inquiry. The team members also need to indicate what they expect their research methodology to consist of, ask a research question and clearly explain how each of the engineering disciplines in their team will contribute to the project topic. The principal challenges of this task are organizing information into the situation, problem, solution, evaluation (SPSE) structure and writing coherently, appropriately and accurately using the language functions and grammar of engineering texts. Each team meets with their professor and the proposal is discussed in detail with reference to a rubric which is both the task and assessment instrument. It is frequently the case that change of topic focus or even selection of a different topic is the outcome of this meeting. It is in these cases that the annotated bibliographies of the team members with respect to alternative and future possibilities are again extremely useful. Furthermore the value of sources that relate to the ACRL's frames, Authority is Constructed and Contextual.

The oral presentation of a progress report provides opportunity for a more public level of scrutiny and feedback. Each team makes a 10 minute presentation of the work undertaken to the time of the progress reports, usually in semester week 7, mid-semester. The audience for these presentations are the members of the other EMDP teams who participate in peer assessment of their colleagues and ask questions at the conclusion of the reports. This task is described by a rubric which also acts as the assessment instrument so the peer evaluation is a meaningful and transparent activity for students. The report is expected to make the SPSE structure of the project clear, explain the multidisciplinary nature of project, refer directly and indirectly to important sources identified to date and demonstrate effective presentation techniques and the use of appropriate and accurate oral report language. In the question and answer sessions that follow the presentations it is often the case that areas

of omission and weakness in the presenting team's EMDP will be identified. This may be the result of more recent research the team has not yet discovered, or it may be a clarification of engineering principles, or it could be information about a professor in the AUS College of Engineering who is conducting research germane to the team's EMDP. Sometimes a team working on a topic with a clear relationship to the presenting team's project can offer advice about additional sources and useful databases to be consulted. In each case the annotated bibliography is a tool that students can refer to for identification of additional or different sources or they can share the information in their colleagues' annotated bibliographies where another team has information to share. In each of these cases the standardized structure of the annotations facilitates the need for, or possibility of, change.

Revision, editing and adaptation of the EMDP topics is a process that is part of an effective team project and continues throughout the semester until the writing of the final report. Following the oral progress report the student teams design a poster and present their EMDP topics to a wider audience of faculty and senior students. This brings them into contact with a more critical audience and further possibilities for extension, reorientation and enhancement of their project topics. At this stage of the semester it is crucial that decisions about change, inclusion or refocus of topics be made on the basis of systematic information from sources that support or do not support alterations. The annotated bibliography has a clear role to play in this process as it provides a set of critical information on which such decisions need to be based.

Both the research log and the annotated bibliography have another important function. The AUS Library makes available a research librarian for student consultations. Both documents are important when students take advantage of this service.

In the summer 2015 semester students completed an open online annotation exercise at the end of the semester in order to demonstrate what they had gained from the experience of the semester. In the exercise they were given a project topic (Design of Airfoils for Wind Turbine Rotors) and a Science Direct journal article relevant to the topic. They were required to write a citation for the article, briefly discuss the purpose and scope of the article, the research methods and presentation of evidence and to evaluate its usefulness to the project topic. Further they were asked about their use of AUS Library databases. First they had to nominate a database (chosen from IEEE Xplore, ProQuest Science Journals, Science Direct) and state how they linked to the database. They were then asked specifically about the keyword search, the other filters that could be utilized and what recommendations they would suggest to improve the database. The average grade for this exercise was 7.8/10, which represents a C+ grade.

If this grade attainment is considered in the context of the Framework for Information Literacy for Higher Education, the conceptual understandings and the knowledge practices that the framework seeks to promote then clearly there is much yet to accomplish. The ENG207 course certainly requires more explicitness in the development and practice of information literacy but there

are limitations of time in an already crowded syllabus. The answer may be to design a course for senior and graduate students which is concerned with developing students' academic and professional writing skills. Such a course could take a starting position focused on the six Threshold Concepts of the Association of College and Research Libraries (ACRL) Framework for Information Literacy for Higher Education and use these to develop critical reading skills and coherent, appropriate and accurate written skills related to critical reading. The departure from this foundation would be to develop academic and professional English language attributes leading to a publication standard academic/professional article on a topic related to the students' majors.

Conclusion

According to the American Library Association (2000) information literacy is an ongoing process and an important component of lifelong learning. However, the application of information literacy must extend beyond the use of discrete library skills and strategies to the ability to use complex information from a variety of library and non-library sources to develop meaning and problem solve. Coupled together, information literacy and lifelong learning can work to assist students in "finding and keeping a satisfying job and moving up the career ladder rapidly and with appropriate rewards, and making cost-effective and wise economic and business decisions" (Kuhlthau, 1999). Therefore, the development of a curriculum-integrated learning object, such as the one proposed, can effectively contribute to Engineering students' learning processes and encourage the development of the skills, knowledge and values needed to become lifelong learners.

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