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## Enhancing employability through leadership training

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## Enhancing Employability through Leadership Training

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### ABSTRACT

Most university engineering degrees include elements of teamwork experience to a greater or lesser extent and students are frequently placed in positions of leadership. Few universities, however, actively develop leadership skills or provide targeted training as a primary objective within course modules. Leadership coaching is a competence that is outside the experience of most engineering academics and providing it offers a new challenge for them. This paper compares two models for teaching 'leadership', offered as options in the final-year of an undergraduate engineering programme. Both use methods far removed from the usual diet of lectures and examinations. One is focused around a semester-long activity where senior students take responsibility for a team of younger students undertaking an industrially-based project. It is supported by a series of activity-based workshops. The second has similar objectives but is very different in style; it encapsulates a three-day intensive outdoor management course that exemplifies team-work and leadership theory through hands-on activities and provides the main focus for pre-course learning and post-course assignments. This paper describes the two variants and the philosophy that inspired them. A short survey reveals how a year-group of students responded to the different training methods and provides a comparison of the two educational models.

Conference Key Areas: Curriculum Development; Engineering Skills; Continuing Education and Lifelong learning.

Keywords: employability; skills

### 1 INTRODUCTION

When asked to describe what professional engineers do, most think strictly in terms of science and technology. They point to examples of familiar products and constructions such as cars, aeroplanes, computers, or bridges to describe outputs of the various engineering disciplines. Not surprising then, that if asked what students of engineering should be taught, we would naturally fall on the fundamental science that lies behind the understanding of these complex products together with the principles of design that brought them into being.

The most valuable asset of an engineering business however, is neither its steel

stock nor its production machinery but the people it employs. Engineering is a team activity; possibly more of a team activity than any other business. Modern manufacturing depends on people with a diverse range of knowledge and skills who must work together to a common end. We, in the universities, are training tomorrow's employees of engineering business, so we should devote at least some of our available time on people skills if our graduates are to become effective members of the team right away.

Whilst 'hard' intellectual skills still dominate in academia, there appears to have been a transition in the workplace where skills which develop Emotional Intelligence (EI) are, apparently, just as important. It was recognised thirty years ago, that intrapersonal and interpersonal intelligences are just as important as the type of intelligence typically measured by IQ[1], and later studies declared them to be even more so. For example, Feist & Barron [2] wrote that social and emotional abilities were four times more important than IQ in determining professional success and prestige, while a recent UK survey further emphasised the importance of soft skills in respect of employability, personal development and career progression. It declared that hard skills help engineers qualify for a job or role, but soft skills dictate career growth and progression. [3] Highly developed EI is particularly important for tomorrow's leaders. The UK Institute of Leadership and Management quotes Daniel Goleman's work [4] in which he suggests that these skills contribute more than 85% of what enables star performers to become great leaders.

Goldberg [5] suggested that students currently spend 80% of their time studying technical subjects but these technical skills developed only constitute 20% of an individual's working day. So, not surprising that the recruitment of graduate engineers seems to focus more than ever on soft skill competencies and students regularly report this after attending for job interviews or assessment centres.

In response, the ASEE [6] proclaimed that "engineering education programs must, not only teach the fundamentals of engineering theory, experimentation, and practice, but be relevant, attractive, and connected," preparing students for a broad range of careers and lifelong learning. And both ABET and the Engineering Council (EC), the bodies in the USA and UK respectively that define engineering accreditation routes list the required 'professional competences' including both 'hard' and 'soft' skills. Specifically, the EC now specifies generic competences for Chartered Engineers that include the ability to "Lead teams and develop staff" and to "Organise and lead work-teams" [7]. While most university degrees include elements of teamwork experience, few specifically address these leadership requirements or provide targeted training. Leadership training tends to be the preserve of professional development specialists and is outside the experience of most academics in engineering.

Despite this, and similar proclamations in other parts of the world, later studies highlight the perception from industry professionals of a soft skills gap within graduates and hold higher education institutions responsible. Meanwhile, employers are becoming more reluctant to invest in graduate training and development[8] due to the perception that this generation that are more likely than ever to leave the company after a short period. Kumar and Hsiao [9] summarised that "*Engineers learn soft skills the hard way*" supporting the theory that engineers enter the market place technically qualified but not sufficiently competent in soft skills.

