Graduate education for leadership and organisational change in sustainable development

Dr Heather J Cruickshank (hjc34@cam.ac.uk),
Professor Charles Ainger (cma30@cam.ac.uk),
Dr Richard Fenner (raf37@cam.ac.uk)

University of Cambridge, Department of Engineering, Centre for Sustainable Development, UK

Abstract:

This paper reflects on the motivation, method and effectiveness of teaching leadership and organisational change to graduate engineers. Delivering progress towards sustainable development requires engineers who are aware of pressing global issues (such as resource depletion, climate change, social inequity and an interdependent economy) since it is they who deliver the goods and services that underpin society within these constraints. They also must understand how to implement change in the organisations within which they will work.

In recognition of this fact the Cambridge University MPhil in Engineering for Sustainable Development has focussed on educating engineers to become effective change agents in their professional field with the confidence to challenge orthodoxy in adopting traditional engineering solutions. This paper reflects on ten years of delivering a special module to review how teaching change management and leadership aspects of the programme have evolved and progressed over that time.

As the students who embark on this professional practice have often extensive experience as practising engineers and scientists, many have already learned the limitations of their technical background when solving complex problems. Students often join the course recognising their need to broaden their knowledge of relevant cross-disciplinary skills.

The programme offers an opportunity for these early to mid-career engineers to explore an ethical and value-based approach to bringing about effective change in their particular sectors and organisations. This is achieved through action learning assignments in combination with reflections on the theory of change to enable students to equip themselves with tools that help them to be effective in making their professional and personal life choices.

This paper draws on feedback gathered from students during their participation on the programme and augments this with alumni reflections gathered some years after their graduation. These professionals are able to look back on their experience of the taught components and reflect on how they have been able to apply this key learning in their subsequent careers.
Introduction

Cambridge University has offered the full-time one-year taught MPhil in Engineering for Sustainable Development every year since Academic Year (AY) 2002-3. This course was established as a professional practice programme and as such there is an emphasis on application of sustainable development strategies in a professional context for implementation when students return to employment after graduating. Currently serving its tenth cohort and with over three hundred students having passed through the programme, it is timely to reflect on the motivation and method of teaching that has evolved over the preceding decade of delivery. This paper reflects specifically on one aspect of the course, that of leading change towards sustainable development.

Recognising that addressing sustainable development issues through postgraduate professional practice programmes allows the freedom to move beyond both curriculum constraints and an emphasis on reductionist thinking often found in engineering courses at the undergraduate level. At the postgraduate level the application engineering science and general principles can be explored against the constraints and complexities represented by the wider issues relating to sustainability. Masters level education provides two clear advantages: students bring with them a maturity and realism of outlook often based on their own experiences of working within engineering organizations and also, they are likely to take up positions of significant responsibility when leaving the course, being employed as leaders of engineering projects or recruited specifically to change management procedures towards more sustainable approaches. Such students “are able to challenge assumptions in the classroom rather than discover a disjunction with reality only when they try to apply acquired knowledge in the field” (Fisk and Ahearn 2006)

Student profiles

The course is targeted at early/mid career engineers and scientists who have some professional experience of working on engineering issues in government, private, or voluntary sectors. Typically, students are in their mid-twenties to early-thirties although some are considerably older (see Figure 1) and could be regarded in some ways as ‘tempered radicals’ (Meyerson & Scully, 1995).

Figure 1 shows the distribution of ages at the start of the course in October each year.

The course attracts high quality graduates from all over the world (over 50 different countries have been represented by a total of 327 students completing the course to date). It was initially conceived that participants on the course would take one year away from their job to study and return to their employer on completion of the course.

While this profile was not expected to reflect the background of all participants, 10-24% of each cohort have returned to their previous employer as their first employment destination after graduation, although their role has not necessarily been the same as that prior to their participation in the course. The vast majority of students, however, suggest that their motivation for joining the course is to change their career prospects and this is manifest in them taking on new roles after completion of the course. Graduates often take up new opportunities and, in some cases, totally new career directions in different countries. Figure 2 shows the first employment destinations, by broad categories, of the graduates. The ‘no data’ category is included to indicate students for whom no information is available about their first destination.
Recognising the diversity of employer types and student backgrounds, the course endeavours to take a broad perspective and allows students to tailor their learning experience to meet their own needs as far as possible, through a highly flexible programme offering a large choice of elective modules. A significant part of the course delivery involves facilitating student engagement and participation, both overtly in class discussions and activities, and also privately through personal action and reflection. This interaction and the chance to learn from classmates are recognized as important aspects of the course experience and learning: “Their [fellow students] professional and personal background highly enriches the discussions. Giving us the opportunity to share experiences and knowledge was great” (student feedback 2011-12).

