

RAE/EPC

The Teaching of Engineering Ethics Group (TEEG)

Note of First meeting

The first meeting of the group was held at the Royal Academy of Engineering on Wednesday 24 March. Those attending were as in the List of Members with the exception of Dr Stephen Wilkinson, Professor Cliff Burrows and Professor Paul Jowitt from whom apologies had been received.

1. Introduction & Background

Andrew Haslett described the origins of TEEG in a decision by the Royal Academy of Engineering to address the issue of Ethics and Engineering. As a first step it held a conference on 22 September 2003, which attracted over 100 delegates with a variety of backgrounds. An immediate outcome of the conference was the establishment of four groups to explore the issues in greater depth in relation specifically to :

- Institutions and other professional and regulatory bodies
- Businesses
- Education and Training
- Individual Engineers

Andrew explained that he will be driving the latter two groups and Chris Earnshaw will be responsible for the first two.

Concurrently, the Engineering Professors' Council (EPC) had been discussing the need to provide appropriate support and guidance to UK University Engineering Departments on the teaching of engineering ethics. It was subsequently agreed that RAE and EPC would collaborate in setting up and facilitating a group of those who are active in the teaching of engineering ethics to consider desirable outcomes in this difficult area.

2. Exchange of Background/Interests

All members of the group described their background, motivation and interest in the teaching of engineering ethics from which it was apparent that the group, collectively, has a broad experience and expert knowledge in this area: it encompasses teaching at school, undergraduate and post-experience level and ranges over science, computing, engineering and medical ethics. A list of the members and their affiliations is attached at Appendix A.

3. Exploration of the territory

Members of the group explored a number of key questions as a means of clarifying issues and views :

- What do we mean by ethics in the context of (a) the study (b) the profession of engineering ?
- Are ethical considerations of particular relevance and/or concern at the present time and, if so, why ?
- Should engineering undergraduates learn about ethics and, if so, what ? How?
- Can /should ethics be integrated with (a) technical studies (b) key skills (c) sustainability (d) health and safety in engineering programmes ?

The following are representative of the views expressed :

1. Integration of ethics with other engineering programme components is to be welcomed – particularly in the form of reflective study of the relationship of ethics to other components of engineering learning;
2. A typical perception that engineers ‘do engineering’ whilst others have the prime concern with the implications is erroneous and based on an overly-narrow view of the role of the professional engineer often held by engineers as well as by others;
3. Engineers are, by their specialist education, better informed about the scientific and technological facts which bear on much of modern life; but increased knowledge bears increased responsibility. The message that undergraduate engineers, as aspiring professionals, have a greater duty of care and a responsibility to society should be introduced from the start and re-visited regularly as other skills and knowledge are acquired.
4. Engineers should be equipped by their formation with an ethical framework within which they can justify their decisions;
5. There is an urgent need for more and better practical examples and case studies linking ethics and engineering in a realistic UK context. Material should incorporate ‘everyday’ as well as ‘dramatic’ examples ;
6. Supporting material and regulatory statements are less well-developed in UK than in USA;
7. Although the focus of the working group is naturally on undergraduate education, it is likely that there will be a stronger and immediate demand for post-experience ethics training/education;
8. The climate of public and professional opinion is particularly favourable to the consideration of ethics at the present time due to a number of recent major disasters and a greater public concern with global environmental issues. The problem is acknowledged by the engineering sector and Health & Safety is forcing the issue. Women, with their distinctive approach to issues and problems, are more influential than heretofore and an ageing population may (or may not) be disposed to adopt a different attitude, providing opportunities for re-evaluation of the importance of the ethical dimension;
9. An increasingly-litigious society may require professionals to prepare themselves better to defend their actions but this is seen as a consequence of a rules-based approach to societal organisation. An improved ethical basis for decision-making may be desirable but may not provide a better defense in law. Consideration of how regulations are derived and how they can be influenced (eg H & S) may provide a

vehicle for a better understanding of the tensions between legal and ethical frameworks;

10. Students need to learn how (and when) to make judgements (of all kinds) which reflect their responsibility to themselves and to society. They usually believe that decisions are objective and need to understand the fuzzy nature of real-life decision-making informed by imperfect and conflicting data. This reflects the need for improved problem-identification skills;
11. Given the increasingly multi-ethnic nature of the student body, any ethical framework for engineering must identify and respect national and cultural issues underpinning differences in the moral codes of prospective engineers.

