Designing and Evaluating a Genre-based Technical Communication Course Incorporating a Task-based Model of Instruction

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Abstract

The universal introduction of a four-year curriculum for undergraduates in Hong Kong has necessitated the development of new types of courses that build on general EAP training in preparing students progressively for the specific language demands of their discipline. This important work has attracted much attention, but reports on the conceptualization of the new courses and their effectiveness have only begun to emerge. This paper discusses how a new genre-based technical communication course at HKUST aims to enable novice engineering students to function effectively in their academic studies through the adoption of a task-based learning framework which exposes students to a careful selection of genres and lexicogrammatical features. The course was piloted with 230 students, and an evaluation study was conducted using triangulated data from course surveys, focus group discussions, and textual analysis of students’ writing. Preliminary results suggest that the course has helped students to acquire the skills for writing a technical description using an appropriate writing style. Students have also learned to use technical words in contextually meaningfully ways. However, they were less successful in writing the introduction to a technical report. These findings are discussed in relation to the students’ prior learning experiences.

Keywords: genre-based pedagogies; task-based learning and teaching; curriculum design; course evaluation

Introduction

Genre-based approaches are now common in tertiary-level English for Academic Purposes courses. A genre has been characterized as a structured ‘class of communicative events, which share some set of communicative purposes’, and which are recognized by expert members of the discourse community (Swales, 1990, p. 58). Examples of academic genres in the field of engineering might include proposal reports and technical presentations. The terms ‘genre’ and ‘text type’ are often used interchangeably, but following Paltridge (2002), we distinguish between ‘genre’, as texts such as ‘proposal reports’ which are defined by external criteria, such as their recognition by a particular discourse community, and ‘text types’, as rhetorical modes, such as ‘description’, which have similar internal discourse structure, regardless of genre.

There are three major theoretical approaches to genre: the Systemic Functional Approach, the New Rhetoric Approach and the ESP Approach, which have all been
described in detail elsewhere (see Hyland, 2004; Hyland, 2007). As our interest in genre is as a tool for helping second language (L2) learners to understand and produce texts in academic and later professional contexts, the approach which principally informs the present study is the ESP approach. However, as typically eclectic and pragmatic ESP practitioners (Belcher, 2006), we also draw from studies by practitioners from the two other schools of genre theory.

The ESP approach takes as its starting point that L2 learners often have great difficulty in producing the text types expected by their discourse communities, and that genre-based pedagogies can assist such learners in understanding the special linguistic and discourse features of the texts they read and help them to make use of these features in the texts that they write (Flowerdew, 2002; Hyland, 2007). Some scholars have questioned whether genre instruction can be effective, given the complex and variable nature of genres (e.g., Freedman, 1994). However, positive findings have been reported from other studies conducted to measure the effectiveness of genre instruction, though these findings have to be interpreted with caution, as the studies, like the one reported in this paper, have been small in scale and varied in context and focus.

A number of scholars have reported that exposure to a range of genres can help students to build up a repertoire of strategies to help them analyze unfamiliar genres (Devitt, 2004; Palmquist, 2005), while Tardy (2009) reported that her L2 graduate students’ strategy when confronting an unfamiliar genre was to compare it with previously learnt genres, building up a rich genre repertoire. Cheng (2007) found that his small sample of graduate students, after noticing and analyzing features of a specific genre, could then integrate these features into their writing. At the same time, Cheng observed students engaging what he characterizes as ‘writerly reading’, in which they placed themselves in the position of a writer when analyzing texts (2007, p. 304). Hyon’s (2002) investigation of the effectiveness of genre instruction in an academic reading course (totaling 11 students) examined data from student interviews and examinations. Her results suggested that genre-based instruction can help students in both academic reading and writing.

Studies in this area indicate that building genre awareness in L2 EAP classes can help students to both read and write academic texts more effectively, though Johns (2002) and Tardy (2009) both noticed a tendency for students to over-generalize from previously learnt genres. Flowerdew (2002) has highlighted the potential perils in leading students to believe that producing appropriate text types is simply a matter of applying the correct organizational template in their writing while other scholars have stressed the importance of supplementing an analysis of ‘moves’ (Swales, 1990, p. 141) with consideration of the context in which the text is produced and the positioning of the writer in relation to the target discourse community (Dudley-Evans, 2002; Swales & Feak, 2012). Johns (2002) reports that her novice student writers had well-established but ‘often sterile and simplistic’ ideas (p. 240) of what constituted academic texts, and needed to be introduced to a richer range of genres and assisted to create a limited number of academic texts, aligned with appropriate text types in their discipline.

The selection of texts and genres at an appropriate level of specificity is always of key importance in the EAP classroom. Scholars making a strong case for a
‘narrow-angle approach’, including Hyland (2002, 2011) and Braine (1995), have argued that there are striking differences in language use across disciplines, and that learners need to learn genres and language features specific to their discipline. Others have argued that although context affects the choice of language features, this does not rule out the existence of a trans-disciplinary common core of features (Huckin, 2003; Johns, 1997), and that highly specific courses present a restricted language that only helps students to function in very limited circumstances (Basturkmen, 2010). A small-scale study in South Africa compared the effectiveness of ‘wide-angled’ and ‘narrow-angled’ approaches by investigating the essay-writing performance of two groups of undergraduate students, one of which followed a genre-based syllabus with subject-specific materials and the other of which followed a genre-based syllabus which was not subject specific (Carsten, 2009). Both groups showed measurable improvement in their writing after instruction with the performance of the subject specific group improving more than that of the cross-disciplinary group. In support of this, Tardy (2005) found that as her students developed knowledge of the discipline, they developed a better rhetorical understanding of texts. According to Belcher (2006), instructors and course designers generally make pragmatic decisions about whether to take a wide- or narrow-angle approach, based on the characteristics and needs of the learners rather than on the basis of their own beliefs about specificity.

In recent years Task-based Learning and Teaching (TBLT) has been commonly used to organize instruction in the L2 classroom in Hong Kong and elsewhere. A task-based approach assumes that language learning is fostered by communicative interaction and employs purposeful activities as the basic elements of the course (Feez, 1998). Tasks can be characterized as ‘a means of creating experience-based opportunities for language learning’ (Samuda & Bygate, 2008, p. 36).