The taught modules are augmented with guest lectures in which professionals working in industry share their experiences. They present the barriers which they have faced when trying to instigate changes towards more sustainable practice and then discuss how these have been overcome, or not. These guest speakers describe practical strategies that are being implemented to deliver sustainable solutions and have been a popular part of the course: “The external speakers were brilliant. It was good to see this theory put into practice” (student feedback 2008-9).

Evolution of leadership course content

The course is comprised of a set of core modules (compulsory participation by the whole cohort) and elective modules (students choose from a very wide selection). Students can choose modules that provide more specialist, technical depth (e.g. renewable energy technologies) or management and policy breadth (several modules are offered by the Business School). Each module carries its own assessment (coursework only, coursework and exam, or exam only).

The concept of ‘change’ has been incorporated into the compulsory component of the course from the start. One of four initial ‘core modules’ studied by all students was “Changing Organisations Towards Sustainability” and this was initially designed to assist and support any individual, of whatever seniority or experience, who wishes to act as a change agent towards sustainability within their organisation. The focus of the module was exploring ways of implementing change within engineering organisations to ensure sustainable solutions are sought and developed at all stages of design, use and disposal.

It was only for the third cohort, however, that ‘leadership’ is mentioned specifically in the aims of the course, but then it is presented as one of three essential ingredients for well-informed engineers to tackle the issues facing the modern world. The objective was to develop an understanding of mechanisms for managing change in organisations so future engineers are equipped to play a leadership role.

By the fifth version of the course there was a move to more clearly link the concepts of leadership and change towards sustainable development. The “Leading Change in Organisations” module provided access to a range of sustainability issues: the various ‘stakeholder’ roles; drivers for sustainability; and business responses, including ethical leadership, CSR and (sustainability) reporting practices; and also organisational change theory and practice. The module made the leadership for change in business a key focus of study and used a combination of theory, case studies and practitioner perspectives to deliver this.
In subsequent years the module evolved further with the emphasis on developing change agents, reflecting new developments in the course as a whole. With a growing alumni group, the module featured former students returning to share some of their stories of what they have been doing since leaving Cambridge, and how they can act as change agents for sustainability in a variety of ways in the jobs they now occupy. By that time some of the early graduates held significant roles in their organisations. This was a popular aspect of the module and was retained as a feature in succeeding years. The following year (AY2008-9) the terminology of the module was amended to reflect recognition of the need to address change in all aspects of an individual’s life, “Implementing Change Towards Sustainability” with a focus and emphasis particularly on assisting graduates to be effective in ‘bottom-up’ individual action for change. The module aims to engage with and support the individual’s own journey of inquiry and self-discovery of a role.

In all incarnations of the module practising engineers were invited to provide guest lectures. They talked about the need for engendering personal motivations to facilitate change in engineering organisations and they recognised the importance of values influenced by a range of world views. This ‘primacy of the personal’ was emphasised in the module. The start of the economic crisis that affected the UK (and elsewhere) during that AY2008-9 and has continued more recently had a significant effect on the discussions around such issues and provided an opening for students to reconsider established Western business practices, ethics and values. This was achieved through development of some personal tools for action, through an action inquiry approach and improvements in communication and dialogue and to review current ways in which industry and business is corporately addressing sustainability, and gain access to an understanding of change management in organisations.

The following year further emphasis was put on “Leading change” in particular through developing individual effectiveness in change through personal power and tools for support. The method of teaching via a greater diversity of activities including participation in a ‘change challenge’ (a long-established component of the module – see below) was recognised as important for delivering the course aim. This being clearly set out to students as follows: Our overall aim is to challenge some of your thinking, which may be uncomfortable at times, but in doing so provide you with the additional breadth to your education so you can deliver engineering products and services in a more effective and sensitive way. This personal reflection that is advocated elsewhere (Cotton & Winter 2010 p47). The course also established a set of key challenges which embrace the specific interpretation of sustainability and lead to the related methodological approaches which help address and deal with them, one of which is “Dealing with change by challenging orthodoxy when it is rooted in 20th Century criteria” such as new metrics such as carbon accounting in addition to traditional economic costing.

