

Creating a Leading Edge: The Link Between Second Language Proficiency, Academic Performance and Employment Leverage for Engineering Students*

JOHN D. GILLEARD and JENNI GILLEARD

Dept of Building Services Engineering, The Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong. E-mail: bejohn@polyu.edu.hk

This paper considers how a building services engineering department sought to 1) better understand student second-language communication problems, 2) enhance second language proficiency, and 3) adopt skills-based industrial learning approaches to impact both student academic performance and employment leverage. Increasing globalisation has created a need for academia and industry to work more closely together to achieve better language skills among engineers. This study suggests that using specifically focused, subject/departmental-based language assessment strategies, targeting language teaching to performance needs, positively encouraging continuous student motivation, and demonstrably valuing individual language efforts could help engineering students to develop their language skills.

INTRODUCTION

INCREASINGLY nations and businesses are recognising that a country's global competitiveness will potentially suffer unless the workforce as a whole heightens its ability to acquire multi-language skills. Flood, for example, suggests there is a need to expand Canadian graduate skills in Chinese, Japanese and Indonesian [1], while Rees and Rees note, that in the UK, there are few individuals who have the talent to combine good foreign language skills with professional competence [2]. Yet links between business and education working to reduce 'the mismatch between new employment and new employees' [1] are still often very tentative in many parts of the world, particularly in relation to language skill awareness. An exception is continental Europe where teaching students 'languages at the same time as we teach them the rest of their business and technical skills, that is, in further and higher education' has long been accepted practice [3].

In many parts of Asia, such as Hong Kong, parts of Mainland China, Singapore, Malaysia and India, the local language of the population is often different from the educating language of its students. Many Hong Kong tertiary students, for instance, are taught not in their native dialect of Cantonese but in English, a direct result of Hong Kong's colonial status until 1997. But Hong Kong students are often not very good at speaking or writing English and this creates pressures for students, for their departments, and for the

community as a whole. Recently, the Chief Executive of Hong Kong, Tung Chee-hwa, raised the tenor of language awareness in Hong Kong in his 1999 Policy Address when he said: 'We must continue to improve the Chinese standards of our students, both written and spoken . . . [and] . . . As a cosmopolitan city, we must ensure that more people can use English and use it better. The business sector has been complaining of a decline in the English standards of our younger generation since [the] early 1990s' [4].

Yet despite these concerns, Evans states that there has been very little research into how English is used within Hong Kong businesses [5]. Increasingly however, multinational corporations such as Imperial Chemical Industries are acknowledging that staff with good language skills bring benefits for global communication, in terms of both better cultural rapport and performance at international transactions [6]. Undoubtedly, such demands for better language proficiency among all kinds of employees will continue to spread, especially within globally focused companies. This possibility was acknowledged at a 1998 interactive seminar regarding enhancement of UK engineering education between schools, universities, industry and relevant organizations. Here the syndicate of representatives agreed the need for more emphasis on 'good communications . . . [and] the benefits of linguistics because of the increasing amount of multinational companies and/or projects'. They also recognised 'communication between teachers and industrialists must be one of the key elements in successful nurturing of the next generation of engineers' [7].

* Accepted 22 May 2000.

Such opinions seem to underscore the increasing urgency for academics, not only to develop language skills among engineering students but also to work closer with industry, to achieve 'a skills-based education as well as one based on academic achievements' [8]. Engineering departments, which do not teach in the mother tongue of all or some of its student body, including departments which may service programmes overseas or offer distance learning courses, face a potential dichotomy. In such instances, some students will of necessity be required to speak, write, read and communicate in a second language in which they may not be totally fluent. But at the same time, pressures from industry demand that academics not only produce competent engineers with practical knowledge, but also with a range of transferable skills, including multilanguage proficiency.

This paper considers how one engineering department in a Hong Kong university addressed such issues, in order to impact both academic performance and employment leverage, by seeking to develop:

- a better understanding of the language communication problems encountered by students;
- ways of nurturing their second language proficiency;
- more skills-based industrial learning approaches.