Although several task-based models of instruction have been proposed, the following elements are common to most of them. The needs of the learners should be specified and the expected learning outcomes should be detailed. Most task-based approaches group tasks by thematic relationships as well as by complexity, with tasks becoming increasingly demanding. Materials and tasks should be authentic, i.e., related to language use outside the language classroom. Tasks involve sustained analytic work, involving a focus on form. Task materials are designed to facilitate the structuring and scaffolding of input by teachers, and to help students notice the relationships of form, meaning and function in texts (Norris, 2009).

Instructional models of TBLT vary, but most incorporate a task-input stage, where learners are exposed to the language learning targets, by reading texts, watching a video etc. Learners then engage in pedagogic work on those texts, with teacher guidance, and then deploy what they have learned in performance of the target task. There may then be a follow-up phase, where learners reflect upon the task, perform another similar task or engage in further focus-on- form activities (Norris, 2009). Some approaches include a focus on form at the task-input stage (Samuda, 2001, as quoted in Skehan, 2003) while others encourage students to use all the language at their disposal to complete that task, with no pre-selection of forms to be focused on at the task-input stage, with focus on form coming after task performance (Willis, 1996).

Genre-based pedagogies are similarly based on an analysis of needs (Belcher,
Designing and evaluating a technical communication course

2006; Hyland, 2007) and the use of authentic texts, grouped by theme or genre, with the introduction of genres sequenced according to their complexity (Hyland, 2007). Support or ‘scaffolding’ from the teacher is crucial, and in genre-based pedagogies, rhetorical consciousness-raising, in which students examine and report back on target texts (Swales & Feak, 2012) plays a prominent role. TBLT appears to be compatible with genre-based pedagogies and provides a strong instructional model in which to frame the teaching of genre in the L2 classroom. In spite of this, genre-based courses tend to emphasize such activities as the deconstruction of text models and the construction of students’ own texts, with relatively scant attention paid to the advantages that TBLT has to offer. This paper discusses how the two pedagogical approaches were combined into a curriculum design framework to guide the development of an EAP course, in the changing context of higher education in Hong Kong.

The Context of the Study

Education reforms in the local community have transformed undergraduate university education from a three-year to a four-year system and in response to these reforms there has been extensive curriculum renewal in local tertiary institutions. The English language curriculum at the Hong Kong University of Science and Technology (HKUST) is being restructured, entailing the development of many new courses. All first year students in the four year curriculum will take a 6-credit, one-year, ‘common core’ EAP course (see figure 1). An in-house test of language proficiency will be administered at the beginning and end of the first year; in order to pass the course, students will have to demonstrate a level of English equivalent to IELTS Band 6.

Figure 1. Structure of English language curriculum at HKUST

In the four-year curriculum at HKUST, the second year marks the end of the more general core courses, and the beginning of the students’ study in their disciplines. Second year students will take a common, one-semester, 42-hour, 3-credit discipline-specific EAP course. In their third or fourth year of study, for their final 3-credits of English, HKUST engineering students will take a final English course which will be individually tailored to the needs of students in each department of the School of Engineering.

This paper reports on the design and evaluation of a new second-year, discipline-specific technical communication course and outlines the pedagogical issues which the course designers had to resolve. The course, named Technical Communication I, aims to enable students to communicate effectively in academic contexts relevant to engineering. The majority of the target students are local L2
learners, with a smaller number of students coming from such places as mainland China, Malaysia, Korea, India and Pakistan. These non-local students tend to have a higher proficiency in English (IELTS Band 7 equivalent or above).

**Course Design**

In developing the new course, we recognized that genre instruction had to be an important element in the course. Previous research into the difficulties faced by undergraduate students in Hong Kong has indicated that writing in the discipline, in particular, is often problematic. Evans and Morrison (2011) found that understanding and conforming to the culture and conventions of a new discipline was extremely challenging for Hong Kong undergraduate students, and that writing was considered to be the most problematic area, with students identifying ‘using appropriate academic style’ (p. 203) as the most difficult.

We needed to decide which genres we could include in a course of only 42 hours. Cheng (2010) has identified more than 30 genres relevant to students of engineering in Hong Kong. For reasons of time, the course included a more limited range of genres for rhetorical consciousness-raising, which the course designers and colleagues from the School of Engineering felt to be most relevant to engineering undergraduates. Journal articles, technical blogs, popular technology articles and talks, ethical codes of conduct from professional bodies, patents, and newspaper articles about ethical issues in engineering, were all included and analyzed in the pedagogic tasks in the course.

Specificity was another important issue. The course was to be taken by all second year students in the School of Engineering, after completing an EAP course in the first year. As our course was to be taken by novice engineering students, drawn from different departments, we needed to design a course that occupied a position somewhere between a ‘wide-angle’ and a ‘narrow-angle’ approach, and which was ‘discipline-specific’, rather than ‘subject specific.’

Our emphasis on genre meant that texts assumed a central role in the course, and selecting texts which were both authentic and comprehensible to a range of novice engineering students was a challenge. Texts had to be representative of text types which commonly occur in engineering writing, but could not be so specific as to be uninteresting or incomprehensible to students from different sub-disciplines of engineering (Clapham, 2001). Some of our texts, such as those about engineering ethics for Unit 2 of the course, were engineering-related, rather than engineering texts, and were more universally comprehensible. Academic and technical texts were the most problematic. Authentic written and spoken texts, not originally produced for language teaching (Brinton, Snow & Wesche, 2003) were selected where possible, though for most texts some kind of modification was needed. Simplification of texts was kept to a minimum and extracts of authentic materials were generally used in preference to rewriting texts. The course was organized around three main themes: Engineers and Identity; Engineers and Social Responsibility; and Engineers and Creativity. These themes were identified, in collaboration with colleagues from the School of Engineering, as being relevant to engineers and thus likely to be engaging to novice engineering students as they align themselves with the interests and concerns of their disciplinary community.
We selected only a small number of genres for production: essays, proposal reports and academic presentations. These genres were chosen for their relevance to the students’ immediate academic needs: oral presentations are required in many courses at HKUST, essay assignments are common in the humanities and social sciences courses which all engineering students have to take, and engineering students are generally required to write a proposal report before embarking on their final year projects. The genres were sequenced according to how complex and unfamiliar they were to students, with the academic essay coming before the proposal report (see Table 1).