In the current version of the course for AY2011-12 the overall structure has been significantly redesigned to reflect the rapidly developing sustainable development agenda. The core programme focuses on developing a breadth of skills and understanding which complement the technical background of participants. The core is designed to provide both a conceptual qualitative approach to understanding sustainability themes, values and change processes, together with a quantitative approach which provides key tools in sustainability methods and metrics. In the first term the core comprises two modules which all students study, the first, called “Concepts, Values and Change”, encourages a mind-set change from reductionist to complexity thinking and considers both the ethics and drivers for sustainability.

This module now introduces concepts of change management and stakeholder engagement. The emphasis is on dealing with qualitative issues and understanding ethical positions surrounding the concept of sustainable development, as well as how individuals can take personal responsibility to deliver real change through formal and informal processes and reflects the conception of sustainability as resting on both factual and ethical components (Carew & Mitchell 2008). An underlying theme is to explain why engineers need to engage in problem definition through careful dialogue with all stakeholder groups through a proper recognition of the context in which engineering solutions are formulated and delivered. Concepts of strategy and change management for sustainability, theories and concepts about organisation structure and change (e.g. top-down versus bottom-up, machine versus organism, power structure), and roles of individual change agents are all addressed, aiming towards facilitating the embedding of sustainability in engineering organisations, and graduates taking leadership roles in encouraging such changes.
Teaching style

From the earliest versions of the course the emphasis has been on a combination of learning and doing. In the aspects related to teaching leadership and change this has evolved into a clear focus on action learning as a key component. Following the style expected for Masters level teaching, taught classes cover the theory of leadership and organisational change and involve access to and use of a considerable library of relevant material selected for the course. The ESD MPhil uses a virtual learning environment (‘CamTools’ based on the Sakai software developed in collaboration with other Universities worldwide) and a large amount of background reading is disseminated through this with ‘pointers’ and ‘signposts’ given to the material during taught classes. The intention is for students to navigate through the material and select the aspects in which they are most interested so they can independently research more fully, prompted by the resources presented. Reflecting on the material available for this module one past MPhil students’ feedback used this analogy: “The Bus Tour – Graduates are on a tourist bus in their journey through sustainable development; they visit stops and have the option to get off and spend time exploring. Often they stay on the bus (there’s a lot of stops to make!) and just observe from a distance. The stops have to be interesting and relevant enough to make them all want to get off the bus and get involved” (Student Feedback 2006-7) a more recent student suggests “even when readings were a lot, I consider them as a buffet where you can serve as much as you want, whatever you like and you need to come with an empty stomach to eat the most” (student feedback 2010-11) while others simply felt there was “too much reading material” (student feedback 2008-9).

The course is delivered through a combination of traditional lectures, games, class discussions, guest speakers, role plays, case studies and personal challenges.

Assessment

The assignments set for the module have evolved over time and have been modified to respond to previous student feedback and to reflect the changing context in which the module operates. For the majority of the cohorts a major piece of assessed work associated with the core modules has been to develop an organizational change strategy for a company. This must be an organization that the student knows well, usually a place where they have worked, or would like to, or where they have some other personal connection. Students are strongly advised that this should not be merely an advocacy for change but must be a plan that clearly sets out various stages and recognizes the need to engage others within (and sometimes outside) the organization. This piece gives the opportunity for students to draw on the tools and theory of organizational change as presented in the taught aspects of the module but also to reflect on how these can best be applied to a real change case.

In addition, students are encouraged to undertake some kind of personal change challenge. Initially this was simply a ‘thought experiment’ to assist them in participating more effectively with class discussions on topics such as “sustainability drivers for businesses” but this has evolved into a more formal submission. In AY2005-6 students were required to submit a two-page report, initially as part of the student’s personal ‘reflective learning log’. They were given feedback from the module leader but the piece did not contribute to the overall module grade. By AY2007-08 however this had evolved into a formally marked assignment representing a 20% component of the module mark with the organizational change strategy comprising the remaining 80% of the module grade.