A small number of curriculum designers in the UK have been inspired to respond, taking advantage of the additional teaching time available in our extended undergraduate Master of Engineering (M.Eng.) Degree. The integrated M.Eng degree was promoted and controlled by the Engineering Council in the late 1990s to be the premier fast-track route to senior professional registration for high achievers. These degrees were to have enhanced learning outcomes beyond those of the Bachelor degree in respect of both technical and transferable skills. With regard to leadership and teamwork skills, the question is; how should they be taught? If we are to prepare our most able students in the image proposed by our professional body, it is apparent that we will need to learn and adopt some pretty innovative methods.

## 2 UNDERGRADUATE LEADERSHIP MODULES

Two innovative 'leadership' modules have been introduced to the final year of a mechanical engineering M.Eng programme. The students choose which route they prefer. Both modules use methods of teaching and learning, far removed from the usual diet of lectures, tutorials and unseen examinations. The first is built around a semester-long 'mentoring' activity where senior students are given responsibility for a small team of year-2 students engaged in an industrially based project. The central activity is supported by a series of activity based training workshops that focus each week on a different 'people management' skill. The second module encompasses a 3-day intensive residential teambuilding and management development course that exemplifies a short preparatory course of management and leadership theory through hands-on exercises and challenging outdoor activities.

### a. Module D500 'Project Leadership'

All second-year students complete a mandatory team project which runs from October to February taking up one afternoon per week. Each team of four students is assigned to an industry-inspired project generated and supported by a group of companies known as the 'Loughborough Teaching Contract'. A final-year student studying project leadership is then attached to each project team, as mentor and this experience forms the central activity of the 'Project Leadership' module. Mentors are expected to chair weekly team meetings that last about 45 minutes and become involved in all aspects of the project at a supervisory level.

The mentor's primary role is that of project manager, who deals with project planning, gives advice and guidance, allocates duties to team members and encourages effective progress. Mentors assist with the promotion and development of ideas, and offer sound one-on-one advice on methodology, analysis and evaluation. They are, however, told to refrain from directly generating solutions or actually performing the technical tasks. Mentors quickly learn the effects of different leadership styles and the need to pay attention to human factors as well as to the technical tasks.

Academic supervisors observe meetings every two or three weeks and are therefore able to monitor the situation and intervene if all is not running smoothly however on many occasions the mentor is left to take charge. Supervisors complete an appraisal checklist and discuss it with the mentor after each observation to provide developmental feedback and support. Supervisors provide a safety net and are ultimately responsible for both the mentors and the student teams including the assessment of both. The objective, however, is for mentors to be given responsibility and therefore to experience first-hand leadership and in the majority of cases supervisors feel able to stand back.

While the mentoring activity is central to the module, to realise the maximum benefit they also need parallel coaching in aspects such as chairmanship, project planning, time management, human resource management, team dynamics, leadership styles and motivation theory. Most importantly, they need the opportunity and encouragement to reflect on events and what are the causes of subordinate reactions in the wider context. A programme of seminars provides a weekly forum in which the mentors are encouraged to discuss and share their experiences and to learn new techniques. The taught element is 'activity based' borrowing most materials from staff training and development organizations.

When this module was first introduced, there was a lecture programme, however it was clear that, although the students listened politely, they had little real interest in non-technical topics taught in this way and, as a consequence, failed to really

develop professionally or properly understand the mechanisms of human interaction. Hence, the lecture programme was replaced by the more effective workshops.

**b. Module D517 'Teamwork and Leadership'.**

This option is built around an outsourced 3-day residential Outdoor Management Course (OMC) currently provided by the Lindley Educational Trust. The Trust undertakes development activities with people of all ages and is experienced in constructing themed development courses for groups ranging from primary school children to senior company executives. This particular course was developed jointly by the staff of the Trust and the module leader at university. University staff accompany the students throughout the course acting as observers. Some of the topics that are fully explored and exemplified through outdoor activities are: the behaviour of individuals and groups, balancing the needs of the task, the team and the individual, leadership styles and skills, motivation and working under pressure.

In the weeks running up to the outdoor course, students attend just 3 seminars 'teamwork' leadership style' and 'motivation' and research appropriate theory such as John Adair's work on leadership and leadership styles, Tannenbaum and Schmidt's style continuum and Belbin's team roles. They research and present a case study as an oral report accompanied by a short written document. At this point, we believe that, although the students perform this task well, they are fundamentally unconvinced of the purpose or usefulness of such theory, nevertheless it provides a good foundation and all becomes much clearer during the reviews and feedback sessions that form an essential part of the residential course.

