

Engaging engineering students in writing - a road less travelled?

Abstract

The presentation reports on the initial findings of a project that was designed to try to help engineering students with their studies. The aim of this activity was to undertake an intervention study to discover how a combined theoretical approach of social linguistics, academic literacy and meta-cognition may influence students' writing and mathematical development. The research question was: "Does a combined connectionist and social/affective teaching strategy help engineering students develop their writing skills?" The study was undertaken with the cooperation of the subject course tutor responsible for two programmes: Extended Engineering (undergraduate) and Masters in Engineering and Project Management. This presentation will focus on the initial findings from the first part of the ongoing project which explored the approach with the Extended Engineering Students. This is an undergraduate course designed to help students choose which subjects to study on the degree. It is, therefore, a very compact course and a question for discussion is: "to what extent should or could, a subject specific writing module be included in a preparatory course programme? The background to the project will be explained, and then the unexpected difficulties encountered in trying to help the students will be discussed. The final part of the presentation will explain the responses to these challenges. The theoretical context is academic literacy and a further discussion of the theoretical and conceptual framework is explained below.

Background

The increasing marketisation of higher education and the pressure on universities to provide graduates with skills to support the economy has allowed for the development of an instrumentalist view of universities' purpose (Brown et al 2008; Fallows and Steven, 2000; Hager and Holland, 2006). This view coincides with a growth of audit and accountability cultures in the public sector (Ainley, 1999) and its resultant emphasis on managerialism (Pollitt, and Boukaert, 2002). It is against this background, that skills deficit models have gained such prominence (Clanchy and Ballard, 1995; Cumming, 2010).

The research was conducted in a post-1992 university in the North East of England. The university had 29,285 students enrolled in 2011. Its commitment to widening participation and employability influences all its policies and procedures and in particular, the learning and teaching strategy; within this context, the management and staff place a strong emphasis on graduates' skills for employment. In the late 1990s, it opened a central student skills centre (SSC) in the library; its purpose is to offer optional, additional study skills support to all students and staff as students. The SSC is staffed by a 'co-ordinator' who is the author and researcher and as a full-time academic member of staff, teaches in the facility and also has management responsibility for the centre. There is also one part-time lecturer. The University is divided into 6 academic schools, although the number of staff available varies, 5 or 6 academic lecturers also work in the centre for up to 3 hours per week during term time. Although the idea behind this centre was well intentioned, the facility provides a complex and contested role (Barkas, 2008). The findings from the research would contribute to the knowledge of the how theoretical and conceptual frameworks are

becoming contextualised in theories of academic literacy, skills and learning development (Cumming, 2010; Haggis, 2009; Hartley et al, 2011; Lea and Stierer, 2000; Lillis, 2006; Preece and Godfrey, 2009). Previous research into the role of the centre employed a mixed model design, utilising both qualitative and quantitative methods to examine the nature of help given to 3420 students. This early work has now been extended to over 13,000 students over a longitudinal study over 13 years (Barkas, 2008; 2011a).

The capacity of the current model of the SSC means the academic lecturers are able to offer student support to approximately 1000 students per year. The students have made repeat visits to the centre and the findings of the research has shown that 10% of the queries were related to requests for help with IT and mathematics while over 90% of the queries are connected to students' requests for help with the development of their writing skills.

As the numbers of students admitted to the university has grown, the issues the SSC presents in terms of students' learning needs has not been high on the list of priorities for course tutors or management, as they have felt their attention is better placed to ensuring all courses can demonstrate students 'employability'. Despite repeated attempts by the researcher to challenge the dominance of a skills deficit model of student support, the role of the SSC, remains contentious. Its appeal as a 'service' to the students, thus overrides any concern academic staff and some members of management may have, that learning development may be better placed within course programmes (Barkas, 2011a).

The most queries at the SSC are from Health and Social Care, which is the largest department (termed 'School' as against 'faculty') in the university. The engineering courses at the university are also popular and these students make up the second largest proportion of queries at the SSC. So a pilot study was conducted over two years from 2007 to 2009 to ascertain the nature and extent of the demand made by engineering students on the SSC. During the pilot study, 505 engineering and science students made 783 visits to the SSC for help with their studies. The engineering tutor provided additional teaching to students having difficulties in understanding and solving problems in civil engineering, project management, manufacturing management and other science subjects. Some of these students also asked for help with their writing skills and this was recorded separately on individual record sheets. The learning support to these students was offered jointly by the engineering tutor and the coordinator of the SSC. During the pilot study, we informally employed combined connectionist and social/affective teaching strategies to help engineering students develop their mathematics and writing skills. This initiative was partially successful because students frequently came too late for the SSC tutor to offer constructive help, or they simply expected the tutor to proofread their work. When there was time to help the student, the teaching methods had positive outcomes; on the strength of this, the author applied for and was successful, in bidding for a university research grant to explore further the effectiveness of this approach.

