

Teaching critical appraisal skills to postgraduate, English as a second language, engineering students *

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SUMMARY: *Teaching engineering students critical appraisal skills that are relevant to their discipline is a key skill for postgraduate study. International English as a second language students, however, may have had limited exposure to critical thinking in their prior learning and may arrive in Australia with approaches that are problematic. Discipline-specific English for Academic Purposes (EAP) courses integrated in the Engineering Curriculum are an ideal, albeit challenging, environment to teach critical thinking and appraisal. This paper describes the development and student evaluation of an Engineering EAP program focussing on teaching critical appraisal to students at Melbourne University. In this paper, I describe teaching and assessment processes and qualitative feedback from an open-ended survey of three semester cohorts of students about the cross-cultural challenges of engaging with critical appraisal. The paper argues that discipline-specific EAP courses are an appropriate place to teach critical appraisal skills and that qualitative student feedback provides a useful complement to program evaluation.*

1 INTRODUCTION

Faculties of Engineering in Australasia increasingly enrol a culturally and linguistically diverse group of students into their postgraduate coursework (and research) programs, including international English as a second language (ESL) students. In the institution in this study, student demographics include Chinese, Japanese, Thai, Latin American, Middle Eastern and other groups. These students arrive in Australia with varied levels of English proficiency, cultural backgrounds and prior educational experiences, and limited training in the comprehension and critical appraisal of texts (eg. Ward, 2001). With this in mind, the Faculty of Engineering at Melbourne University enlisted the services of applied linguists to offer a discipline-specific English for Academic Purposes (EAP) course to address these issues, titled "Presenting Academic Discourse: Engineering". This paper reports on the development of this subject, and course evaluations and qualitative student feedback obtained during the four semesters of 2002 and 2003, during which the author coordinated and taught this course. The study focuses on the challenges and benefits of developing and integrating

an applied linguistics and composition course into the postgraduate coursework curriculum of engineering.

2 APPLIED LINGUISTICS, CRITICAL THINKING AND ESL

The contribution of applied linguistics and EAP courses to Engineering, and to the teaching of critical thinking and critical appraisal, is not yet an area where there is educational consensus.

2.1 Applied linguistic contributions to discipline-specific concerns

In many fields, including Engineering, high international student enrolment has encouraged debate about the need for explicit teaching of writing and associated academic skills, such as critical appraisal in writing across the curriculum (WAC) and EAP courses (Artemeva et al, 1999; Bruce, 2002; McDaniel, 1994; Norgaard, 1999; Pantelides, 1999; Riemer, 2002; Swales et al, 2001). Although some applied linguists and ESL teachers believe they should limit themselves to teaching generic academic language (Spack, 1998), there is a growing body of theoretical work that contests this position and has shown the value of EAP teaching of the genres of the disciplines (Johns, 1997; Melles et al, 2005).

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2.2 Critical thinking and EAP teaching

A range of skills form part of the brief of EAP programs, while critical thinking and appraisal has emerged as a focus at the intersection of EAP and discipline-specific needs. As Pally (1997) has argued, embedding critical thinking and appraisal in EAP courses rather than through workshops seems to offer distinct advantages to ESL learners. Indeed, in some tertiary ESL programs critical appraisal (Thompson, 2000; Pennycook, 2001; Benesch, 2001) has been framed in terms of social and political dimensions familiar within literary and critical discourse analysis (eg. Fairclough, 1995).

While the social, ethical and ideological dimensions of engineering projects are often of particular relevance, it is not this version of critical thinking and appraisal that is emphasised in genre-based EAP teaching. More pragmatic approaches to the critical appraisal needs of ESL students within genre-based teaching have questioned the relevance of such ideological teaching in EAP (Atkinson, 1997) and highlighted the need for practical accommodation to students academic needs (Allison, 1996; Swales et al, 2001). This pragmatic accommodation approach is represented, for example, in Swales & Feak (1994), in that discipline-specific critical reading and writing are seen to be intrinsic elements of the skills required in postgraduate academic writing and speaking.

Ballard & Clanchy (1984) provided a definition of critical analysis that addressed the potential conflicts students from non-Western cultures may have when asked to evaluate and critique established academic authorities – a task that can be culturally anathema. As Woodward-Kron (2002) also noted, critical appraisal of texts combines description and evaluation. Although students may cope well with the descriptive task, their ability to evaluate "experts" can be compromised. The assessment tasks (see below) that drive the teaching process in the course give students the opportunity to develop a balance in this sense. As students reveal in reflections on the critical appraisal process below, the descriptive stage of summarising research sources is a far less demanding task intellectually and cross-culturally than evaluating the claims in such sources.