The course takes place in 'the Hollowford Centre: a purpose built training centre in the heart of the Peak District National Park in central England. This is a sparsely populated craggy mountainous region noted for outdoor leisure activities such as rock climbing, caving and hill walking. It is through this type of activity amongst others that we enthuse the students and empower them to develop their individual strengths, create positive relationships and construct effective work cultures. This type of course is popular with many commercial organisations for teambuilding and management development but rarely available as part of the engineering curriculum in British universities.



Fig. 1: Students tackling various indoor and outdoor challenges.

The activities, which are led by experienced professional trainers are intense: beginning with short ice-breakers, problem solving activities, and a raft building exercise. Teams are formed and each team earns virtual money through successfully completing exercises and the money is carried over to the next task. Each activity is designed to bring out a different aspect and the students are expected to take on different team roles. They all experience leadership in some form by the end of the course. Half way through day-2 a major 24-hour exercise begins. This runs late into the night with the teams only returning to the centre for a short sleep and carries on into day 3. The exercise is based on a manufacturing/ construction business scenario involving a product, purchase of materials and components, the disposal of variable assets, transportation, working to strict time constraints and a whole host of manpower issues. Competing 'companies' (in teams up to 10 students each) are required to construct a model aircraft in the 24-hour period. They need to 'buy' their raw materials (the components of a plastic kit). Parts are 'bought' with virtual dollars that can only be earned by completing specified tasks such as abseiling, rock climbing, orienteering problem solving etc. The 'tasks' are situated at map references within a 20 mile radius and two minibuses with drivers/trainers were available for each company. Other centre based tasks such as hill walking, high wire activities or completing an obstacle course need to be completed to earn 'fuel miles' for the buses. Students must also feed their teams while out on activities and can earn points for cooking for the staff who are there to facilitate the activities and ensure the safety of the teams. Staff do not play any part in deciding what is done or when; all these are decisions that must be made by the teams through careful planning the appropriate division of manpower and the appointment of section leaders. In fact, the trainers will happily drive in the wrong direction or take the wrong equipment if told to do so by the students or will stop the bus if the teams miscalculate and run out of fuel miles. Under these circumstances, on a cold spring night, teams soon learn the importance of careful planning and thinking ahead. Plans are presented to staff at the outset for approval or otherwise.

Notwithstanding the obvious attractions of the outdoor activities, the focus remains very much on learning with extended review and feedback sessions after each activity. Review sessions are led by the trainers and prove very effective at teasing out the important lessons embedded in the assignments. The trainers refer back to the theory studied before the course and it then becomes much easier to place these ideas into context.

### c. Assessment

Assessment of each module comprises three elements; there are no formal examinations.

*Table 1* Module assessment details.

	<b>D500</b>	<b>D517</b>
1	A structured essay is set midway through the semester to encourage students to research and report on leadership techniques for themselves.	Pre OMC Case study comprising a short paper and oral presentation (small groups – peer moderated)
2	At the end of the project, mentors write up their experiences in the form of a reflective critique.	Individual report on OMC experiences

3	The progressive appraisal system identifies strengths, weaknesses and growth from the perspective of both supervisor and subordinates.	Team exercise – create a video documentary on a specific topic of teamwork and leadership.
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### 3 RESULTS FROM A SURVEY OF PARTICIPANTS

The novel methods used in both modules have created a lot of interest, not least from prospective employers. Graduates recount how prospective employers often appear disproportionately interested in hearing about these activities during job interviews and many claim that taking part has given them an edge in the employment market. It is difficult, however, to be objective about how effective the modules really are in achieving the intended learning outcomes. Anecdotally and from verbal feedback received there is no doubt that our students think the opportunities are invaluable. Both modules operate on the principle that leadership cannot be taught but has to be nurtured through experience.

The students were asked to complete surveys of their attitude to leadership issues both before (anticipation) and after the course (reflection). Similar questionnaires were used with both modules to determine which elements are truly effective and which methods are less useful. In total 65 participants took part in the survey.

Along with a number of general questions designed to elicit written comments a set of statements focused on students' emotional reactions to being required to lead or be led; they are listed below.

- |                                   |                                      |
|-----------------------------------|--------------------------------------|
| 1. I like to encourage others     | 9. I am an organised person          |
| 2. I feel comfortable as a leader | 10. I plan before doing things       |
| 3. I like to work in teams        | 11. I pay attention to detail        |
| 4. I like to work alone           | 12. I am patient                     |
| 5. I am good at decision making   | 13. I like to get on with things     |
| 6. I am confident in my abilities | 14. I reflect upon what has occurred |
| 7. I am confident as a person     | 15. I review the work I have done    |
| 8. I listen to what others say    |                                      |

#### a. Analysis of Trends

It is perhaps not surprising that a group of high-flying finalists should respond well to leadership; this is certainly no cross-section of the general public. The surveys were completed and collected in isolation from each other at different times, so most would not remember their answers to the anticipation survey when reflecting. Of course, a different group of students participated in each module. The anticipation surveys for both modules shows relatively few apparently introverted individuals, reluctant to be involved but despite the relatively high 'anticipation' scores, the collective trend for both modules was to a further increase scores after the module.