The next section outlines the theoretical and conceptual framework of the research and this is followed by an explanation of the research study.

Theoretical and conceptual framework of the study

The context of the study is ‘writing in the disciplines’. For the past three decades, research into “writing-across-the-curriculum” (WAC) and “writing-in-the-disciplines” (WID) has developed a number of theoretical positions to explain the nature of the relationship between successful writing and learning (Hyland, 2004; Monroe, 2002). Discursive contexts and writing practices can be broadly split between three traditional areas of academic inquiry: the physical sciences, where writing is often conceived of as an ancillary activity; the social sciences, where writing is integral but instrumental and the humanities where writing is readily constituted by each discipline’s particularity (Hyland, 2004). Organisational problems in academic writing are often attributed to interference or negative transfer from other linguistic influences, resulting in students making inappropriate rhetorical and linguistic choices (Shaw, 1992). This means that students have difficulties understanding the appropriate academic style of writing required for each subject. Texts and contexts share an interdependent relationship; in other words, it is not a one-way cause and effect relationship in which contextual constraints dictate the rhetorical choice of writers (Barton et. al, 2000; Fairclough, 2000; Gee, 2000; Hyland, 2004; Monroe, 2002). There is also a developing body of work that employs an academic literacy approach with the teaching of mathematics (Ahearn, 2006). As a result of these difficulties, genre theorists and academic literacy researchers stress the importance of teaching the rhetorical features of academic texts (Barton et al, 2000). For lecturers, this means teaching ‘how to write’ about knowledge in a discipline. While meta-cognitive, cognitive and social/affective strategies in language learning and language use are commonly employed in the teaching of English as a second language, employing these methods in an academic literacy context for national speakers is less common (Barkas, 2008).

The culture and norms that construct knowledge within any subject varies across, and sometimes within disciplines (Becher and Trowler, 2001). These influences are then reflected back in how much importance is placed on writing in a subject. In engineering and science related subjects writing is often conceived as being incidental to the role of mathematics or science (Hyland, 2004). This means that the style of writing practice deemed acceptable in a subject is vastly different. For example, the past tense and active voice form the base in language of reporting detail, whereas passive-perfect verbs and possessive noun phrases are used more frequently in sub-topics (Fairclough, 2000; Hyland, 2004, Shaw 1992). Writing about chemistry and engineering differs and as explained by Hyland (2004,172), “while disciplinary genres may display an interdiscursive hybridity by drawing on other others of discourse, the myriad ways they do this may well lead to the growing mutual incomprehensibility of academic communities.”

The following section describes the practical methods employed in the research study and the unexpected challenges to data collection.

The research study and unexpected challenges to data collection.

A successful application was made to the university’s research fund and the grant was awarded to cover the data analysis costs and an additional 90 teaching hours. The project commenced at the start of academic term 2010 and at the time of writing in

February 2011, the project had a further 3 months to run, with time for data analysis over the summer of 2011. The university research project report is due for submission in September, 2011.

The teaching hours are provided by an engineering tutor. The engineering courses were chosen because the academic member of staff involved agreed to try to find new ways to help the students develop their confidence in writing skills.

The plan for the research was well supported by senior management. Although the other course tutors for the various programmes expressed an initial interest in the study, this did not materialise, despite reassurances that further work would not be required as the research was designed to use existing course materials. The subject course leaders claimed they did not want to pursue it because they had recently completed either a review or revalidation of their course. After several meetings with the course tutors, one agreed to partake in the project and this tutor had responsibility for two courses: a preparatory engineering course to help students decide which degree to choose and a Masters in a number of different areas of engineering. Further meetings then took place with this lecturer and it was agreed that I would present a lecture on the importance of writing in engineering and provide additional one-hour workshops for 6 weeks. These sessions were supported by the other engineering tutor who worked in the SSC, providing 15 sessions of two hours per week in the first term (30 hours). This was part of the normal course programme. In addition, a further additional 30 hours spread over 2 hours per week for the same period, was offered in the SSC. The aim of the sessions was to provide the students further opportunities to obtain help with engineering, writing and mathematics. As student attendance proved to be an issue in data collection, it may be decided to include students from other engineering courses, who also attend the SSC for help.