3 STUDENTS, TEACHING AND ASSESSMENT FRAMEWORK

3.1 Student profiles

With growing numbers of international postgraduate coursework students, in the summer semester of 2001-2002 the Faculty of Engineering requested that a course be developed and delivered by applied linguists from the Centre for Communication Skills and ESL. The author was charged with developing discipline-specific content that would allow the

students who had not achieved the International English Language Teaching System (IELTS) 6.5 band score the opportunity to develop academic, rhetorical and linguistic skills relevant to their postgraduate careers. The student cohort would complete simultaneously four subjects in their first semester – three in engineering and the EAP course. The curriculum design of this subject – Presenting Academic Discourse (PAD) – did not explicitly foreground critical appraisal in its objectives, taught without discipline-specific reading materials, and had a strong focus on basic language skills for all disciplines.

3.2 Assignment and teaching process

In consultation with the postgraduate engineering committee and in response to my experiences of teaching the subject in the first semester of 2002, I decided to focus more explicitly on critical appraisal. Many of the students in the four cohorts who completed the program were from Southeast Asia. Class size averaged 25 students and although most were in coursework Masters Programs, eg. Telecommunications and Software Systems, a significant minority came from research Masters and PhD programs. The incorporation of critical analysis as a key feature of the course began in semester two 2002. Employing the assignment framework below, four assignments (three written and one spoken) incorporate critical appraisal as intrinsic to learning the academic language and skills necessary for postgraduate success (see table 1). Articles for assignments come from the various sub-disciplines of the students.

Given the uneven quality of articles submitted for review in the first iteration of the program, eg. dubious-quality web references, students were required to only source refereed journal articles and conference proceedings from standard database sources, eg. IEEE Xplore or similar. This ensured a standardisation of articles among students, although still allowing students the freedom to choose topics and focus. As a by-product, it also familiarised some students with the database sources at the university and library searching techniques.

The increasing demands of the assignments can be seen to be developing higher levels of Bloom's Taxonomy of learning, which distinguishes between the learning of knowledge (facts) through to the ability to evaluate such knowledge, with the literature review building towards demonstrating analytic and synthetic abilities in a rhetorical context. Students are recommended to "sustain" the same research topic through the assessment tasks so that research and writing build cumulatively towards an extended understanding of a particular issue. Such thematic continuity helps develop a mutual recognition between the student and author of the area of student focus. The first assignment is preceded

Table 1: Engineering EAP assessment framework, 2002-2003.

Assessment	Task requirements
Assignment 1 10% Week 4	Critical appraisal of one article (750 words). Student chooses an article from their field and critically appraises text following an explicit rubric.
Assignment 2 15% Week 7	Critical appraisal of two articles (1000 words). Student chooses two articles from the field and reviews following previous rubric, but with comparison and contrast added.
Assignment 3 40% Week 13	Literature review (3000 words). Students chooses at least 12 articles from field and critically review these in relation to a pre-defined topic.
Assignment 4 30% Weeks 11/12	Oral presentation (500 words). Student presents 12-minute oral presentation (with three minutes for discussion and peer assessment) on topic of assignment.
Participation 5% Weeks	Participation in class activities. Student assessed for participation in class tasks and discussion.

by readings, classroom discussion and practice tasks, model assignments for student evaluation, and classroom clarification of assignment criteria, which are intended to lead to a clear idea of the format and content of the first assignment.

There is an expectation that students will develop grammatically and stylistically coherent writing. My conception of cohesion and coherence is informed by the functionalist perspective of the Chicago School, a model that has been widely adopted in North American textbooks on technical writing for native and non-native speakers (Huckin & Olsen, 1983; 1991; Williams, 1990; Williams & Colomb, 1997). Extracts from these texts are included in reading materials and class handouts. In writing I expect students will develop a single theme in a paragraph and the paragraph will demonstrate “logical” coherence in the patterning of given and new information. Although somewhat of a “fuzzy concept”, text cohesion is, as Lee (2002) pointed out, both a text-property and reader interpretation, which can be successfully taught to ESL students.

