Abstract

Technical communication is a vital part of an engineering student's education. Both the Accreditation Board for Engineering and Technology (ABET) and the American Society for Engineering Education (ASEE) emphasize the necessity of good communication skills within their standards criteria. A technical communication course for engineering students needs to incorporate both writing and speaking skills of technical reports and presentations as well as technical or professional correspondence such as information request letters. Since making connections with other engineers from around the world is now a realistic possibility, engineering students must have the skills to adequately correspond using professional written conventions. The importance of information gathering is also an indispensable element of engineering education. 21st century engineers need to successfully search and retrieve information related to their specific field in a timely manner.

A set of tasks that combine information gathering skills and professional correspondence writing has been developed for undergraduate Engineering students in a Technical Communication course at a university in the United Arab Emirates. The tasks concentrate on initially obtaining information related to the student's own specific engineering field of study. The first task focuses on searching for engineering-related research being carried out at a variety of universities, specifically emphasizing the webpages of university-based research laboratories. A second information seeking task involves finding information from engineering or technology-related companies, particularly looking for information related to research and development within companies. Students are then required in a follow-up task to write an information request to either a company or university researcher directly related to information gathered. Students are provided request letter models and the specific language necessary for appropriate writing conventions. The follow-up request letter provides an authentic application to tie into the engineering-related information gathering tasks.

Keywords: Technical Communication, Information Literacy, Engineering students, Lifelong learning.

1 INTRODUCTION

Keeping informed of the latest developments in science and technology research as well as having good communication skills are now well recognized as key abilities by engineering university programs. Being able to appropriately locate up-to-date findings and Communication skills, both oral and written, are included in the criteria of the Accreditation Board for Engineering and Technology (ABET) for engineering education standards [1] as well as being highlighted in various publications of the American Society of Engineering Education (ASEE) [2]. The focus on improving communication skills within engineering programs has been influenced by a noted concern voiced within industry of newly graduated engineers lacking what is expected [3, 4]. The need for good communication skills by engineers is also apparent in the additional communication-focused coursework many engineering university programs are now including in their curriculum [5 - 7].

The required communication skills are not limited to the vital ability to write and present technical reports appropriately, but to also include various types of correspondences that can arise due to the collaborative nature of engineering. Interpersonal communication —. In its Engineer of 2020: Visions of Engineering in the new century publication, the National Academy of Engineering (NEA) indicated the need for improved communication skills, especially with the increasingly global environment associated with engineering through modern communication tools [8].
There has been a noticeable rise in the amount of scientific collaboration between universities within the past two decades [9], and an increase in research productivity from the collaboration as well [10,11]. This increased collaboration has been as a result of Internet-based communications. Consequently, the interpersonal skills of collaboration and communication are viewed as being increasingly necessary in the engineering workplace of the 21st century.

While reading up-to-date journal articles and attendance at engineering-related conferences will bring together researchers of similar focuses, information of current research is often available through the Internet as well. Giving engineering students instruction and practice of identifying technical research through the webpages of universities, especially specific to engineering department webpages, or technology-based companies with dedicated R+D webpages can help make them better aware of this [12,13].

The Internet-based search tasks and the Information Request writing task are activities that the students will be able to use throughout their lives. These types of tasks are therefore associated with the lifelong learning aspect, another important ABET engineering education criteria [1].

2 INTERNET-BASED RESEARCH TASKS

Two Internet-based research tasks were integrated into a Technical Writing course taken by 2nd and 3rd-year students. Because the students are all in various Engineering majors, the Internet research tasks target gathering information related to either Engineering or science and technology topics. The two tasks allow students to find related websites that correspond to specific information asked for.

The initial Internet-based research task (See Fig. 1) required students to identify Engineering/Technology-related research being carried out at five companies related to their academic major, and if possible with a focus specifically similar to their own within their academic major.

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**Fig. 1. Research Skills Worksheet: R+D of Engineering Companies.**

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The second Internet research task is designed to have students gather information from websites of engineering programs at various universities worldwide (See Fig. 2). Before completing the worksheet focusing on web-based research of engineering universities, students are provided an article titled “Putting the touch back into Touchscreens” from New Scientist which nicely compiled research in the area of touch-screen technology incorporating haptics from a number of university research institutions [14]. Students are provided a digital version of the article and asked to identify the universities and the particular research developments being carried out. This clearly shows students how a collection of research information such as this is written in some common science/technology-based publications. Students are then asked to form small groups of the same academic major to brainstorm their knowledge of similar engineering programs at other universities around the world and any specialized research focuses they may be aware of. Students are allowed to search for information from one of the universities they are aware of, but are also encouraged to locate others that they are not familiar with.

**ENGL 220 Technical Writing**

**Name _______________________ Student I.D. #: ________**

**Research Skills Worksheet: Engineering Research at Universities**

**Academic Major:**

**Specific Focus within Major:**

Search the Internet to find universities with similar Engineering departments/schools and identify specific research projects being done within each university. Identify three (4) universities in different parts of the world that 1) have engineering departments related to the type of engineering you are majoring in, and 2) specific research being carried out at the university.