Table 1
An outline of the themes, tasks and genres in Technical Communication 1

<table>
<thead>
<tr>
<th>Theme</th>
<th>Tasks</th>
<th>Genres/text types (recognition)</th>
<th>Genres/text types (production)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit 1</td>
<td>• Oral presentation: ‘Why I chose to study engineering.’</td>
<td>• Informal oral presentation</td>
<td>• Technical description</td>
</tr>
<tr>
<td>Engineers &amp; identity</td>
<td>• Analysis of an academic article</td>
<td>• Engineers’ personal blogs</td>
<td></td>
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<tr>
<td></td>
<td>• Writing a technical description</td>
<td>• Academic article</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>• Magazine feature article</td>
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<td></td>
<td></td>
<td>• Instruction manual</td>
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<td></td>
<td></td>
<td>• Video feature on GPS devices</td>
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<td></td>
<td></td>
<td>• Textbook technical description</td>
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<td></td>
<td></td>
<td>• General interest web-based technical description</td>
<td></td>
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<tr>
<td>Unit 2</td>
<td>• Comparison of different engineering codes of ethics</td>
<td>• Engineering codes of ethics</td>
<td>• Written summary of the causes of an engineering disaster</td>
</tr>
<tr>
<td>Engineers &amp; social</td>
<td>• Analysis of real-world workplace engineering ethics cases</td>
<td>• Extracts from investigative reports on engineering disasters</td>
<td></td>
</tr>
<tr>
<td>responsibility</td>
<td>• Analysis of causes of an engineering disaster</td>
<td>• A video news report</td>
<td>• Oral presentations</td>
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<tr>
<td></td>
<td>• Analysis of a controversial engineering case</td>
<td>• A video drama about a (fictional) engineering accident</td>
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<tr>
<td></td>
<td>• Oral presentation, analyzing ethical issues in a fictional case</td>
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<td></td>
</tr>
<tr>
<td>Unit 3</td>
<td>• Recount of the story of an engineering innovation</td>
<td>• Oral presentations</td>
<td>• Written and spoken introductions to a technical project</td>
</tr>
<tr>
<td>Engineers &amp; creativity</td>
<td>• Informal presentation of an innovation</td>
<td>• Press releases</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Oral technical description</td>
<td>• Research paper (introduction, review of literature and technical description)</td>
<td></td>
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<tr>
<td></td>
<td>• Analyzing the credibility of different sources</td>
<td>• On-line news report</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Writing a technical description</td>
<td>• Patents</td>
<td></td>
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<tr>
<td></td>
<td>• Evaluating large-scale technological innovations</td>
<td>• General interest web-based technical description</td>
<td></td>
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<tr>
<td></td>
<td>• Presentation of an innovation</td>
<td>• Magazine feature article</td>
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</table>

A task-based learning framework was adopted as the organizing principle for the course. A TBLT framework, in which meaning is primary and language is always connected to its social context, fitted well with our focus on exploring the genres that our students needed to be able to recognize and produce to be successful in their disciplinary discourse communities. Our focus on genre meant that we wanted classroom instruction to draw the learners’ attention to features of different genres, so
The instruction design was built upon activities designed to first develop the learners’ genre awareness, using a task-based framework. Students were given multiple opportunities to produce the target text types, with the tasks sequenced to become gradually more demanding. For example, when students were taught how to write technical descriptions, they were first asked to write a short text in class on a familiar technology, the GPS system. After reading and discussing the features of different technical descriptions of the GPS, students then wrote another description of a simple technology for homework (see Appendix 1, point 1). A few weeks later, students read examples of technical descriptions of roller coasters and established some of the salient features of this text type via ‘examine and report back’ activities. They then made notes from a video on the features of a new type of roller-coaster. After discussing in groups the organization and language features that they needed to write an appropriate technical description, with input from the teacher, students wrote their second technical description (see Appendix 1, point 2). Finally, students wrote a technical description as part of their assessed proposal report for their own innovative concept, with minimal teacher input (see Appendix 1, point 3).

Previous research has found inadequate vocabulary to be a major obstacle to academic studies in higher education for Hong Kong tertiary students (Evans & Morrison, 2011). Range and accuracy of vocabulary use have also been shown to be an important indicator of academic writing proficiency (Tschirner, 2007). One important implication of these findings is that a vocabulary component needs to be planned as part of any EAP course, especially one that aims to develop students’ academic literacy. Our course design followed three guiding principles in developing our focus on academic vocabulary. First, the words should be selected from the authentic texts used in the course so that students can see how the words are used in context. Second, the words should be those that students are expected to comprehend and produce in an academic setting. In other words, we saw words as tools that contribute to students’ academic achievement (Nagy & Townsend, 2012). To include words that students are expected to comprehend as an engineering student, we first identified a small set of possible words that occurred in the course texts, based on our intuition. We then examined the frequency of the words in three engineering corpora: (a) the HKUST wordlist of the most frequently-occurring words in engineering textbooks used at the university (James, 2001); (b) the Hong Kong Polytechnic University engineering corpus (http://rcpce.engl.polyu.edu.hk/HKEC); and (c) the science and engineering corpus which has been loaded into Word Neighbors, a HKUST-designed concordance program (http://wordneighbors.ust.hk). Words that occur frequently in these corpora should be part of the students’ receptive knowledge and were thus selected. Examples include ‘paramount’, ‘breach’, and ‘compliance’, which often appear in engineering ethical codes. Other words were added because students would need to use them in their assignments. For this reason, words such as ‘efficacy’, ‘niche’ and ‘unrivalled’ were chosen to enable students to describe engineering innovations. Third, technical words should form an essential part of any
Designing and evaluating a technical communication course. Thus we consulted the Cambridge Online Learners Dictionary (http://dictionary.cambridge.org), and incorporated words from our initial list that were classified as ‘specialized’ (e.g., ‘effluent’, ‘resistance’).

Using the three principles described, we identified a total of 120 target words. This total was deemed manageable to students, and we avoided a larger number of words in order not to give the false impression that the course was about language forms (i.e., lists of words to be memorized) rather than communicative tasks. It was also one of our primary aims to help students to develop an awareness of the need for vocabulary work and to acquire sophisticated strategies for learning new words. In brief, the emphasis was not simply on learning a fixed number of lexical items.