Classroom instruction and resources on the language of comparison precede the second assignment. Given the inclusion of (at least) two sources, this exercise involves students demonstrating their ability to accurately cite from the respective papers using acceptable formats, eg. IEEE and APA, within their sub-discipline. Once this exercise has been returned with feedback, sometimes following individual discussion with students, I have begun to have clear expectations about the likely difficulties facing students in the literature review. In the case of the research students (Masters and PhD), the literature review task may be immediate preparation for thesis writing. For the literature review, five categories are used to mark assessments: structure, content, vocabulary, grammar and referencing. Students’ drafts are presented in week 12 and discussed in relation to these criteria. After this, students make their final submission.

3.3 The literature review in particular

The culmination of the assessment process is the literature review. It is their performance in this genre that is uppermost in the minds of students when they respond to course evaluation and the qualitative assessment described below. The literature review is a common academic genre and used in genres of engineering writing, such as the final-year project in the engineering curriculum (Braine, 1995; Killingsworth & Gilbertson, 1992; Walker, 1999). It is used to “demonstrate your understanding of the relevant work of others and your ability to summarise this information for the convenience of your readers” (Reed, 1998).

We currently have little evidence about the processes by which international learners manage to produce this genre (Swales & Lindemann, 2002). However, Levis & Levis (2003) noted that ESL students have difficulties in synthesising multiple references, defining a research question and discovering “that articles may not overlap in obvious ways”. In the context of the final-year project, Krishnan & Kathpalia (2002) also noted how second language students in Singapore employ compensatory copying or “plagiarising” strategies in writing their literature review. They argue that examples of copying can be used to help students master the art of writing academically-sound literature reviews by insisting on them being rephrased. As Jones & Freeman (2003) added, for many ESL students copying is “a natural process, with cognitive roots in imitative learning” and a strategy that can be encouraged at the drafting stage.

One of the key criteria for the success of the literature review is the integration of sources. A minimum of 12 is required, within a descriptive and evaluative stance on prior research. In addition to a tendency to unacknowledged copying from sources, studies of non-native speakers’ use of citations have produced some conflicting evidence. Bloch & Chi (1995), for

example, showed that although Chinese and English speakers have different citation strategies, these are not significantly different in the physical sciences, and Chinese writers are as "critical" as their English-speaking counterparts. On the other hand, Connor & Kramer (1995) found ESL students could not go beyond summarising to use sources critically in their writing. In the two years reported on in this study, the author's experience was that some students found it very difficult to move beyond summarising, especially those with poor language skills.

In the assessment of the literature review the three categories (and subcategories) of specific relevance to discussion in this paper are structure, content and referencing (see table 2); weighting of the final grade is placed on structure and content. Student work, preceded by extensive drafting (including the opportunity to rephrase copied text), embodies a balance of summary and evaluation, with a focus on the incorporation of research sources using clear rhetorical structuring strategies, eg. headings. The categories included under structure focus on both coherence and specific expectations of introductions and conclusions. They also stress the need for logical transitions and coherence between sections and paragraphs in the body text. This coherence is partly achieved by the inclusion of cohesive devices, but also through careful "staging" of the text by the use of rhetorical moves, headers and graphic elements, eg. diagrams. The importance of specific moves in introductions, eg. the establishment of a research "gap" and conclusions, is based on Swales and embodied in teaching texts (Swales, 1990; Swales & Feak, 1994).

Table 2: Literature review assessment criteria.

<p>Structure</p> <ul style="list-style-type: none"> • The introduction contains background to the issues, clear thesis statement (or rationale for the research), and an outline of the paper • There are clear links between the major sections, between and within paragraphs • Section headings, if used, are specific and appropriate • The conclusion summarises the main points and highlights areas that need further research/ investigation or the proposed research project
<p>Content</p> <ul style="list-style-type: none"> • Main ideas/arguments are clearly developed • Ideas/arguments are supported by relevant research or reference to scholars • There is evidence of critical engagement with the ideas and /or the cited research • There is evidence of synthesis of sources
<p>Referencing</p> <ul style="list-style-type: none"> • There is a sufficient number of references used, i.e. no over-reliance on one text • Quotes, paraphrases and summaries of references are used appropriately • References used are correctly acknowledged in the text • References used are correctly set out in the list of references

3.4 Student challenges

Students in the PAD: Engineering course experience some difficulty with going beyond the mere description of sources to be able to synthesise and evaluate multiple sources. This ability of go beyond description of sources and employ paraphrase, summary and other strategies of synthesis is mentioned by several students:

In my mind, I think that it is not difficult to understand what critical thinking and writing is. But I found it difficult not to copy author's sentence or paraphrase it.

When I wrote the first essay, I don't know how to use the critical thinking. Thus, I always repeated the author's issues in the whole paper.