At the start of the project, 150 extended engineering students were expected to enrol, but this number reduced to 105 before 2 students obtained full-time employment. To fit in with the students timetable, the lecture was included in the course time, with the workshops offered immediately afterwards. In the six weeks, 11 of the 103 students attended the workshop with 5 of them taking advantage of the further free tuition offered. The first plan was to help students write a report, but on further investigation of the course programme, this assessed piece of work was a 'use of IT exercise', so there was not sufficient writing to warrant analysis. So the decision was then made to obtain a piece of 'free writing' to analyse; a paragraph on 'why I want to be an engineer' to start the students' personal statement. This was a requirement of the course assessment criteria and would be the start of the linguistic analysis. The course tutor met with the students for 12 weekly lectures and reminded them of the workshop and the further tuition in mathematics, engineering and writing. This notice was supported by several reminders circulated by email, but the remaining 92 students did not attend.

Qualitative and quantitative research methods are to be used, so to enable some data to be analysed and the data base to be designed, the engineering tutor has forwarded the first assignment to me. This was an essay on water pollution submitted for the module on chemical science and the environment, (the forerunner to the degree in chemical engineering). Unfortunately, the essays were not available until the night

before the deadline for the submission of this paper for the conference in April, 2011, so an initial analysis of the material will be offered in the presentation.

The next planned stage of the data collection is to obtain material from a 12 hour programme of lectures and workshops on the remainder of the module on chemical science and the environment. The researchers will use the existing course material and design a pertinent class exercise. Revision workshops on all the modules will then be offered. The cost of this tuition will be made from the research grant.

The next section provides the concluding comments on the work-in-progress

Conclusion

The pilot work conducted on the model of teaching employed, had taken place over the years 2007 to 2009 and the findings of this work had shown successful outcomes with 505 students from undergraduate to post-graduate programmes. The SSC is often fully-booked and the engineering students make up the second highest number of queries at the centre. So therefore, because of this, it was assumed the take-up of the offer of further practical tuition would be made. In hindsight, it now seems the guidance on the importance of writing and the additional workshops in mathematics was offered too soon. The extended engineering course is very compact and heavily assessed, with all the modules requiring 2 assessments or 2 examinations. There is no provision for the teaching of writing within the modules and no space for formal tutorials. Although there are plenty of opportunities for laboratory practise, the teaching style appears to be mainly based on transmissions-type models (Barkas, 2011b). Student attendance on the entire course is approximately 45%, many of the students seem to have part-time jobs, and the course tutor suggested that because the course material is on the virtual learning site, he believed many students only attend for the minimum hours required to pass, so it may be that the offer of further help is not welcomed. The course tutor advised that even the smallest alteration to a course, requires extensive consultation and paperwork, so it may not be until the next course validation that it will be possible to redesign the programme to include any tutorials and tuition in 'writing in the discipline'. It may be that the requirement for such a number of assessments could be questioned, because if the aim of the course is to 'prepare' students for a suitable degree choice, a question that could be asked is, "are so many assessments necessary?" The material that is acquired for this research will be analysed and the findings submitted to the journal at a later date, but the question to start discussion is:-

"to what extent should or could, a subject specific writing module be included in a preparatory course programme?"

As the psychiatrist M. Scott-Peck (1978) wrote in his book, people need to learn discipline to become balanced spiritual and emotional human beings, but this is not a popular method, so hence a "less travelled" approach to life. In the same way, students have to learn to discipline their mind if they are to successfully study in higher education, but in an age where the value of information often supersedes knowledge, this is often a barrier to their own learning. Further barriers may even be the existence of the SSCs (Barkas, 2011, b). The issues created by the SSC can be

seen on a small scale to illuminate the challenges faced by universities in today's society (Barkas, 2011, a). So although the pilot work on subject-specific skills development supports other research in academic literacy (Ganobcsik-Williams, 2006) and learning development (Hartley et al, 2011), not all subject tutors are willing to embrace the teaching of academic literacy in their courses. This may be because of the pressure on staff to teach more students within restricted resources, the increase in the influence of virtual learning environments and the density of overloaded programmes, provides the environment for the normalisation of the skills deficit model to take hold (Bernstein, 2000). In the engineering course at the university, this research project may just be a small step in the right direction, but to return one last time to the analytical metaphor of the paper, borrowed from Scott-Peck, (1978), it may also be a *road too far*.

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