English language and critical thinking support for students from diverse backgrounds

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Abstract
Feedback to students which is valid, reliable and helpful is critical to their intellectual development and progression. Engineers communicate and generate ideas in a variety of ways, and language is an important medium requiring a high level of ability in clear communication and critical thinking. There is diversity within the student body in terms of its ability to communicate effectively in writing. A series of surveys of students and employers was undertaken, including a focus group with employers and various timetabled sessions with students. Arising from this work, a framework for providing more appropriate feedback to students has been developed.

Keywords: technical writing, critical thinking, feedback

Background
The cohort of 16 students on the second level Higher National Certificate Railway Engineering programme undertakes a railway engineering project. The assessment includes writing a discussion of the problem to be tackled and then the resolution of that problem by engineering measures. The exercise in developing feedback has been focused on the initial 500-word problem statement and allows for marking and then a period to review the feedback with the students.

The cohort comprises five native English speakers. The mother tongue of the remaining 11 is as follows: Afrikaans (two), Albanian (two), Bengali, Czech, Hausa, Konkani, Portuguese (Angola), Urdu and Yoruba. The Bengali and Urdu speakers were educated in the UK, the Hausa and Yoruba speakers were educated in English in Nigeria and the Konkani speaker was educated in English in Kenya and India. The remaining six students were educated in their mother tongue in their home country. This is a rich mixture of students with a breadth of language skills. Two students have four languages, three students have three languages and seven students have two languages. The English students have the least broad language skills, with four of them only having one language.

Rationale
Flateby and Fehr (2008) point out that, as writing is typically taught prior to attendance on an engineering course, students who lack the ability to write and reason within the discipline can expect little additional support in developing their written communication skills. Some may regard writing as a so-called ‘soft’ skill; however, most researchers in engineering education recognise the strong link with intellectual development, for example Hanson and Williams (2008), who offer a method for improving meta-cognition by asking students to explain a statics problem in writing. Some perhaps go too far (e.g. Boyd and Hassett, 2000) by offering a mechanistic approach to student support with writing. The CBI (2009) identifies literacy, which it defines as including the ability to produce clear, structured written work, as an employability skill, and notes that employers were “not overly impressed” with graduates' literacy skills, suggesting that a gap remains between output and expectation. There is a need for better literacy within the engineering profession and
work remains to be done to develop appropriate valid and reliable measures for assessing critical thinking and written English.

Dr Ruth Van Dyke’s work at London South Bank University (Van Dyke, 1997, 1998 and 1999; Van Dyke et al., 2000; Van Dyke et al., 2005), supported by the Higher Education Academy and Equality Challenge Unit, concerned fluency in English in relation to identifying why there are differences in ethnic and gender degree attainment. This work confirms the work of Jacobs et al. (2007) which suggests that there is a statistically significant negative effect on degree attainment for those from BME groups.

The aim of the project was to develop innovative practices in providing feedback on written English based on trials with a diverse community of students studying a Railway Engineering HNC part-time. The aim was supported by the following objectives:

- To engage with employers to assess their requirements with regard to critical thinking and written English skills for graduates working in engineering industry
- To benchmark the performance of current students against each other and other cohorts within the department
- To develop criteria for marking technical written English with precise and supportive forms of commentary and feedback that are valid and reliable.

**The approach**

The approach adopted was to survey students and employers and to develop a feedback form with feedback on this form from students.

Students were asked to rate on a ten point scale (1 being poor and 10 being excellent) their ability in listening, speaking, reading and writing in each of their languages. A general pattern emerged: they rated their listening and speaking ability (averages of 8.1 and 8.3 respectively for their first language) more highly than their reading and writing ability (averages of 7.9 and 7.3 respectively).

English dominated as the reported second language (eight out of twelve with a second language). The average scores for listening, speaking, reading and writing were reported as 7.3, 7.2, 7.3 and 6.4. Unsurprisingly, these are less than for the primary language, but interestingly the average score for reading is fractionally greater than for speaking.

Nine students wrote emails and ten wrote reports. Other forms of communication in which students were involved were: writing letters, specifications, method statements and quotes and minutes. Nine students wrote for an internal company audience, while fewer wrote to clients (six) and suppliers and sub-contractors (five).

According to the scores of importance on a five point scale, the order of priority of aspects of written work were as follows: i) comprehension (4.77); ii) clarity (4.54); iii) precise use of technical terms (4.25); iv) conciseness (4.09); v) logic of argument (3.85); vi) and vii) (equal) precise use of words and spelling (3.77); viii) ordering (3.75); ix) lack of ambiguity (3.25); and x) precise use of verbs (3.23).

Students were asked to comment on the feedback form currently used for giving comments on written English. They were asked to state whether or not they understood the comment being made and, if not, to rate its importance (1 = not important at all, 3 = neither important nor unimportant, 5 = very important).

The feedback which students understood least (with only seven students saying they understood) is as follows:

- Singular nouns always conjugated with singular verbs and vice versa
- Verbs conjugated in appropriate tense
- ‘Data’ always with a verb conjugated in the plural
• Reference with multiple authors (e.g. Name et al.) always with a verb conjugated in the plural
• In text: three or more authors referenced as 'Author1 et al. (year)', authors initials not quoted.

It is probably the grammatical term ‘conjugate’ which is causing confusion. Other points which only either eight or nine students understood included style points in choice of words (use of the word ‘key’, use of ‘if’ as opposed to ‘whether or not’, use of the phrase ‘I feel’ or ‘I believe’, choice of verb, e.g. ‘to look at’ rather than ‘to consider’) and points relating to Harvard referencing.