Several other students acknowledged that evaluation of sources and the development of a position was an intellectual challenge:

At first, it is little bit for me to understand the meaning of critical thinking and writing, because it didn't equal to simply give my idea in a paper, it need me to collect the information, compare them, and doing the conclusion; even though it is harder than simply give out my opinion, what I am writing is more trusty and precise than before.

It was not very easy for me to understand critical thinking and writing at the beginning. For example, to do critical writing, you not only need to give your own opinion of the technology you are talking about but also need to tell the difference of many technologies.

It was not easy to understand what is meant by critical thinking because we were used to understanding then summarising what we have understood. But in writing critically there was more of making arguments of what we have understood and judging on other's point of view.

4 EVALUATING STUDENT SATISFACTION AND GATHERING QUALITATIVE FEEDBACK

4.1 Student satisfaction

In four iterations of the program, independently-assessed teaching quality¹ was evaluated at 4.0 to 4.6 out of a possible 5.0. In the three iterations where critical analysis was made an explicit focus of the program, respective scores were 4.5, 4.6, and 4.3; scores that were above both the Faculty of Engineering and Faculty of Arts annual averages for the year. Thus, in general terms, the course was successful, but for appropriate course evaluation and development further qualitative comment was needed.

4.2 Qualitative analysis

In response, all students of the three cohorts from semester two 2002 to semester two 2003 were invited to complete a questionnaire, in which they addressed five questions:

1. What do you (now) understand as critical thinking and writing in English?
2. Do you think it is relevant to engineers in your field? If so, how and why? If not why not?
3. Did your other engineering courses this semester require you to write and present critically? If it was different, how was it different?
4. How difficult (or easy) was it for you to understand what critical thinking and writing meant? Please explain why?
5. Do you think you have developed your ability to critically analyse and write through this course? If not, why not?

Sixty-four students returned responses (85% return rate) and these responses were uploaded and analysed using Qualitative Data Analysis Software (NVivo 2.0). Ethics approval (HREC 020614 International Engineers Develop Critical Writing Skills) was sought and obtained to include comments from students. Given that one of the primary functions of the feedback was to develop the course further and that students responded directly to their lecturer, there was potential for bias in responses.

¹ Teaching quality is one of six core questions and is used by the university as a key indicator for promotion and other teaching.

Notwithstanding these limitations, the overall correspondence between independent course satisfaction levels and responses to the survey, and the willingness of students to identify limitations in the course suggest that responses contained valuable information. Student responses were initially coded under five general headings, which responded to the questions above, but through inductive analysis four categories were developed, which are represented below.

4.3 Qualitative themes in student feedback

No attempt here is made to incorporate all the themes identified in the data. A selection of significant themes is chosen and exemplified. As shown below, some of the conventional understandings of challenges facing ESL students are reinforced by student responses, but other feedback provides, I believe, a unique window on teaching and learning challenges they face.

4.3.1 (Re)defining critical appraisal

Both the survey question, and the teaching and learning objectives linked critical thinking (reading appraisal) and writing as integrated processes. The expectation was that students would recognise this and provide definitions that recognised this link:

The goals for critical thinking and writing are understand the main points in an article, analyse the finds or argument of the article, decide the appropriate criteria by which to evaluate the article, and provide a critical evaluation of the article based on the criteria selected.

It's a critical evaluation on what you read and write. Before, I just read and summarise the text [that] I read. Now, I learn to critically evaluate the text I read and write by comparing different text and commenting on each text.

Although many students offered such "integrated" definitions, some focused on either reading or writing as the domain of critique:

Also, rather than accept only when reading or listening to others' ideas, I should question about their validity, applying prerequisite, unrevealed facts and do deeper evaluation and development.

From my understanding of critical thinking and writing, it is our idea that we think further than what it said in an article or information we read.

In some cases, this critical analysis was practically equated with evaluating the advantages and disadvantages of methods as described in the literature:

We should firstly analyse the main idea of the author(s), and then analyse what he (she) has done and how he (she) has done, what are the advantages and disadvantages in his (her) methods and conclusion?

One student, who also argued somewhat vaguely about the need for some questions, acknowledged that describing the process was difficult:

In my opinion, after I read some articles and words relative to a same topic, and after I fully understand those articles and make a summary, I have some questions and understand about them. That is it. (It is really a hard question).

The responses above imply, rather than make explicit, that critical appraisal is always in contrast to one's own work, an idea taken up by a few students:

Also it is the examination and evaluating of suggested solutions with other's solutions to see whether they will work or not.