STUDY OVERVIEW

The formal teaching language of most universities in the Hong Kong Special Administrative Region (HKSAR) is English. Students take examinations, write essays, listen to lectures and are expected to be able to respond appropriately in English. HKSAR businesses, that have an international focus, also demand a certain proficiency in English from their supervisory and management levels. But the native language of Cantonese is still the main way most students (and workers) communicate orally. This dichotomy led the Hong Kong Polytechnic University (PolyU) in early 1996 to draft a response to an education report stating 'The PolyU fully subscribes to the view that there is an urgent need to enhance language proficiency in both Chinese and English for our students . . .' [9]. This case study evaluates the findings of a survey into the second language English skills of one section of the student cohort from the Department of Building Services Engineering (BSE) within the PolyU.

BSE graduates work within a professional discipline that is highly regarded within the HKSAR, the majority of whose graduates are drawn from the PolyU BSE Department. In the last few years lecturers had felt there had been a deterioration of English fluency among BSE students that impacted their academic performance [10].

In addition, comments from professional building services institutions implied they too considered the English communication ability of graduates very variable. Anecdotal reports are notoriously personal and generalised however. The objective of the BSE survey was to gain more concrete evidence on which to base departmental judgements regarding student ability to use English as a second language and development of second language skills.

Just under two hundred first-year part-time (PT) building service engineering degree students were chosen for the initial study because they were deemed most at risk in terms of both level of English and potential academic performance. These students, already working within the building services profession, were, due to their job experience, allowed to enter the degree course with a potentially lower level of English than full-time entry students. There was a concern within BSE that part-time students could therefore be disadvantaged in both their studies and their career development within their chosen profession. However, BSE recognised, that before they could verify this hypothesis and subsequently focus departmental effort, they needed to know:

- the proficiency of part-time students to use English;
- whether this was truly declining for new intake years;
- the impact of English for Academic Purposes (EAP) teaching;
- the correlation, if any, between English ability and end-of-year/end-of-degree academic results.

Quantitative analysis of assessment techniques and end-of-year academic results, and qualitative evaluation of BSE departmental's responses to language provision were undertaken. The survey helped to inform future departmental action and identify areas that needed to be addressed, with regard to development of second language proficiency among building service engineering students.

MEANINGFUL ASSESSMENTS

In the PolyU, engineering students are taught English for Academic Purposes as a supplementary subject to their main academic discipline. During the academic years 1995–97 first year PT B.Eng. students received EAP over two terms (56 hours). End of course English assessments were based on generic university grade descriptors ranging from A-F, lacking performance definition. So in November 1996 BSE asked the PolyU's Centre for Professional and Business English (CPBE) to make a one-off assessment of years 1–4 PT B.Eng. students. CPBE was approached because they undertook English assessments for industry based on detailed level descriptors covering writing, reading, oral skills and listening. All their assessors had

also been trained in the scoring of the descriptors to ensure consistency of standard allocation. Students scored at the lower, weaker levels (approximately equivalent to university grades C and D) in this assessment were subsequently offered extra English courses, in addition to their normal EAP programme.

Following the introduction of a credit-based degree programme in 1997/98, first year PT B.Eng. students were provided with a higher concentration of EAP teaching during their first semester than previous cohorts. But they received no other timetabled English input for a further twelve months. An additional difference from the previous system was that at the end of December 1997, English assessment grades were submitted to BSE based on more clearly defined band descriptors, specifically designed for English testing purposes; also rating was now undertaken by lecturers who had been moderated to ensure consistency of standards. As before, those students considered most at risk in terms of second language ability were asked to undertake further English enhancement at an individual level, and offered an opportunity to take a summer programme.