To help students become effective vocabulary learners, a range of activities were designed, including:

- **Awareness-raising activities.** These sensitized students to different types of words which serve different purposes, e.g., formal vs. informal words, technical vs. non-technical words.
- **Computer-assisted activities.** These encouraged students to use a concordancer to examine the properties of words (e.g., whether ‘paramount’ has a verb form; whether ‘abide by’ appears in any other contexts apart from talking about rules and laws).
- **Rewriting activities.** In one of these activities, students rewrote sentences for a different audience, necessitating the substitution of formal words for the informal words used.

Course Evaluation

The course was piloted with 230 students from two engineering departments. While a range of issues were explored in our evaluation, in this preliminary report we seek to answer two research questions which centre on the development of students’ academic literacy in writing.

1. By the end of the course, could students write a proposal report using appropriate organizational structures and writing style?
2. To what extent did students use the target vocabulary accurately in their writing?

Method and Research Instruments

In an attempt to collect triangulated data, we employed student questionnaires, focus groups and textual analysis of students’ writing as the data sources for our study.

**Student Questionnaires**

Two questionnaires were developed and administered to all the students, one at mid-course and the other at the end of the semester. They aimed to elicit student feedback on two major units of the course, covering the themes of (a) Engineers and Social Responsibility and (b) Engineers and Creativity respectively. Each
questionnaire consisted of two parts. The first part focused on students’ opinions on specific aspects of the course, including the difficulty level and usefulness of the materials, workload, relevance of the assignments for their academic study, and improvements in language skills. A 4-point Likert scale was used, with the neutral option excluded to encourage students to express a definite opinion (Brown, 2001). The second part consisted of open-ended questions asking students to provide further opinions about what they had learned and how the course could be improved (see Appendices 3 and 4). Both questionnaires were administered online, and students completed them outside class.

Focus Groups

Two rounds of focus group discussions were conducted, with two groups of local students taking part in Cantonese-language focus groups and one group of non-local students in an English-language focus group in each round. The groups were facilitated by language instructors but students did not attend groups facilitated by their own instructors. The ‘local’ students were Cantonese-speaking Hong Kong residents while the ‘non-local’ students were from the Chinese mainland, Korea, India and Pakistan. For each round, 4–5 students were randomly selected from the entire cohort and invited to join the groups: the actual number who took part in each group discussion varied from 2 to 6. An interview guide with key questions was developed for each round of focus groups (see Appendices 5 and 6), with other questions created during the discussions to allow the interviewer to probe for details. In the first round, student comments focused on issues of workload, so for the second round, the prompts were refined to ensure that students gave feedback on the effectiveness of materials and classroom instruction. Group discussions were recorded and then translated into English (in the case of Cantonese-speaking groups) and a written summary was made of student comments.

Textual Analysis of Students’ Writing

Samples of students’ writing were collected and a three-fold analysis was performed, focusing on organization, academic writing style and vocabulary use respectively. The data for examining the development of appropriate move structures and writing style came from writing samples from two report sections: the introduction and the technical description section. All samples were written outside class in a natural composing environment, with free access to dictionaries and other support. In all the writing tasks where students wrote on given topics, the topics were technically unsophisticated and were fully accessible to students of all engineering disciplines.

Two sets of introductions written by 12 students of varying proficiency were analyzed. The first was written in Week 9 when students were first introduced to report writing under the theme ‘Engineers and Creativity’. During the lessons, they were first exposed to ways of introducing a technical topic and given classroom instruction in introduction writing. The content input for Introduction One came from a video about an engineer’s project to harvest natural light to illuminate the interiors of buildings (see Appendix 2, point 1). Introduction Two was written towards the end of the course in Week 13, when the students prepared a proposal report for their own innovative design, which represented the summative writing performance of the
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Three sets of technical descriptions were examined, also written by 12 students of varying proficiency. The first technical description was written in Week 2 of the course, as the students were introduced to different kinds of engineering-related writing under the theme of ‘Engineers and Identity’, but before any focused instruction on technical description. The second was written in Week 10, after students had analyzed the genres of technical description in class, and had received focused instruction in technical description writing. The third set of technical descriptions was written as part of the proposal report mentioned above, in Week 13.

Swales’ (1990) CARS (Creating a Research Space) model was used for the analysis of the two introductions. In Swales’ model, the three moves of an academic introduction comprise ‘establishing a territory’ (Move 1), ‘establishing a niche’ (Move 2) and ‘occupying the niche’ (Move 3). These ‘moves’ are highly connected and systemic, and writers need to work through them progressively to establish their own position in the field. For the analysis of the structure of the technical descriptions, Lannon’s (2008) model was used, comprising: overview; description of major parts and their functions; description of operations.

The use of selected linguistic features (Dudley-Evans, 2002) was also noted as evidence for the development of a formal academic writing style. The texts were examined for: use of colloquial language versus a preference for more formal and precise language; use of ‘I’, ‘we’ and ‘you’ and use of passive versus active voice.

Students’ writing samples were also assessed for accurate use of the target vocabulary. For this purpose, we focused on the final assignments of four classes. Each of the three authors was the instructor of one of the classes, with the fourth class being an advanced class for high achievers. The classes were randomly chosen, and we considered them to be typical of other classes on the whole. We loaded the students’ assignments into the freeware concordance program ‘Antconc’ (http://www.antlab.sci.waseda.ac.jp/software.html), which were used to identify all the occurrences of the target words in the students’ texts. We then scored the words by basing our procedures on those adopted by Lee (2003). A target word was counted as accurately used if it was correct in meaning, spelling, and part of speech. Verb tense, subject-verb agreement, and other syntactic errors that did not impede comprehension were not considered as errors. A target word containing an error in meaning and/or spelling and/or part of speech was classified as an error (see Table 2).

Table 2
Sample coding of target words used in the writing assignment

<table>
<thead>
<tr>
<th>Target words used in the assignment</th>
<th>Analysis</th>
<th>Coding</th>
</tr>
</thead>
<tbody>
<tr>
<td>It has better <strong>mobility</strong> as it occupies less space …</td>
<td>The target word ‘mobility’ is correct in meaning, spelling and part of speech.</td>
<td>Correct use</td>
</tr>
<tr>
<td>It is <strong>prevalent</strong> method to create circuit boards …</td>
<td>The target word ‘prevalent’ is correct in meaning, spelling and part of speech. The indefinite article ‘a’ is missing, but this does not impede comprehension.</td>
<td>Correct use</td>
</tr>
</tbody>
</table>
To **complement** this inconvenience, a functional Smart Trunk was designed …

Here the target word ‘complement’ contains an error in meaning, and should be replaced by another word such as ‘minimize’ or ‘overcome’.