Related to this questioning approach to reading, some students also highlighted to need to evaluate textual claims through reading:

Sometimes, statements may look right or convincing. Being critical is to check whether those statements are true, based on evidences, supports, or references, also check if those statements still true if seen from different angle.

Critical thinking is always questioning the information you get, evaluating the correctness of the information, and determining whether there are any inconsistencies, assumptions and biases in the information.

This general need to evaluate sources and make appropriate choices was highlighted in several responses, such as the following:

Critical thinking is thinking for myself and not always accepting what people say, claim. I let my mind open to get information but I have to sort the good, the one I need from a mass of information.

4.3.2 Relevance to academic engineering

In reviewing the relevance of critical analysis those students either in research degrees or considering future enrolment in such degrees, the relevance of critical appraisal skills seemed obvious. Not surprisingly, perhaps, many students related the importance of critical appraisal to the particular fields they were in, such as telecommunications, medical technology and mechanical engineering. A few students generalised this to critical appraisal being intrinsic to engineering or the writing process:

I evaluate when I write primarily because it is almost impossible to avoid doing so.

Yes it is relevant to engineering field because engineering means logical and critical thinking.

I just can say that there are strong relationships between critical evaluation with engineers. And critical thinking is essential for engineers.

In a variety of ways, students also related critical appraisal to management of knowledge in the field. This was explored as building on the past, as in the following quote:

Yes as we know, in the engineering field, any solutions presented for solving existing problems is a long-term process. Critical thinking and writing gives the chance to perfect other people's ideas by adding their own ideas, which develops the development of engineering.

Under the theme of knowledge, management was also found to be showing field knowledge, ie. appraisal as a public demonstration of expertise. This was sometimes explicitly linked to the quantity of information required to be known:

Sure, it is relevant to engineers since in engineering we are always involved in preparing research about different subject regarding our field so, we are required to read many papers, articles, books and write reports showing what we understood,

I think critical evaluation is very important in each engineering field. It can show how much you have mastered the knowledge.

In the engineering field, there is generally heaps of information available and one has to be very careful and thoughtful to assess the information.

In addition to highlighting the specific relevance of critical appraisal to their sub-discipline, a number of students associated critical appraisal with the ability to make choices or evaluating existing technological solutions. One student, for example, offered the following rationale:

In the engineer life engineer always have to solve problems. And to solve a problem there always many solutions proposed by different people for the same problem. So the engineer have to think critically when he search for his own solution from others solution so he have to understand and analyse other's solution to know what suits his problem and what does not.

4.3.3 Cultural difficulties in understanding and practicing critical appraisal

Ballard & Clanchy (1984) argued that the reproductive learning styles and traditions of Asian students make critical appraisal difficult. Many, though not all, students suggested ways in which they were challenged relating it to cultural difference:

I spent several weeks to understand what critical thinking and writing meant after I arrived [in] Australia. As an international student, the way to consider thinking and writing in English is a big challenge to me. Critical thinking is a typical way to introduce own ideas based on other persons' result; however, it's also the most difficult thing to get used to it when changing the thinking mode.

The link between a change of thinking mode and language was also mentioned by two Chinese students, who referred to the (cultural) ambiguity of the term “critique”:

Because, in Chinese, Critical means finding a mistake of finding some unreasonable words, not like that in English

At beginning, I misunderstand what it is. I thought critical review requires us to identify some errors or inaccurate words in the original article. So I wrote it in the wrong way. After I took this course, I understood what it was.

More specific cultural rationales for the difficulty in embracing critical appraisal were offered by some individuals. An Indonesian PhD student, for example, related cultural resistance to cultural deference to experts:

I grow up in Javanese culture. It is a bit taboo in Javanese culture to criticize people idea directly, especially older people's idea. Although I understand the meaning of critical writing and thinking, I still feel uneasy to criticize other people ideas, especially when they are more senior than me, for example my supervisor.

This foregrounding of cultural difference and the unease with which students felt capable of critiquing experts adds a significant challenge to international second language learners. Several interviewees also raised this issue, and the general perhaps underlying lack of confidence to critique others:

In the beginning, I find it difficult and lack the confidence to critique academics, because I think the articles that published from the standardisation organises, such as IEEE, are classical and authoritative. But after learning this course, I find very thing has its weakness, and we should have critical mind, especially to our engineers. And now I can more effectively think and write with critical mind.

and especially you are going to do such thing which needs a lot of practices, especially when you are going to do such work on article or white papers which are written by professional people and professors and require from you (I mean from the students) to write a critical review and find the weakness and strengths of this article.