The survey suggests that English achievement assessments rated against rather generic criteria, such as excellent (A), good (B), satisfactory (C) etc, are not especially helpful for departments trying to judge a range of language abilities in their students. BSE did not know where to focus their efforts to help weak students partly because generic grading showed only broad trends. It was this lack of specificity that decided BSE to further test their first year PT B.Eng. students, using performance assessments that targeted skills such as speaking, writing, listening, etc. Such a decision suggests that academic departments need clear and focused interpretation of language test results, if these are to be meaningful to non-specialist language lecturers. Within businesses, 'instructional system designers are sharpening their knowledge and skills in test development' so as to ensure the tests have 'performance validity' [11]. And indeed it was only once assessments were linked to specific language criteria, that BSE felt confident that additional

English input for their weakest second language students would be worthwhile.

PERFORMANCE ENCOURAGEMENT

Assessment of second language proficiency for first year PT B.Eng. students over the academic period 1995–1998 shows a decline in ability at the higher grade B, and an increase in convergence towards average (grade C) proficiency. Even though the assessments for July 1996 and 1997 were based on generic grade assessment, while those for December 1997 were benchmarked against more specific descriptors, the overall trend towards reduction in second language proficiency of first-year part-time students seems clear (Fig. 1).

A rather surprising inference revealed by the survey is an apparent decline in first-year PT B.Eng. students' second language ability even when upskill teaching was provided. Assessment scores, shown in Fig. 2, Bar Graph 2, suggest a substantial fall in the number of students rated as good (equivalent grade B), and an increase in those scored as satisfactory (equivalent grade C) in July 1997, compared to November 1996. This is despite weaker assessed students being offered extra second language courses during April-May 1997, and all students continuing to have EAP input throughout the year. Two factors may account for this finding. First the BSE language coordinator reported that the extra courses were not compulsory, and were held in the evenings, necessitating voluntary input time which part-time students may have been unwilling or unable to give. Attendance was reportedly inconsistent, with a significant dropout rate as the weeks progressed. Second this was a period when EAP teaching paralleled generic grading. Even English lecturers may not have been able to easily recognise where best to target their teaching to ensure greatest impact. This is the antithesis of many corporate training interventions, which (because costs and time are driving factors) usually require both compulsory attendance and highly tailored programmes based on customised needs analysis.

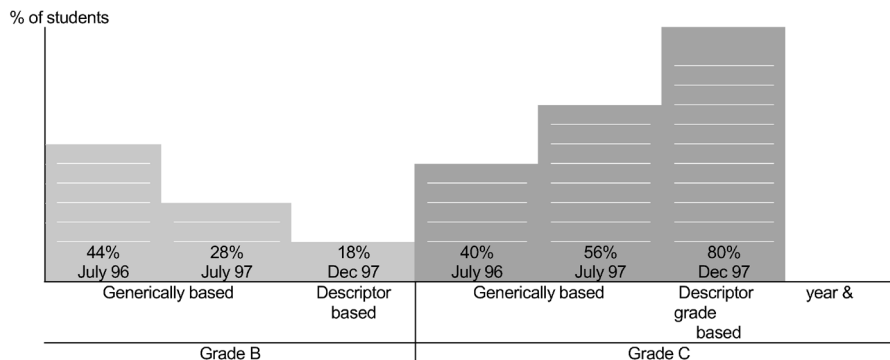


Fig. 1. Bar Graph 1: Assessment returns for above average and average second language proficiency.

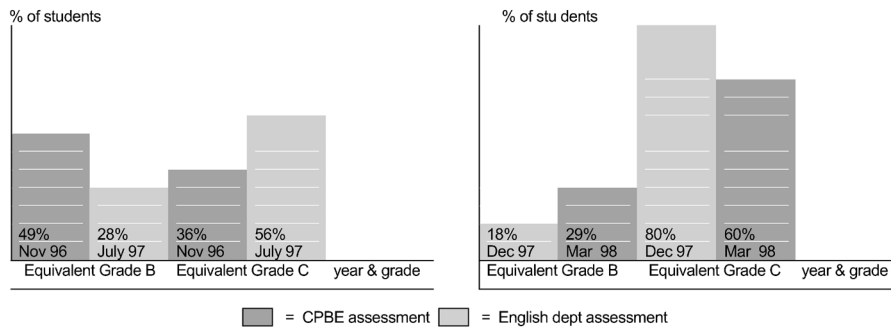


Fig. 2. Bar Graph 2: Decline in proficiency; Bar Graph 3: Improvements in second language proficiency.