The emitter will send ultrasound signals to **surrounding** …

Here the target word ‘surrounding’ contains an error in part of speech.

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**Results**

**Student Questionnaires**

Students’ responses to the Likert-scale statements for both on-line surveys were generally positive. They felt that the course materials were on the whole useful and interesting, and agreed that their technical vocabulary had expanded and their ability to write about and speak about engineering-related issues had improved after taking the course (see Table 3).

**Table 3**  
*Student responses to sample survey questions*

<table>
<thead>
<tr>
<th>Statements in the survey</th>
<th>Mean</th>
<th>S.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit 2 was interesting.</td>
<td>2.50</td>
<td>0.69</td>
</tr>
<tr>
<td>Unit 3 was interesting.</td>
<td>2.73</td>
<td>0.72</td>
</tr>
<tr>
<td>Unit 2 was useful.</td>
<td>2.50</td>
<td>0.65</td>
</tr>
<tr>
<td>Unit 3 was useful.</td>
<td>2.80</td>
<td>0.62</td>
</tr>
<tr>
<td>I have expanded my technical vocabulary in English.</td>
<td>2.92</td>
<td>0.60</td>
</tr>
<tr>
<td>I have improved my ability to write about technical and engineering issues.</td>
<td>2.96</td>
<td>0.57</td>
</tr>
<tr>
<td>I have improved my ability to speak about technical and engineering issues.</td>
<td>2.94</td>
<td>0.63</td>
</tr>
</tbody>
</table>

*Note. Values are the mean of reported scores on a 4-point scale (4 = strongly agree, 3 = agree, 2 = disagree, 1 = strongly disagree). A mean of 2.5 or higher is interpreted to indicate agreement while a mean of less than 2.5 is interpreted to indicate disagreement.*

In Survey 1, the open-ended questions asked students to comment on any improvements they had noticed in their writing and vocabulary as a result of instruction. Fewer students completed the questions requiring a written response than those completing the multiple-choice items, but the majority of those who did gave a positive report of the benefits of instruction:

1. *Has Unit 2 helped you improve your writing skills? Please give some examples.*

63 students responded to this with 44 students making positive comments, such as:
Example 1: Yes, it does. It helps when we need to deal with some technical writing.
Example 2: Yes, helps for structuring the coherence of the content.
Example 3: Yes, I have a chance to try the format of a formal journal and try to use the notation for references. This helps me to understand the use of references.

2. Has Unit 2 helped you expand your vocabulary? Please give some examples.

64 students responded to this with 51 students making positive comments, such as:

Example 1: Of course. Many words I did not learn before.
Example 2: Yes, I learnt some words that are useful in engineering such as ‘legitimate’.

In Survey 2, students were asked to respond to more specific statements about their perception of their learning in specific areas of technical writing, some examples of which are detailed below:

1. Statement: I can describe a technological innovation and compare existing technologies.

Out of 127 respondents, 116 agreed that they could do this.

2. Statement: I can organize and write a project proposal report.

Out of 127 respondents, 120 agreed that they could do this.

There was a broad consensus on the positive role that the instructional materials in the course had played in helping students to improve their writing, with 110 students agreeing with the statement:

‘I found the materials helpful in enabling me to write an engineering innovation proposal.’

Most students also felt that they had learnt new vocabulary items, with 103 students agreeing with the statement:

‘I have expanded my technical vocabulary in English.’

Focus Groups

The number of students who attended the focus groups was very small, and the resulting comments must be treated with caution. However comments by the focus group members reinforced the broadly positive views of the usefulness of the course expressed in the student questionnaires. The local students’ group felt that the course had helped students to write technical descriptions using suitable language and style, and there was agreement that the writing tasks were relevant to those that were
required in their content subjects. Students differed in their opinion of the usefulness of the selected vocabulary. The lack of specificity to a specific engineering discipline of the vocabulary was seen as a positive feature to some and a negative feature to others. The non-local students also felt that writing the proposal report gave them practice in writing something similar to texts they had to produce in their content subject. They could see the relevance of the task. However all of them felt that they needed more guidance on the differences between written and spoken English, and on how to achieve an appropriate technical style.

**Textual Analysis of Students’ Writing**

Our textual analysis focused on three areas: organizational structure, academic writing style and vocabulary use. For organizational structure, we focused on two text types: the introduction to a technical report and technical description.

The students managed to organize the first introductions that they wrote quite successfully, and all the sample texts for this first attempt included the CARS moves:

**Example from Introduction One:**

*Lighting is a great innovation that makes people can work at night* (Move 1). However, with the developing of human society, more and more tall buildings are constructed. The natural light is blocked by the tall structures and because of the wrong angle of windows, we cannot make well use of the sun light. Therefore, we need to turn on the light at day time and it is a kind of energy wasting.

Duncan Earl sees this problem and has decided to harvest the sun light so that we can save the energy. [...] *However, using glass mirror is so expensive.* Hence, Earl tried to use plastic instead of glass but [...] *the melting point of plastic is low and cannot resist the high temperature due to the sun* (Move 2). *At last, Earl using a material called acrylic.* (Move 3) Acrylic will not melt under the sun and its production cost is lower than using glass.’

However, contrary to our expectation, in the second introduction many students were unable to organize their writing appropriately. In the following example, an attempt at Move 2 was made but it did not clearly lead to a more focused research space. The connection between Move 1 and Move 3 was thus not achieved.

**Example from Introduction Two:**

*Data transmission* (attempt at Move 1) is transferring data over a point-to-point or point-to-multipoint communication channel. The communication channels include copper wire, optical fibres, storage media and wireless channel such as Wi-Fi. *Although there are many kinds of channel, each of them has their own advantages and disadvantages* (attempt at Move 2). For example, copper wire can provide a stable transmission rate, but the speed is low and the wiring restrict the mobility; storage media has high mobility and may have acceptable transmission speed but [...] *Besides speed, mobility and operation distance, efficiency and cost are the main factors for choosing the*
most suitable channel for data transmission. *HomePlug*, an adaptor using the existing wiring as media for data transfer, would be an innovation in this area and will providing a surprising and satisfying performance (attempt at Move 3).