There is insufficient space in this paper to discuss all the results in detail but the charts, below show selected highlights. Each chart shows the responses for the two modules side-by-side; the mentoring-based module with the light bars. The darker bars behind refer to the residential course module. Each bar represents the percentage of students on each module who either agree or disagree with the statement – in the anticipation survey (A=left bar) and in the reflection survey (R=right bar) so an increase in positive answers or a decrease in negative answers

from A to R suggests development. In most cases one observes that the neutral or semi-negative scores fall as these people shift to the more positive scores to the right.

Question 1 (figure 2) considers aptitude to working with others: both modules require the student to take an active interest in the work of others but there is a fundamental difference that in D500, the mentors are required to encourage a team of younger students while the team activities on the outdoor course are all within the same peer group. Both modules show some development but the improvement is stronger in D517. It appeared that some pretty strong and lasting friendships grew out of the activities whereas mentors are, by their very role, expected to remain rather detached from their mentees. It is always easier to encourage a friend.

Question 2 (figure 3) asks whether individuals are within their comfort zone in a leadership situation. Again, the results are encouraging showing that the experience has led to an overall improvement in confidence. In this case, the mentoring experience shows the greater development. This may be because the topic of this module (an engineering project) is more familiar territory than some of the outward bound experiences that are designed to stretch the participants in new areas of achievement. Nevertheless it is quite common for a student to admit some trepidation at the thought of taking responsibility for a second year team in D500.