However the trend towards weakening language skills appears to reverse for PT B.Eng. students during spring and summer semesters of the academic year 1997–98, even though these students received no EAP teaching. Figure 2, Bar Graph 3 shows improvements within both good and satisfactory returns for first year Building Services part-time students.

The question is why? BSE arranged English assessment testing for all first-year students in March 1998. Because of the unusual nature of the exercise for engineering students, and its mid-year timing, students may have seen this as a signal that BSE considered second language proficiency an essential aspect for successful academic achievement. If so, this may have created psychological motivation for part-time students to pursue their own self-development language learning strategies. In addition a follow-up letter, requesting low rated students attend at a *compulsory summer vacation* upskill English programme, may also have acted as a catalyst, evidenced by some acceptably rated students also asking if they could attend.

THE END RESULT

The survey also compared the November 1996 assessment returns with various first-year exit results. The findings show that over half of first-year PT B.Eng. students assessed as below average withdrew from BSE before the 1997 start. Although no exit interviews are available, these students almost certainly struggled to understand course content and lecturers, where both focused on second-language usage. Two part-time students, who did not complete their first year due to resit failure and deferral, also had poor English. While many factors bear on a student’s decision to withdraw from a course, difficulties in coping with target language for lectures and tutorials must have some impact. These inferences gain greater credence when compared to findings for a similar group of part-time students in 1997–98. At the end of this academic year, practically all resits in written course work subjects were taken by first-year part-time students within the lowest English assessment ratings for that year. Yet the same

students had little difficulty in passing their maths exam, suggesting weak second-language writing ability may compromise some part-time students. While this may seem an obvious conclusion, it raises the question, ‘How can this be avoided?’

This aspect is important to address because the survey does seem to show some link between proficiency of second language, and final building services degree classification. Comparison of results of a one-off assessment exercise, undertaken for *all* BSE students in November 1996, with final degree classification, indicated that all July 1997 and 1998 1st Honours PT B.Eng students were rated at high or above average ability in English (i.e., equivalent to grade A or B), as were two thirds of 2.1 classification students. However, 66% of 2.2 classifications and all 3rd Honours part-time students had been assessed at average or below average (i.e. equivalent to grade C or below).

It therefore appears likely, that if part-time BSE students do not have second-language proficiency already up to expected performance standards when they enter the university, or are not brought up to acceptable levels as quickly as possible, their academic performance could be adversely affected throughout the whole of their time at university. Such students appear to be at particular risk on two fronts. First if second language ability is weak, understanding of course texts and lectures may be compromised. Second, poor fluency, by default, almost certainly means limited second-language expression skills, potentially interfering with effective written and oral communication of ideas during academic subject examinations. In the longer term these inadequacies could impinge on final degree classification.

IMPLICATIONS

This survey suggests that academic institutions, which require their students to learn predominantly in a second language, may need to take greater account of:

- how second language ability is assessed;
- what techniques and methods are used to encourage better language acquisition;

- the extent to which second language proficiency may be impacting academic performance.

As a corollary, the more decisive the efforts of academic departments to maximise second (or even third) language ability, the better equipped will such students be when they enter the workplace. This will not only benefit the students but also give leverage to engineering departments within the profession.

The merits of focused assessment testing

The findings imply assessments based on detailed second-language performance criteria would provide more useful information to engineering lecturers and more reliable trend indication, than if achievement grades were based on generic university scales. In addition testing undertaken by lecturers known to have test development expertise would almost certainly have greater credibility than where moderators relied more on individual subjective judgement. But there would still be the need to target such knowledge wisely. It has long been accepted in the business world that if ‘training is not of the right type . . . [and] training goals are not related to work goals . . . [and] new skills are not supported by the environment’ training programmes will not be successful [12]. Engineering departments must however, accept that second language ability cannot be acquired overnight. Yet they must also begin to insist that language upskill teaching has to be much more focused towards their student needs and less towards provision of universal content; must be related to the type of skills students need at any particular moment in time; and must be immediately transferable to their students’ academic environment.