Only one sample text for the second introduction demonstrated a systematic and coherent use of the strategic moves.

Students were far more successful in their use of the appropriate moves when they wrote their first technical descriptions than they were writing the introductions. In the first technical description, all but one of the students successfully used the key moves of technical description, with minimal previous instruction. In their second and third technical descriptions, all the students used the appropriate moves. Control of the organizational structure of a technical description seemed to be more intuitive to our students than control over the structure of an academic introduction.

The second area of our textual analysis was academic writing style. In the first introduction, we found that a large proportion of the students used an inappropriately personal style, with frequent use of ‘we’ and imprecise use of language: ‘we cannot make well use of the sunlight’; ‘the second problem came’. Language use was often inappropriately colloquial: ‘a guy named Duncan Earl’; ‘the key thing here is to…’; ‘It was a tough time for Dr Earl’. Many of the samples presented the project introduction as a narrative, and made frequent use of sequential discourse markers such as ‘then’, ‘later’, ‘lastly’. All the students focused on the engineer, Duncan Earl, rather than on the work of the project and many sentences had ‘Duncan Earl’ or ‘He’ as the subject.

The style of the first technical descriptions that students produced was also inappropriately personal: ‘You can even use Trekker on a moving vehicle’. Passive voice was almost always avoided: ‘Trekker can customize the user as it can work with PDA which can provide better point of entries’. As in the first introductions, connectives such as ‘moreover’, ‘on the other hand’, ‘nevertheless’ were frequently used and descriptive language was often imprecise and informal: ‘Trekker helps blind a lot’.

The students’ later pieces of writing showed a much greater alignment to the appropriate writing styles of their disciplinary community. Students avoided a narrative style in their second introductions and all of these samples were written in a more impersonal style. Use of the generic subject such as ‘people’, the dummy subject ‘it’, and passive constructions was also common. In the second technical description, there was also less frequent use of personal pronouns and more use of the passive voice, often in short phrases, e.g., ‘The track is built by steel’. However students tended to replace personal pronouns such as ‘you’ with more impersonal nouns: ‘users’, ‘passengers’, ‘riders’, in preference to using passive structures. Connectives like ‘moreover’ and ‘on the other hand’ were not used and students tried to use more precise, technical vocabulary; for example, the shape of a transport pod is described as ‘capsule-shaped’ or ‘bullet-shaped’. In the third technical description, students’ use of vocabulary was noticeably more technical and precise than in their previous writing and passive voice was used more frequently.
The sample sizes that were analyzed were small, but an attempt was made to include samples from students of different proficiency levels. The researchers could discern no correlation in this small sample between language proficiency and an ability to produce text types suitable for the target genre. The higher proficiency students demonstrated a greater range of vocabulary use and a higher level of accuracy in their writing, but appeared to be no more able to use the appropriate linguistic features and organizational moves than students of lower proficiency.

The third area of our textual analysis was vocabulary use. Students’ self-reports in the questionnaires and focus groups revealed that they had learned relevant engineering vocabulary in the course. These self-reports were corroborated by our analysis of students’ final assignments. First, although use of the target vocabulary was not a requirement of the assignment, a majority of the target words (67%) were found in the students’ texts where they were used to describe various aspects of students’ innovations. This seems to suggest that the words were appropriately recognized and employed, by students as tools to support their academic writing.

Second, of the target words that found their way into the students’ assignments, a large number were accurately used most of the time (see Table 4). Repeated encounters of these words in the course materials, together with the vocabulary-learning activities developed, may have contributed to the successful learning of the target words. Some words were not accurately used, but students’ attempt to use them in their assignments indicated their partial knowledge of the words and that they were in the process of acquiring the words (Henriksen, 1999).

Table 4
Use of target words: Frequency and accuracy

<table>
<thead>
<tr>
<th>Target words</th>
<th>Frequency</th>
<th>Correct use</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>abundant (adj)</td>
<td>4</td>
<td>6.6</td>
</tr>
<tr>
<td>accelerate (v)</td>
<td>4</td>
<td>6.6</td>
</tr>
<tr>
<td>catapult (v)</td>
<td>9</td>
<td>14.8</td>
</tr>
<tr>
<td>complement (v)</td>
<td>3</td>
<td>4.9</td>
</tr>
<tr>
<td>consortium (n)</td>
<td>1</td>
<td>1.6</td>
</tr>
<tr>
<td>deficiency (n)</td>
<td>9</td>
<td>14.8</td>
</tr>
<tr>
<td>degradation (n)</td>
<td>1</td>
<td>1.6</td>
</tr>
<tr>
<td>dominant (adj)</td>
<td>3</td>
<td>4.9</td>
</tr>
<tr>
<td>efficacy (n)</td>
<td>4</td>
<td>6.6</td>
</tr>
<tr>
<td>fasten (v)</td>
<td>1</td>
<td>1.6</td>
</tr>
<tr>
<td>fatigue (n)</td>
<td>5</td>
<td>8.2</td>
</tr>
<tr>
<td>harvest (v)</td>
<td>9</td>
<td>14.8</td>
</tr>
<tr>
<td>inherently (adv)</td>
<td>2</td>
<td>3.3</td>
</tr>
<tr>
<td>mitigate (v)</td>
<td>6</td>
<td>9.8</td>
</tr>
<tr>
<td>mobility (n)</td>
<td>15</td>
<td>24.6</td>
</tr>
<tr>
<td>niche (n)</td>
<td>12</td>
<td>19.7</td>
</tr>
</tbody>
</table>
Third, students had learned not only the target words but their collocates. For example, when students used the word ‘niche’ in their assignments, they invariably wrote ‘fill a niche’ or ‘occupy a niche’. Interestingly, in the course materials the word ‘niche’ occurred as the word partners of ‘fill’ and ‘occupy’, suggestive of the role of the materials in students’ vocabulary learning.