This first piece, in the form of a ‘learning note’ reflection on their ‘action for change’ was submitted after four weeks (i.e. in the middle of the eight-week Cambridge University term). The educational value attached to this assignment by many of the students, and recognized by the course staff, became apparent, through a combination of facilitated discussion in class, student feedback comments (see below) and assignment assessment. As a result, the following year, each assignment formed 50% of the overall module mark, the ‘personal change challenge’ assignment was extended to cover six weeks (three-quarters of the term) and students were encouraged to express creatively their journey through the challenge and were given the option to submit reports in the form of: a film / video / audio presentation (of no more than 20 minutes duration); a collage or annotated photo-montage; or the more conventional narrative report (maximum of five pages long). While the majority (76%) of students chose to report in essay format 17% used either film or PowerPoint with audio and some of these alternative submissions were very impressive. This non-written format required careful preparation and scripting to be effective and therefore the submissions retained a high quality in terms of content as well as presentation.
The evolution of this assignment into a more substantial part of the module – both in terms of incorporation of reflection on the activities as part of class discussion, and also as a marked assignment with a greater overall weighting than previous incarnations – brought new insight into its effectiveness. It became apparent that the real value offered by the exercise could be attributed to encouraging students to reflect on the success or otherwise of their actions and to draw wider lessons for themselves about the impact of change on key stakeholders (including themselves) and others less directly involved. It was recognized that this could be facilitated more formally to encourage wider uptake of real action learning. The scale and impact of the challenge adopted is of less significance than the experience of undertaking the change and feeling the emotional aspects of success and frustration encountered. This then enhances students’ ability to appreciate the ways in which to instigate a change and make it successful (Cruickshank and Fenner 2010).

Even as recently as AY2009-10 students could still score well on the written report by either reflecting on an action undertaken (or imagined) some time before the specified period or by reporting on possible outcomes of actions not actually completed and thus assuming a greater level of success than may eventually have occurred. In this way, course leaders felt that students were missing out on some key experiential learning or over-estimating future successes. In an effort to address both these issues AY2010-11 brought a further innovation to this assignment.

Encouraged by precedent set elsewhere (McMahon et al., 2010) the decision was taken to trial the use of an online ‘blog’ as a formal part of the ‘Personal Change Challenge’ assignment submission, together with further extending the duration of the change challenge period up to ten weeks. Students were required to set up an online blog and use it to record their progress and reflections with a minimum of one entry per week. Blogs were in the public domain at all times although not obviously associated with the course or the assignment. Student authors had the option to remain anonymous throughout, with the module leader holding a list of student pseudonyms for the purpose of assessment. Students were provided with a list of the blog addresses and were encouraged to follow each other’s blogs and contribute if they wished. Contribution to other blogs was not assessed but was monitored informally and can be argued addresses the call for “follow up and feedback on personal change and sharing that between the class” (student feedback 2008-9). The module leader also commented on some of the blog entries during the term. The blogs contributed a percentage component to the ‘Personal Change Challenge’ assignment, the remainder being a report of the experience as in previous years with the option of using alternative formats retained. Together this contributed 50% towards the overall module mark. The exercise was repeated in much the same format the following year (AY2011-12) with the only alteration being a requirement to submit a written report in the form of an essay. The blog component has proved to be interesting for most participants albeit very time-consuming for all concerned.

**Student feedback**

All students are asked to submit their comments regarding all modules. In the first version of the course (AY2002-3) students were asked to reflect on whether, as a result of taking the course, they had begun to appreciate the opportunities and challenges for change, and the mental approach needed. Respondents were unanimously positive in this regard but recognized that they “already have this mind set, so it would have been more helpful to actually place us in a situation and make us make decisions to see if we actually understand the mindset” which perhaps was an early pointer towards the need to make the material more personal to the individual student. When the same group were similarly asked whether they would “Be able to argue a sustainable development case in an effective manner, beginning to be a ‘change agent’” the answers were somewhat less certain. They recognized that “this class gave the basic fundamentals” and “I could present a decent argument. However our approach, methods and understanding of the issues could have been further cemented”. Significantly one respondent (out of 14 in the initial cohort) stated that “I don't know until I try” (student feedback 2002-3).