The importance of departmental intervention

The survey implies some correlation between departmental support for student efforts to improve non-native language skills, and subsequent student motivation and academic performance. Vygotsky has demonstrated individuals continue to self-develop if encouraged and supported by facilitator intervention [13]. Academics may find change-making techniques to assist the process of personal learning and motivation used in some business environments [14] helpful for engineering students. For example:

- explicitly signalling to students the importance of second language ability could ensure a *focus* they may not develop on their own;
- departments known to value assessment testing may act as a catalyst creating the *will* for motivating student efforts;
- academics taking a lead through positive, direct intervention, such as facilitating target language teaching, establish the *capability* to achieve this end.

Developing critical mass may be as crucial for creating change in the student second-language

learning process as it is for changing mindsets with corporate organizations. This may be especially so for engineering students who also work while undertaking tertiary studies. They may be too busy and distracted to give any priority to developing their language skills, without focused support and definitive assistance from their academic mentors.

The significance of customer service

Balla, Stokes and Stafford’s research suggested that as Hong Kong student years progress ‘intrinsic interest and satisfaction from studies over the three-year period’ begin to decline [15]. Such feelings may well be compounded for many engineering students, by the fact that length of course completion is increasingly being extended, due to the emergence of modular, distance learning, and credit-based programmes. Corporate organizations work hard to maintain customer loyalty. They create a learning relationship with their customers to ensure a positive attitude towards their products and the company [16]. Engineering departments may need to do the same, if they wish their students to develop a positive learning style towards attaining multilanguage proficiency. Academics must not only provide the service their students want—such as *relevant* second language teaching—but they must also establish a bond between student and department, that shouts out to their students ‘we appreciate your efforts in language learning’. Leitch *et al.* have suggested that a fundamental factor for establishing a learning company is for leaders ‘to create conditions conducive to learning and just as vital being seen to value it’ [17]; this is what engineering university departments must also learn to do.

Pre- and post-evaluation

There appears to be some correlation between results of written engineering exams demanding second-language input, and eventual degree classification. Further research is required to positively verify such a relationship, but common sense suggests poor aptitude to express oneself must affect grade scores. Therefore to ensure engineering departments accept only second-language speaking students with reasonable ability, it would seem prudent to undertake specific, *subject/departmental needs-based language testing* prior to entry. This would allow weak second-language students to be eliminated from programmes they would probably struggle with or fail to complete. It would also ensure intakes more likely to fulfil their degree, and any related profession’s requirements. Focused pre-testing would also be more cost-effective, as it would reduce the necessity for a variety of damage limitation responses at later stages down the academic pathway. Indeed because pre-testing establishes the foundation for post-testing, it creates a more efficient means for comparing

before and after behaviour, as a result of language upskill teaching.

Kirkpatrick suggests pre/post comparison is the most 'important and meaningful' kind of evaluation [18]. Certainly availability of such statistics would provide engineering academics with a more accurate picture of their students' improvement, or decline, in second-language proficiency.

CONCLUSIONS

Engineering educators need to become more concerned that their students' second language skills are sufficient to meet the demands of academic courses and professional bodies. Ultimately, wherever students are required to use a second language as a means of academic communication, the better a student's language abilities, the better a department's ability to create a more rigorous learning atmosphere, and the better equipped students will be to enter the engineering workplace.

The speed of change in the business world also necessitates greater integration between education

and industry, 'one that facilitates the continuous updating of employee competencies and continuous learning within organizations' [19]. By developing performance-based learning techniques, academic departments can help engineering students to build and improve their language skills. Positively utilising assessment strategies will help students identify weaknesses. Targeting language teaching to performance needs, providing the support and means to encourage continuous student motivation, and demonstrably valuing student effort can also create impetus for individuals to ultimately take more responsibility for improving their language skills. Transferable skills, as with multilanguage proficiency, form part of a complex foundation that assists long-term competitive leverage for engineering students in both the local and global marketplace. Tertiary departments, which purposefully seek to develop student cross-cultural communicative skills, help inform strategically focused students. By implication such departments also provide their graduates with a leading edge as they enter the corporate environment.