4. What next?

The group discussed desirable outcomes and possible actions and the following commanded a broad consensus :

- a. Key starting points are Philosophy and Experience.
- b. Good teaching and case-study material is very important and should show engineers as 'heros' – that is to say, they would illustrate good and courageous behaviours by engineers from different disciplines;
- c. These examples should also include examples of relatively minor situations which would allow students to play out the engineer's role where judgements have to be made on incomplete or fuzzy information; employers should be involved in the generation of case studies;
- d. A forum is required for developing and sharing good educational material;
- e. A Teaching/Learning Model is required for Ethics, comprising Content/Process/Timing, which would demonstrate the feasibility of delivery – possibly, but not necessarily in the form of a Programme or Module Specification. It should demonstrate how content could be integrated with technical material.
- f. Within this, reasoning skills are held to be critical and a key outcome must be a framework for ethical discussion which will endure alongside ephemeral technologies.
- g. Training is required to raise the confidence of staff in their ability to deliver; appropriate teaching support materials would be required and colleagues will need to be persuaded of its accessibility. An important message to teaching staff who decry their own expertise in ethics is that "we are all experts". LTSNEng should be approached to identify its role and potential for involvement in staff support. Ethics presents engineering staff with an opportunity to teach differently and to learn differently.
- h. The post-experience area, where demand may already be high and more-clearly articulated, should not be neglected.
- i. Nevertheless, there is also tremendous potential to excite young people who can be persuaded to believe that they can make a contribution to society as well as to engineering. Ethics could be used to promote engineering!
- j. Novel teaching/learning techniques eg theatre should be explored. In certain instances it may be better to use a range of professionals, as engineers tend to use a 'closed' language.
- k. Assessment may be a means of motivating reluctant students but may conversely inhibit development of underpinning ideas.

5. Agreed Actions and Timescale

Purposes

It was agreed that the groups' purposes were :

- to improve the provision of ethics teaching in the engineering departments of UK Higher Education Institutions;
- to provide a forum for those active in the teaching of engineering ethics.

Outcomes

It was agreed that the existing group, augmented if thought fit, would work together to bring about outcomes under four headings :

The Map

A Teaching/learning Model or Framework for Engineering Ethics - which would set out what outcomes in this area might be delivered, to whom, how and when.

The Content

Case Studies, both major and minor, exploring the impact of ethical reasoning on engineering judgements, specifically in the UK context and across a range of disciplines.

The Context

The context is the professional practice of engineering in the UK. Therefore steps should be taken to gain the support of appropriate national professional and regulatory bodies such as EC (UK), Professional Engineering Institutions and QAA and to interface with their activities in this area.

Dissemination

A dissemination and embedding strategy will be developed, based on the use of workshops and the web. Staff development will be a key mechanism.

Methodology

Work will be progressed under all four headings by small sub-groups with the authority to commission others. The sub-groups will report to TEEG at a meeting to be arranged in early July 2004, at which TEEG will review progress and suggest improvements. It is intended that work should be completed by January 2005.

The working sub-groups comprise:

WSG/M - Simon Rogerson (Leader), Ian Howard, Sue Chetwynd with feedback from John Taylor and Chris Kent

WSG/C - Andrew Haslett (Leader), Gary Lye, John Monk

WSG/X - Delegated to EPC via Tim Whiteley

WSG/D - Mervyn Jones/Peter Noakes

Administrative support and co-ordination will be provided by Tim Whiteley, to whom all communications between WSG members should be copied.

Appendix A – Membership - Teaching of Engineering Ethics Group

Professor Cliff Burrows	Centre for Power Transmission and Motion Control, University of Bath
Dr Sue Chetwynd	Lecturer in Philosophy and Ethics, Universities of Warwick and Keele
Professor Ian Howard	Mechanical Engineering, Sheffield University
Dr Mervyn Jones	Director, Centre for Professional Development, Imperial College
Professor Paul Jowitt	Civil Engineering, Heriot-Watt University
Dr Chris Kent	Chemical Engineering, Birmingham University
Professor David Lidgate	Professors & Heads of Electrical Engineering
Dr Gary Lye	Reader in Biochemistry, University College, London
Professor John Monk	Professor of Electronics, Open University
Rowland Morgan	Civil Engineer, Visiting Fellow, Bristol University
Peter Noakes	Senior Lecturer in Electronics, Essex University
Professor Rafaella Ocone	Molecular & Particle Process Engineering, Heriot- Watt University
Professor Simon Rogerson	Director of Centre for Computing and Social Responsibility, DeMontfort University
Dr John Taylor	Head of Physics, Rugby School
Dr Stephen Wilkinson	Centre for Professional Ethics, Keele University

Conveners :

Tim Whiteley	Project Officer, Engineering Professors' Council
Andrew Haslett	Group Technical Director, ICI (for The Royal Academy of Engineering)

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