A small subset of students come to the course with very little work experience. These we categorize as ‘new graduates’ if they have completed their first degree or a follow-on Master’s in the Summer immediately preceding their starting the MPhil course (see Figure 3). These students have sometimes commented in feedback that they have found it difficult to produce the organizational change strategy when they have little work experience on which to base this. Students recognize that the course is targeted at those with work experience and make suggestions for how to assist those with less experience: “The assignments were good. Although the organizational change is an amazing opportunity to fully understand how to do the change. In some cases some of us might have not
worked before or don’t know well enough a company. Maybe give some examples of real change strategies and trying to do real plans with college will help to do real plans” (student feedback 2011-12) and “The guest speakers were great real life examples of agents of change in their area of expertise. Maybe consider pairing those who are keen with an ‘alumni buddy’ to help them through this process and beyond the course” (student feedback 2008-9).

In response to this, current students have been encouraged to actively engage with the global Alumni Network which is now developing into a useful forum for sharing ideas and support within and between student cohorts. More experienced former students can offer advice and career guidance. In addition, earlier graduates are now in positions of seniority where they can recruit more recent alumnae into their organizations.

Figure 3 shows the proportion of students who are new graduates when joining the course and those who return to their previous employer as their first appointment after completion of the course.

For the latest version of the course and assignment, student views varied. Students commented on the benefits of “learning by doing!” and of having their views challenged, “lectures were eye opening. I came to ESD with a singular idea in mind, this course has expanded my interest to the wider sustainability context”. The module also encouraged the idea that “Soft skills are very important in bringing about change, but difficult to practice”. Recognizing that this is a “Very nice module, much more focused on ‘practice’ than theory” one student stressed that the assignments and class activities were “exciting and challenging”. With specific reference to the personal change challenge assignment and the blog, some saw the blog as one of the best aspects of the module “Really enjoyed the personal challenge!!” whereas others felt it was “somewhat pointless”. “I think that having a blog was a great idea to keep the change challenge in our minds throughout the term.” The cost, however, was that “continual assessment (every week) was time consuming” (student feedback 2011-12).

With regard to the mechanism of the assignment, the logistical challenges should not be overlooked. One student commented that the change challenge was the best thing about the module “although I found the blog software difficult to manage!!! (sorry)”. Others noted that “blogging was very challenging” and “I really struggled with the blog. I enjoyed the informal writing but struggled to find relevance of sustainability in my daily life. Perhaps more a critique of myself than anything”. Many students asked for further guidance on how to undertake this unfamiliar form of assignment submission with particular need for clarity on how it is evaluated (student feedback 20011-12). The work is actually assessed against five criteria: evidence of personal motivation for the selected change challenge; presentation and description of the action undertaken; level of coverage given regarding the various stages of action and its impacts; analysis of the change undertaken and its likely sustainability; reflections on the experience and lessons learned from the experience of the change challenge. These categories are intended to encourage self reflection and draw personal lessons relevant to the individual.

Alumni reflections

Much of the material covered on the course, and perhaps in particular the organizational change and leadership theory, is difficult to fully appreciate in an academic environment. It is recognized that
important learning is gained from applying the theory to real situations. While an attempt is made through the assignments to give a degree of reality to the work, most value is added after graduation. The course has developed an active Alumni network that has maintained contact with over 80% of the student body through a combination of social networking (predominantly through a LinkedIn group) and on-going contact with course staff.

Through this network anecdotal reflections are received from alumni and some each year are invited back to participate in the delivery of the current course and in recent years through presenting as part of the annual Dissertation Conference held in mid-July. These presentations provide an opportunity for graduates to talk of their own professional background but also to reflect on the value of what they learned on the course when they took it themselves some years earlier. Many of these include very personal comments about their experience of transitioning from the academic environment back into practice and the challenges and opportunities they have faced. Many comment on the ‘double-edged sword’ of being labeled as a ‘sustainability expert’ with an expectation to deliver solutions to potentially long-held challenges in an organization. Graduates often talk about the excitement of new possibilities tempered by a weight of expectation and the balance between holding a niche position and feeling alone in trying to bring about change, a recognized challenge to implementing change management (Walker, 2006). This honest reflection by people from a similar background is highly valued by current students who are better able to relate to the perspectives of professionals who some short time before were sitting (sometimes literally) in their seat than hearing the corporate line from a senior professional presented as an expert giving a lecture on how change can be achieved. “MPhil Alumni stories” are frequently cited in the student feedback as one of the best aspects of the course.