With one exception, the average score for importance was always greater than 3.00, indicating that students generally thought the points had some level of importance. The most important (average of 5.00) was the use of punctuation (full stops, commas and so on being used appropriately) and the least important (average 2.56) was the point about the slash never being used because it has no grammatical meaning.

Overall, it can been seen from answers to the twelve to fifteen questions on the initial survey that students have neither knowledge of grammatical terms, nor an understanding of feedback when grammatical comments are made about their work.

A focus group of civil engineering employers was held as part of the Industrial Advisory Panel meeting held on Wednesday 23 February 2010. The group comprises senior figures from a range of backgrounds and the discussion, based around four generic questions, was led by Ruth Van Dyke. The following section summarises the responses against each of the four questions. A final sub-section summarises challenges for engineering educators in developing English language skills.

Employers reported that employees need to write curricula vitae, ‘standard reports’ (that is, reports with a standard structure which firstly describes what the report is about, followed by the main body and then a conclusion), and various internal and other work-related documents such as business letters and emails.

The audience for the written work might be future employers, work colleagues, the engineering community and a wider group with less extensive or limited engineering knowledge. The audience may be professional or lay and the style should be objective and logical.

Employers said that written work should be written clearly and this is best achieved, it was suggested, by simple, clear and precise language with short sentences and good punctuation. If acronyms or abbreviations are used then they should be explained so that they are understood by all readers. Overall, reports and letters should be concise.

Where the audience is within the engineering community, use should be made of appropriate terms (engineering language). Where the report or letter is for lay-people then information has to be expressed in terms that they will understand.

All communication in an employment setting should include: correct spelling, sentences written in accordance with the rules of grammar and adherence to the rules of punctuation.

Very importantly, a point was made which relates to critical thinking. Employers suggested that there should be an ability to identify and develop options which ought then to be evaluated in an objective way. This comment demonstrates that writing is merely a vehicle for communicating thoughts and ideas.

Writing that would be deemed poor is often written in an emotive rather than an objective style and may be personalised and similar to that which may be found on social networks or in text messages.

There is a tendency for people not to check their work for spelling, clarity, grammar and logic. It is too easy with word-processors and email for communications to be sent without having been checked. Employers recognise that they have to review what has been written, but this view is not always understood or shared by employees. One comment suggested that “technology has made us lazy”.
Other examples of poor writing occur when writers do not understand their audience or what is entailed in producing a standard report.

Student feedback on the form (see above) has indicated that they have little or no knowledge of grammatical terms and that they do not understand feedback when comments are made about their grammar. Clearly, a development of the form would require any grammatical terms to be explained.

In addition to the consultation with students and employers, valuable comment has been made by both John Seely (London South Bank University Faculty of Engineering, Science and the Built Environment) and Graham Barton (who works in a specialist English support unit at the university). A revised form has been developed which has arisen out of development and use by John Parkin, the consultation with the students and discussions with these other expert staff.

**Assessment**

The revised feedback form was used with the HNC Railway Engineering students on a short piece of written work they submitted as part of the Railway Engineering Project. It has also been used to mark the BSc (Hons) Civil Engineering final year design project submissions.

After the written work was handed back to students, they were asked to comment on the form by hand-writing comments across it. Most of the feedback consisted of tick marks. Other positive comments included things like: “common mistake” and “always struggle [with this]”. The other comment, made twice, was that the abbreviation ‘Ill.’ for ‘illogical’ was not understood and so this has been changed to ‘not logical’.

**Evaluation**

We started from a position where we had an existing feedback mechanism for written English but were concerned that this may not have been as useful as it might be for students, particularly those from non-English speaking backgrounds. Also, it needed to be improved in order to tackle more directly the issue of providing feedback associated with the critical thinking aspects of written work.

A series of surveys has been undertaken with students and their employers which has sought to identify the main issues of relevance to them in written English and critical thinking. In parallel with this, a revised instrument for providing feedback to students has been developed and tested with them.

**Discussion, summary**

Educators need to ensure that students are aware of the standards that they have to achieve. This process should commence at the very outset of the students’ time on the course and may require time to be set aside specifically to work on writing so that they can be explicitly taught, for example, the rules of grammar.

A further important challenge is to reach a point where students recognise that writing is an important core employability skill and understand that poor quality *curricula vitarum* and job applications will affect both their ability to find work and their promotion prospects once in employment. This is challenging, but success here would provide the motivation required to spend the time necessary to gain the skills required.

It is also necessary to teach students not only about what constitutes good writing, but also about the required general approach to writing. This includes the ability to: a) generate the ideas about what will be written, b) develop a draft and, very importantly then, c) to re-read what has been written in order to make it clearer and more succinct.
Educators should ensure that students receive appropriate feedback to enable them to understand where their strengths and weaknesses in written English lie. In addition (and this could be quite challenging), there is perhaps a need to provide feedback on the processes in which the student has engaged to develop a piece of written work. This may include a requirement to submit both initial and final drafts so that the development of the work can be evaluated by the tutor.

**Further development**

The feedback form that was developed as part of this project should continue to evolve and should become embedded within the department. There has also been the opportunity to use the form as part of a new cross-faculty first year ‘design and practice’ module which introduces students to technical writing. As part of this module, the form has been used with over 500 students on a piece of writing used as a diagnostic test at the beginning of the year and will be used for a further essay later in the year.

**References**


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