REFERENCES

1. A. L. Flood, Bridging the gap: young Canadians and the job market, *Business Quarterly*, **60**, 3 (1996) pp. 11–16.
2. J. I. Rees and C. J. Rees, Lost for words . . . and losing business, *Industrial and Commercial Training*, **28**, 3 (1996) pp. 8–13.
3. D. Ferney, Language skills: is reactive training enough? *J. Eur. Ind. Training*, **14**, 9 (1990) pp. 27–30.
4. Tung Chee-hwa, Policy Address 99, *South China Morning Post*, (October 7, 1999) pp. VI–VII.
5. S. Evans, The English language needs of building services practitioners in Hong Kong, *Asian Journal of English Language Teaching*, **9** (1999) pp. 41–57.
6. K. Barham, Developing the international manager, *J. Eur. Ind. Training*, **15**, 1 (1991) pp. 12–16.
7. A. Lilley, Engineering through education, *Education and Training*, **40**, 2 (1998) pp. 63–67.
8. P. Humphreys, K. Greenen, and H. McIlveen, Developing work-based transferable skills in a university environment, *J. Eur. Ind. Training*, **21**, 2 (1997) pp. 63–69.
9. Hong Kong Polytechnic University, *Draft Response to the Education Commission Report No. 6*, Senate paper (January 1996).
10. J. D. Gilleard, *Improving English Standards within BSE by Introducing Evaluation into Teaching Programmes*, Internal BSE working paper (February 1996).
11. N. M. Dixon, New routes to evaluation, *Training and Development*, (May 1996) pp. 82–85.
12. A. Furnham, Comment, *J. Eur. Ind. Training*, **19**, 1 (1995) p. 3.
13. L. Vygotsky, Interaction between learning and development, in M. Cole *et al.* (eds.), *Mind in Society*, Harvard University Press, London (1978).
14. The learning organization: 'change proofing' and strategy, *Industrial and Commercial Training*, **27**, 10 (1995) pp. 22–24.
15. J. Balla, M. Stokes and K. Stafford, Changes in student approaches to study at CPHK: a 3-year longitudinal study, *AIR Conference Paper*, Melbourne (October 1–3, 1991).
16. A. M. Webber and H. Row, How you can help them, *Fast Company*, **11** (Oct–Nov 1997) pp. 128–136.
17. C. Leitch, R. Harrison, J. Burgoyne and C. Blanter, Learning organizations: the measurement of company performance, *J. Eur. Ind. Training*, **20**, 1 (1996) pp. 31–44.
18. D. Kirkpatrick, Great ideas revisited, *Training and Development*, (January 1996) pp. 54–59.
19. T. N. Garavan, Training, development, education and learning: different or the same? *J. Eur. Ind. Training*, **21**, 2 (1997) pp. 39–50.

John Gilleard is an Associate Professor specializing in the teaching of facility management and design. Prior to joining the Hong Kong Polytechnic University in 1991 he taught at universities in the USA, Singapore and the UK. As the English Language coordinator in the Department of Building Services Engineering he has adopted a proactive response to improving language and communication skills within the department. He is a member of the Hong Kong Institute of Engineers. In 1998 the International Facility Management Association nominated him Educator of the Year.

Jenni Gilleard is a business communications trainer and part-time university lecturer in Hong Kong. She designs and delivers highly focused programmes for corporate clients who need to use English to communicate either through writing or speaking. Training preparation always includes close diagnostic analysis of individual or departmental performance requirements. She is a strong advocate of e-training. She writes regularly on training issues and has won awards for most outstanding papers in management and training journals. Her research interests include development of training through Internet and corporate intranet sites, and implications for cultural awareness. She obtained an M.Sc. in Training from the University of Leicester in 1996.