It is interesting to note that where such professional viewpoints are included as a separate seminar series and draw also on non-course graduate professionals, the lessons presented apparently have less resonance with the students, as evidenced by student feedback. Fortunately, after ten years of the course the alumni network gives access to graduates who now hold senior positions in some organizations. There are also cases across a wide spectrum of employers from multinational corporations and organizations such as the United Nations and the World Bank, through private companies of all scales, or international charities and start-up companies initiated by graduates themselves and others.

Conclusions

Engineers now and in the future will be key players in delivering the goods and services that underpin society. If they are to do this in a manner that contributes positively to sustainable development they will need to challenge the orthodoxy and traditional approaches of businesses and organizations. As such, the MPhil in Engineering for Sustainable Development, includes a core module that specifically addresses skills needed to lead this change. The module emphasizes the personal skills required to bring about change and uses a range of delivery and assessment methods to encourage development of ability in students who have previously benefited from a largely technical education. Recognizing that in some cases this is a difficult transition the ‘primacy of the personal’ is facilitated through activities that encourage reflection on personal choices, ethics and values in a supportive environment where risks can be taken.

The efforts to facilitate this deep reflection by students looking critically at the efficacy of their actions has attracted attention elsewhere in the university and the change challenge and associated blog format, as well as being retained for the next cohort of the MPhil in Engineering for Sustainable Development will also be adopted by other courses from AY2012-13. Significantly, this assignment is being trialed on two new part-time MSt programmes and will run over a protracted period of up to two years with professionals addressing real change in their own organizations during that time.

It is recognized that since the course was launched at University of Cambridge Department of Engineering in Academic Year 2002-3, the context in which it is delivered has changed considerably both in terms of prior knowledge and expectations of the students joining the course and also in terms of skills required by organizations wishing to employ graduates. The course covers leadership and organizational change as a significant component. In ten years of teaching leadership to over three hundred students, the style and focus of delivery has evolved in response to student and alumni feedback and also to the changing global context. It is expected that leadership and change will remain a significant part of the course in the near future, though all course content is continuously reviewed for relevance and evolve based on prior experience and predicted future requirements.

Students are encouraged to reflect on their own experiences in a structured way to enable them to develop their own leadership efficacy. Students also have the chance to draw on experiences of
practitioners, including alumni of the course through formal guest lectures and via an extensive alumni network. The course content, through lectures, class discussions and exercises including role plays, and coursework assignments, is geared towards extending knowledge about ways to bring about change and consolidating this theory with experiential learning. The aim of this is to encourage students to address bigger questions associated with implementing sustainable development in practice in a range of organizations.

The course benefits from a cohort of students who have self-selected to undertake graduate study, normally after some experience in the workplace, and are all at some transition point in their life making them more than normally receptive to skills for effectively carry out change, both professionally and personally.

Students are expected to reach out beyond their specialist engineering role and engage with key stakeholders and communicate effectively in different circumstances. It is assumed that graduates of the course are likely to take up senior posts within an organization and the MPhil encourages them to act as leaders for positive change from whatever level of the organization they find themselves in. The emphasis of the course is to help students to consider and develop their own values and determine where they want to direct their efforts for change both in the organizations for which they work and also in their personal lives.

References


McMahon, Muireann; Fitzpatrick, Colin; Fowler, Ellen; Moles, Richard; Gowran, Rosemary Joan; & O'Regan, Bernadette (2010) “Shared Learning: A multidisciplinary approach to teaching the complexities of sustainable development” Engineering education in Sustainable Development Conference (EESD10), Gothenburg, Sweden, 19-22 September 2010


Acknowledgements

The authors would like to thank the students who have participated in the MPhil in Engineering for Sustainable Development since 2002.

Copyright statement

Copyright © September 2012, authors as listed at the start of this paper. This work is licensed under a Creative Commons Attribution-NonCommercial-NoDerivs 3.0 Unported License (CC BY-NC-ND 3.0).