Finally, there was a tendency for students to use the target words in the sense which they were used in the course materials. For instance, the word ‘realize’ means making or organizing something based on a design or idea (Collins COBUILD Dictionary for Advanced Learners) in the course materials (as in ‘realize the potential of a project’), and when students used this verb in their assignments, they used it to express the same meaning. There was not a single instance of ‘realize’ meaning ‘to become aware of something’. This seems to indicate that the students saw the target words as engineering-related words rather than common, non-technical words.

**Discussion**

In the second student questionnaire, the majority of respondents were confident that they could organize and write a project proposal report. Our students’ limited ability to structure the introduction in their proposal reports indicates that this confidence might be misplaced. The first introductions that students wrote were appropriately organized, but that may have been because the video input was structured in a problem-solution format, similar to that frequently found in introductions to academic articles in engineering (Swales, 1990). The fact that Swales’ three moves were included in almost all the first introduction texts could be a result of students simply reporting what they had seen in the video, rather than exercising the strategic moves of CARS. The use of a narrative style, and the foregrounding of the engineer, rather than the work, may also have been derived from the video input, in which the story of a project unfolded.

One reason for our respondents’ confidence might be that they consider ‘introductions’ to be a text type they are already familiar with from secondary school writing. The less successful writers of the second introductions had typically produced rather short texts that seemed to have been written solely to introduce the topic and to arouse the interest of the readers, similar to the introduction in a general-interest feature article. Milton’s (2001) survey of Hong Kong secondary school English textbooks found that they failed to draw students’ attention to genre. Texts were often newspaper articles and students were frequently required to model newspaper articles, letters to the editor and Op/Eds in their writing, with no distinction being made between newspaper reportage and other text types. Some recently-published secondary school textbooks pay more attention to genre but a recent sample English writing paper for the Hong Kong Diploma of Secondary Education (HKDSE) only required students to write a letter, a news article or a review of a book or performance (Hong Kong Examinations and Assessment Authority, 2010). It can be speculated that secondary school teachers may be unlikely to devote time to developing students’ awareness of genre variety, when the HKDSE only requires students to write in a limited number of genres.

Our students, as novice undergraduate writers, may have been drawing on a limited and constricting repertoire for introduction writing, based on their secondary
school experience. In contrast, the students were more successful in organizing their technical description writing. One reason for this may be that they had limited or no previous models for technical description from their secondary school English learning experience to over-generalize from, while their disciplinary knowledge may have given them some familiarity with technical description. HKUST engineering students may have read technical descriptions in science and engineering textbooks, on-line technical blogs and websites and have had some previous practice in writing technical description in lab reports.

As course writers, we underestimated the problems students would face in the writing of an introduction appropriate for an engineering report. Swales (1990) has outlined the difficult choices writing such an introduction involves: decisions have to be made as to the amount of background information to include, the positioning of the writer, and the directness of the approach. Our course materials moved too abruptly from the ‘joint construction’ of the first introduction to the ‘independent construction’ of the second introduction, when students would have benefited from an intermediate writing stage, with reduced ‘scaffolding’ but continuing instructor guidance. The structure of the video text assisted students in completing their writing task appropriately, but did not lead to students adding to their genre repertoire. More exposure to examples of the target genre would have been helpful in ‘destabilizing’ our students’ limited conception of an introduction (Johns, 2002).

We also underestimated the help students would need in positioning the researcher in relation to their work. Perhaps our students’ status as novice engineers was a factor: they may lack the experience to take an appropriate position. Writing a technical description seemed to be a more straightforward task, presenting fewer problems of authorial positioning. The video did not help as students took the role of an outsider, writing about someone else’s project, rather than being involved in the research process themselves. Students’ difficulties may also stem from the conception of the course as disciplinary, rather than subject-specific. Students often had to read and write about engineering topics in our course materials which were not drawn from their own subject area. Although the majority of respondents to the questionnaires reported that the assignments were relevant to them, we can speculate that in some cases the assignments were not quite relevant enough.

Students seemed to have been more consistently successful in adapting their language style to the requirements of the discipline. The first introductions and technical descriptions adopted an inappropriately personal and colloquial style, and over-used connectors and sequential discourse markers. Again, over-generalization from secondary school writing may have contributed to this. Milton (2001) found that in Hong Kong secondary school text books great emphasis was placed on the use of connectors, such as ‘moreover’ and ‘furthermore’, and several books explicitly directed students to make frequent use of these. The students’ later pieces of writing showed progression in the alignment of their own writing with the writing styles of their disciplinary community.

Feedback from the local students’ focus group indicated that they felt that they had learned to use the appropriate writing style for technical reports, while the non-local students felt that they needed more assistance in this area. In our limited data set, correlations between linguistic proficiency and the ability to produce the appropriate
linguistic features and organizational moves of the discipline were not apparent. The small numbers in the focus groups make any generalizations extremely tentative, but perhaps as the non-local students tend to be of higher proficiency than the local students, they may have been aware of the disparity between their high linguistic proficiency and continuing difficulties in producing the texts appropriate to their academic discipline. When Milton (2001) compared the writing of Hong Kong L2 students and L1 students with that of professional academic writers, he found that both student cohorts tended to use linguistic features more typical of informal spoken English in their academic writing, in comparison with the professional writers. He concluded that an overuse of conversational features was a distinguishing feature of novice writers in an institutional setting, who were unpracticed in the conventions of academic discourse.

Results from the student questionnaires and focus groups indicated that students believed that they had expanded their vocabulary repertoire after following the course. Our textual analysis appears to support this belief. Students were not only able to use the target words accurately in their writing, but were also aware of collocation. As well as teaching students the target items, one of our aims was to help students to develop an awareness of the need for vocabulary work and to acquire sophisticated strategies for learning new words. Some of the responses to the open-ended questions in the survey indicated that this may have been successful with some students:

‘I can find some difficult vocab or words in the dictionary or notes. Upload them online and have an online test for meaning, it can enhance my memory for this word in my deep mind.’

A detailed analysis of the success of this aim is beyond the scope of this preliminary small-scale investigation. Nevertheless, the use of noticeably more technical and precise vocabulary in the third technical description may indicate that students’ awareness of the need to use specialized vocabulary, appropriate to their disciplinary community, had developed throughout the course. If this ability to use ‘contextually meaningful’ lexical items in different genres is a mark of a competent writer (Yasuda, 2011), it can be said that the course has helped students develop their writing expertise in some way.