I have to admit that actually it was not easy to understand the concept of critical thinking and writing. However, in my own experience, the most difficult part is not just {to} understand the meaning but the process to develop your ability and confidence to think and write critically.

A significant number of students from all ethnic backgrounds highlighted the fact that this was their first encounter with critical appraisal. One Latin-American student, for example, suggested

both reproduction and education systems do not encourage critical thinking at the undergraduate level:

It was really difficult because in our education system we are not encouraged to think critically. We just follow some technical steps in order to write the paper our teachers ask for. Honestly, it was little bit difficult since we haven't studied this course in our Bachelor courses. It was really difficult for me to understand what critical thinking and writing meant because it was the first time for me to hear about it. I did not have any idea about it neither know about the steps required to perform it. It is quite difficult for me to learn to be critical in thinking and writing, even now. In my previous study, university and lower levels, this quality was hardly mentioned; therefore it did not become a characteristic of mine. I only have an idea of that when learning English. Having come across this skill (explicitly) for the first time, it was tough in the start to assimilate this concept.

More provocatively perhaps, one Turkish student rejected the presumption in the critique by Ballard & Clanchy (1984) and others that there is a universal form of critical thinking, highlighting simultaneously his ability to pragmatically adapt to local custom:

I don't think there is only one way of critical thinking and writing but I know that I have to use the appropriate one according to conditions that you are involved, at that point I could adapt myself.

4.3.4 Balancing language and critical appraisal skills

The balance between language and critical skills continues to be a subject of debate among students. Although a majority appreciate the introduction to critical appraisal skills, some students remain sceptical about the focus, especially those whose English (IELTS) levels were low:

Obviously, I have improved my English background to some extent through this subject. I learned and enjoyed from the class.

I think PAD is aim at improving the critical thinking of engineering students. And we actually have progresses in the critical thinking. But I find that I have little progress in my basic communication and writing skills. I mean this subject is better to focus on developing basic English skill as well.

Even where students acknowledged the development of English and critical appraisal skills, they also had suggestions for other training to be incorporated. This included general academic skills, more group work, a greater focus on written English, and more speaking and writing skills, as the quotes below make clear:

Generally, this course is very useful for me; because it gives help me to improve my English from the daily life level to the academic level. I think this

course should not only teach the student how to write. Most of the students who take this course are their first semester to study in English. So I think it would be good to introduce how to study in the second language in the first one to two classes.

I think this course still needs to involve a lot more group works or collaborations so the students can learn from each other.

I would like to suggest that more exercises should be done at class on how to improve the coherence in written communication.

I think the ESL course need to add some phases of oral practise in some different and interesting ways, just one presentation is not enough. Because we need to do lot's of presentations in our further study. It is not a simple thing for us whose first language is not English. The writing and reading practices are beneficial.

5 DISCUSSION

Many students appear not to have been exposed to critical appraisal prior to coming to Australia. The independent teaching surveys and the evaluative comments provided by students suggest that a focus on critical appraisal skills in EAP discipline-specific courses is a potential avenue for student development. They are also challenged by the prospect of having to develop a position on a research topic with the support of sources, which may entail critiquing recognised authorities. The pragmatic compromises on which the program is based have helped develop a learning community based on the principle of clearly communicating about authentic genres to an audience of peers from the broad discipline of engineering and science.

Small-scale case studies of teaching practice as outlined in this paper, employing quantitative and qualitative data, can prove illuminating not only about the particular issues of the case but also of larger pedagogical issues, such as the teaching of critical thinking and appraisal. Studies such as this invite expansion through complementary faculty data and, combined with similar case studies, may allow for some generalisation (Stake, 1995). Qualitative data in particular offer some advantages compared to questionnaire and other student feedback data, as they allow for some depth of meaning to be attached to responses, which also may allow for further exploration in program evaluation and research.

There is still debate on the value of applied linguistics and EAP to discipline-specific teaching, and this paper contributes to that conversation. The capacity of EAP to respond to the international student cohorts in engineering and other disciplines has, however, been established in a range of situations; this paper adds to that body of work. The foregrounding of linguistic, rhetorical and critical skills in such courses may be

a challenge to traditional forms of teaching writing in engineering and, therefore, require something of a pedagogical culture change in Australasia. It is indisputable that high-level disciplinary skills in engineering and other disciplines can not be learned in EAP or writing classes, but require the sustained exposure and practice of engineering subject teaching. However, the potential for applied linguistics to contribute to the task of preparing engineers may have been underestimated.

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