**Specific Requirements:**

- No more than 2 universities from North America and Europe
- Identify at least 2 different types of specific research being carried out

1) **Name of University:**

Type of specific research being carried out: (Type or Cut and Paste brief section):

Researcher’s name(s):

URL of specific research information (paste URL on line below)

2) **Name of University:**

Type of specific research being carried out: (Type or Cut and Paste brief section):

Researcher’s name(s):

URL of specific research information (paste URL on line below)

**Fig. 2. Research Skills Worksheet: Engineering Research at Universities.**
3 THE INFORMATION REQUEST WRITING TASK

One week after completing the two Internet-based research skills worksheets related to engineering research at companies or universities, students were given the Information Request writing task prompt (See Fig. 3). The writing task prompt asks students to choose one of the companies or a university-based researcher to enquire about some form of interaction. The students could choose their own particular aspect of coordination they saw fitting. As explained in the instructions for the task, which was assessed as an assignment, students also needed to provide clear proof of the connection between the chosen company or university researcher and their own academic interests in the form of weblinks and a brief explanation of the on a separate paper.

<table>
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<tr>
<th>ENGL 220 Technical Writing</th>
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<tbody>
<tr>
<td><strong>Writing Task: Information Request</strong></td>
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<tr>
<td>Context: Imagine that you are interested in the research or product development being carried out at a company or research institute (including universities). Also, since collaborative research is increasingly common in an engineer’s career, even with engineers or commercial entities of different companies or institutes (even in other countries), you may want to initiate communication with them.</td>
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<tr>
<td>Instructions: Using the information collected from the two Internet-based research tasks done previously (Engineering research at companies/universities), choose one (1) of the entries to write an Information Request letter via e-mail. You may choose the particular situation of your request, but it should correspond with your academic focus mentioned on the research tasks worksheets.</td>
</tr>
<tr>
<td>Be sure to consider the following in your correspondence:</td>
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<tr>
<td>• Give information about yourself, your institute affiliation, and/or the common science/technology associated with the request.</td>
</tr>
<tr>
<td>• Use appropriate language for a request of this nature (See “Technical Language for Information Requests” in Moodle).</td>
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Fig.3. Instruction Page for Writing Task: Information Request.

While students had previously received instruction and practice of the conventions of formal letter writing, including internal memos and appropriate e-mail correspondence, the Information Request task allowed for reinforcement practice with a more authentic application. After receiving the Information Request writing prompt, students were asked to brainstorm the possible information and corresponding language that would be used in such an event. The various ideas were collected and written on the board for all to view. To assist in the specific language useful for the task, students were directed to a webpage with an online article that addressed the various types of correspondence with others in the industry that engineers may have in the workplace [15]. Created with Chinese engineers in mind, the article nicely covers a wide range of correspondence situations that engineers in an international setting could encounter, and especially geared toward cooperation with other engineers at companies or research institutes.
Technical Language for Information Requests

Correspondence involving information requests typically includes requesting program information, requesting company information, requesting product information, requesting technology information, requesting reference materials and price quotations - information services. Common patterns in correspondence related to requesting information technical training include the following (with examples):

Stating the organization's interest in the requested information. Requests for information should not be viewed as merely a means to obtain information. Instead, information requests should be considered as the first step in identifying the mutual interests of both organizations. For instance, how will the other organization benefit from supplying this information?

"We intend to explore other possible applications of these films, particularly in the IC, electronics and packaging industries here in Taiwan."

"Our laboratory is currently developing a flow measurement test rig. Our design consultant suggests the use of ABC valve products on some of the mechanical components. The following is a list of items we are interested in purchasing from your company."

Requesting information. By clarifying your organization's interests, you allow the reader to make a correlation between the interests and goals of both organizations.

"Please send me introductory information as well as other relevant publications that explain your strategies, methodologies, achievements, and future objectives."

"Since our goal closely resembles that of your organization, we would like to develop a partner relationship with your Industrial Material Exchange Service and, in this way, facilitate information exchange and other possible collaborations."

Other Language for Technical Correspondence (to be used with Information Request)

Correspondence involving technical cooperation typically includes exchanging information, seeking technology licensors, paving the way for technology transfers, proposing how to proceed with technical cooperation, requesting participation in/or accreditation by an international body, and reporting the current status of related activities. Common patterns in correspondence related to technical cooperation include the following with example statements below:

Stating the organization's intention of seeking cooperation. Simply stating the organization's desire to form a cooperative relationship with another organization helps avoid future confusion.

"I'd like to propose a technological information exchange between our two organizations regarding environmental pollution prevention-waste minimization."

"We recognize that the continued success of our work depends on our sharing and exchanging experience with similar organizations."

Providing suggestions on how to initiate cooperation.

"I am looking forward to hearing your ideas or suggestions regarding this information exchange opportunity. I would also like to arrange for a ten-day technical visit to your organization this upcoming May as the initial step of our cooperation."

"Please let me know if there are any areas of common interest you would like to discuss."

Commending the achievements and reputation of an organization. Sincerely acknowledging or commending the other party's success in a particular technology expresses the organization's intention to contribute toward as well as learn from the collaborative relationship.

"Your corporation has a long tradition of providing outstanding engineering that has various properties and excellent quality."

"ABC's Biotechnology Group has developed some interesting products that we would like to understand in more detail."

4 CONCLUSION

The increasingly collaborative nature of engineering work, where engineers can now even collaborate with other engineers or scientists in different countries, has fostered the need for engineering education to include more technical correspondence instruction and practice. Engineering students should also be aware of the means to identify, via the Internet, other researchers or companies related to their focused interests within their engineering major. The two web-based engineering research information retrieving tasks and the corresponding follow-up Information Request writing task were developed with this type of interaction in mind. The link between the results of the Internet search tasks with the Information Request task successfully creates a more authentic situation in which to motivate students. All engineering students would benefit from the combination of these types of tasks and, therefore, should be included in Technical Writing courses in engineering-based university programs.

REFERENCES