Conclusion

The technical communication course outlined in this paper was a discipline-specific course, designed to build on the EAP training that the students received in their first year of study and to introduce novice engineering students to the generic language and writing patterns used in their discipline, enabling them to function effectively in their academic studies. We were aware that our undergraduate students faced many difficulties in adjusting to the discourse requirements of their subjects, and particularly in academic writing.

Our course focused on genre, using a task-based instructional framework, initially building awareness of different genres and then guiding students to produce appropriate text types for the academic genres they need to master. Our experience was that most students have problems in producing appropriate texts in their academic discipline, and need help to overcome these difficulties. Students’ previous
knowledge could, in some cases, limit their ability to successfully produce appropriate
text types. In future offerings of the course, we will need to include more examples
and analysis of the target genres, and more scaffolding for the students in their
production of some academic text types, such as the introduction to a technical report.
However the course appears to have been effective in that instruction helped our
students to identify and produce the typical organizational structures and lexico-
grammatical features of some text types relevant to their studies. Most of our students
seem to have moved further along the road to becoming competent writers of some of
the typical text types in their discipline.

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Appendix 1  Prompts used for Writing Technical Descriptions

1. Students watch a short video feature about GPS and write a technical description of this system in class. They then look at descriptions of GPS in different genres (academic textbook, popular science web feature) and discuss the features of these genres in groups, comparing these features with the short text they have just written. Students then watch a video on a GPS application for blind users: ‘Trekker’. They make notes on the video content and then work in a group to complete their notes. They write a one-paragraph description individually for homework. This homework is required, but not assessed.

2. Students read a variety of technical descriptions of roller coasters (a patent, a web-based feature) and analyse the distinctive features of the two genres. They then watch two videos about a rollercoaster system, ‘Shweeb’, which is being proposed as a possible innovative urban transportation system. Students then make notes on the features of the system and its functions in groups. Working individually, for homework, they then write a one-paragraph technical description of Shweeb, imagining that they are helping the developer of the system to prepare a proposal. This homework is required, but not assessed.

3. Students work individually to write the technical description section of their proposal report for the ‘TechVention’ competition described in Appendix 2, point 2. Students write outside class, and are explicitly directed to include a technical description section in the proposal.

Appendix 2  Prompts used for Writing Introductions

1. Students watch a video which introduces the work of lighting engineer Duncan Earl in developing a technology to harvest sunlight for use in the indoor environment. They complete a set of skeleton notes as they listen, and then work in a group to complete their notes. Each student writes a one-paragraph introduction to the work of Duncan Earl for homework. This homework is required, but not assessed.

2. Students work in a group to develop an innovative concept as an entry for ‘TechVention’, an annual student competition that aims to nurture creativity and imagination as well as to provide a platform to showcase innovative concepts to potential investors. The competition is imaginary but based on authentic competitions open to engineering students. Students have to write an individual formal proposal for the competition as one of their main course assessed assignments. Students work on this outside class, and are explicitly directed to include an introduction in the proposal.
Appendix 3  Questions for Survey 1

For Questions 1–11, students were asked to indicate whether they strongly agree, agree, disagree, or strongly disagree with the statement.

1. I have a better understanding of the major ethical issues that engineers have to face.
2. I have improved my ability to speak in class.
3. I can organize and deliver a presentation relating to engineering ethics.
4. I can lead a seminar discussion.
5. I can write about the main facts and analyze the key issues of an ethical case.
6. I have learnt new vocabulary related to engineering and ethics.
7. I found the assignments relevant to my needs.
8. The materials were of an appropriate level of difficulty.
9. The materials were interesting.
10. The materials were useful.
11. The workload was appropriate.
12. Has Unit 2 helped you improve your speaking skills? Please give some examples.
13. Has Unit 2 helped you improve your writing skills? Please give some examples.
14. Has Unit 2 helped you expand your vocabulary? Please give some examples.

Appendix 4  Questions for Survey 2

For Questions 1–12 and Questions 15–20, students were asked to indicate whether they strongly agree, agree, disagree, or strongly disagree with the statement.

1. I can describe a technological innovation and compare existing technologies.
2. I can compile a literature review to provide background information for a proposal.
3. I can use IEEE style when writing a project proposal report.
4. I can organize and write a project proposal report.
5. I can organize and deliver a project proposal presentation.
6. I found the materials helpful in enabling me to write an engineering innovation proposal.
7. I found the materials helpful in enabling me to give a project proposal presentation.
8. I can use visual aids effectively in a presentation.
9. The materials were of an appropriate level of difficulty.
10. The materials were interesting.
11. The materials were useful.
12. The workload was appropriate.
13. Comments about the proposal report:

14. Comments about the proposal presentation:

15. The course inspired me to learn more about ethical issues and engineering innovations.
16. The course assignments provided opportunity for collaboration and team work.
17. The course assignments provided opportunity for creativity and creative thinking.
18. I have improved my ability to write about technical and engineering issues.
19. I have improved my ability to speak about technical and engineering issues.
20. I have expanded my technical vocabulary in English.
21. In comparison with your other 3-credit courses, the workload in the technical communication course is: (much heavier, a little heavier, about the same, a little lighter, much lighter).
22. Approximately how many hours per week outside class do you spend doing work for the technical communication course? ________________________________
23. Final comments on the course: ________________________________

Appendix 5  Key Questions for First Round of Focus Group Discussions

1. Have you found Unit 2 useful/interesting/relevant to your needs?
2. What was the most useful/interesting part?
3. What was the least useful/interesting part?
4. How about the out-of-class activities?
5. How about assignments and workload?
6. Was there anything that should have been included?
7. Is there anything else you would like to raise?

Appendix 6  Key Questions for Second Round of Focus Group Discussions

1. Have you found Unit 3 useful/interesting/relevant to your needs?
2. What was the most useful/interesting part?
3. What was the least useful/interesting part?
4. What was the least relevant part?
5. How about the out-of-class activities?
6. Did you find the library class useful?
7. Have you used the library course guide?
8. Was there anything that should have been included?
9. Have you found the whole course useful/interesting/relevant to your needs as an engineering student?
10. What do you think about the assigned vocabulary and vocabulary tests?
11. What about the Personal Word List?
12. What about the use of MyWords?
13. What about the use of Turnitin?
14. Is there anything else you wish to raise?