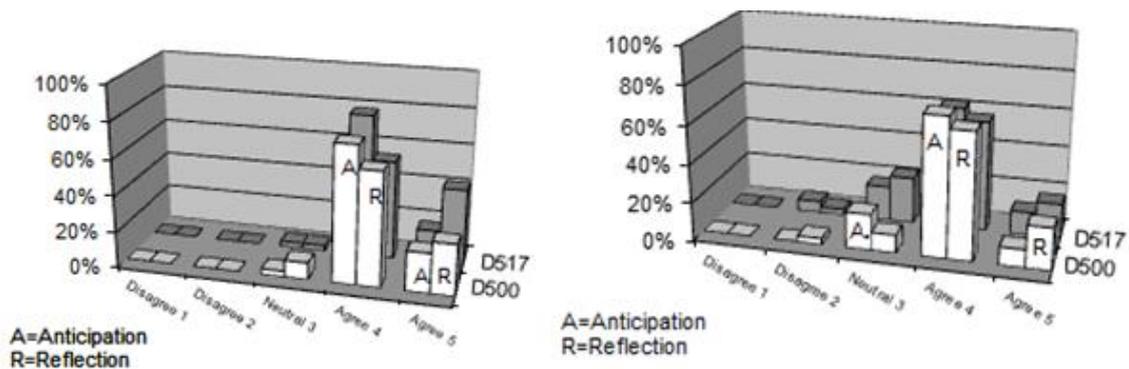


Fig. 2: I like to encourage others

Fig. 3: I feel comfortable as a leader

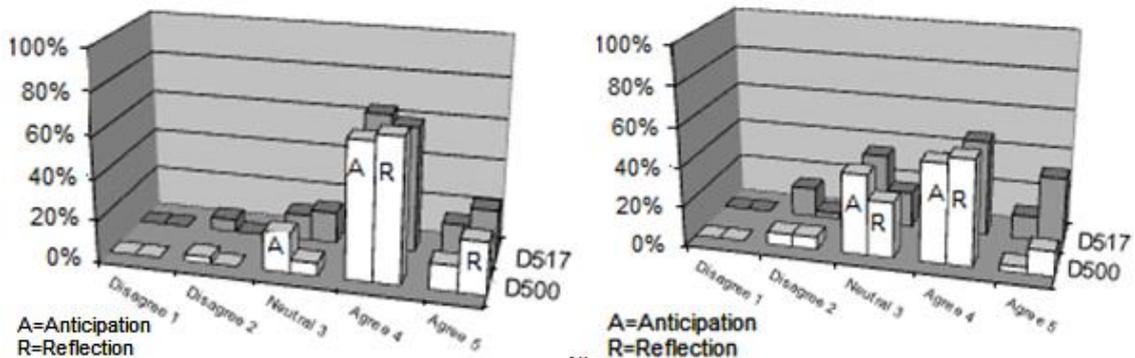


Fig. 4: I am confident in my abilities

Fig. 5: I review the work I have done

Figure 4 looks at confidence in abilities; (question 6) Here again the mentoring module indicates a bigger gain. Perhaps there is truth in the anecdote that a person learns their subject well when they have to teach it to others, a feature of this module. Question 9 (figure 5) shows the results for question 15 concerning the ability to reflect and review. The outdoor course seems particularly good at developing this

important ability and approximately 20% of students recorded movement from one response category to the next. As an observer, I was very impressed with the eagerness the students showed in the review sessions; they were self-critical and able to offer useful advice to others. Many told me that it was only after these sessions that their previous study on management topics back at university had started to appear relevant. One student commented in writing of the residential module “some of the most important and valuable lessons I have learned during my degree”.

Finally, figure 6 summarises the responses to all questions in numeric form. The table has been compiled by allocating numbers to all responses: 5=strongly response, 4=agree, 3=neutral, 2=disagree and 1=strongly disagree and calculating the group average scores before and after the modules. The chart shows the percentage change. Of note, perhaps is one negative change for D500; question 13, “I like to get on with things”. There is no obvious explanation for this. The overall picture, however is of improvements across the board for both modules which is very gratifying.

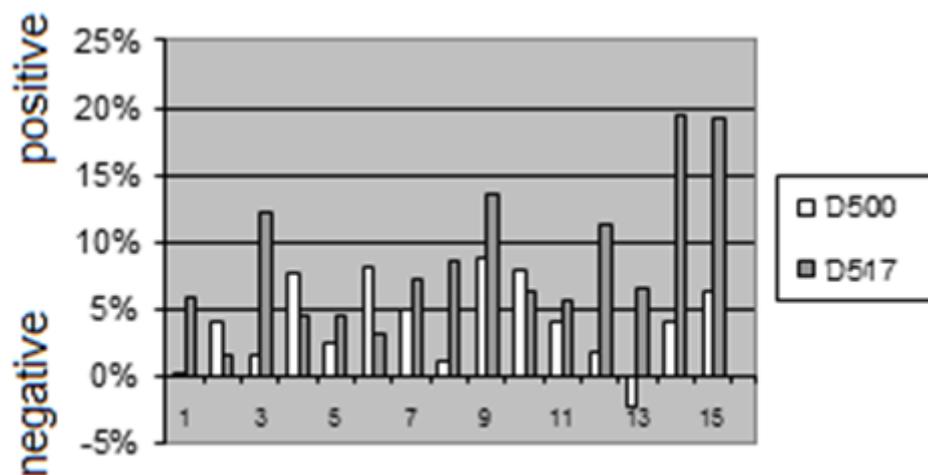


Fig. 6: Change analysis for all questions.

#### b. Written comments

Asked what they hoped to gain from the modules before starting, many wished to gain confidence and personal skills others looked forward to actually experiencing management skills and gaining organisation abilities. A number also hoped to gain in confidence and expected this would be good experience for the interview situations they would face in the near future. Comments on the reflection surveys seem to indicate that these expectations had been achieved by most and in many cases they were exceeded.

## 4 CONCLUSIONS

Venturing into the world of employment training has been an interesting and rewarding experience for both the staff and students involved. There is no doubting the enthusiasm for this amongst a large proportion of participants. I'm convinced that one reason for this enthusiasm is that, after four or five years at university, these senior students are mature people who are focusing on their next career step into paid employments with considerable ambition. I doubt the courses would be so successful with a less well driven cohort. Indeed, one of the Lindley trainers

commented that this group showed more enthusiasm than many groups of company executives and middle managers.

The survey results were pleasing in that they suggested that both models are valuable. At present the two modules are offered as two alternative options which are described to the prospective students in advance. It would be easy to imagine that some people might find the content of one or other quite daunting and offering a choice prevents the possibility of an unhappy mismatch.

While both modules appear to meet the objectives well, it would appear that mentoring appears particularly strong in developing leadership and confidence while the outdoor management course excels in building teamwork and understanding theory through review and feedback; these, in fact were the areas that showed the biggest gains of all.

Experience of leadership and teambuilding training provides a powerful added attraction to potential employers of engineering graduates.

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