

Making ethical engineers: Engineers for Social Responsibility

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***Abstract:** Research reported in the literature shows that students who engage in unprofessional conduct are more likely to face subsequent censure as practising professionals. There appears to be an opportunity within engineering education to influence the ethical behaviour of engineers. Engineers for Social Responsibility (ESR) was founded in 1983 at the height of concerns about the effect of nuclear weapons, and engineers' responsibility for their production. It has broadened its remit to include any impact of engineering on people or the environment, and acts in many ways as the 'conscience' of the engineering profession in New Zealand. ESR maintains a separate but working relationship with the Institution of Professional Engineers New Zealand (IPENZ), and has helped formulate the IPENZ Code of Ethics. More recently it has introduced the Engineers' Affirmation, an equivalent of the Hippocratic Oath for engineers. It is proposed here that engineering schools ask undergraduates to sign and display the Engineers' Affirmation during their undergraduate programme, as part of their professionalism training, and in an attempt to reduce unprofessional conduct. The effect of adoption of the Affirmation could be measured.*

Introduction: professional conduct at university and beyond

The conduct of a practising professional appears to be related to the way they behaved while at university. This suggests that there may be an opportunity within engineering education to influence the ethical behaviour of engineers. The problem may best be stated in terms of unprofessional conduct (UC), which in an undergraduate engineer may include cheating of various kinds, computer/network abuse, or other antisocial behaviour. It has been described by a number of authors, for example: Carpenter, D. D., Harding, T. S., Finelli, C. J., Montgomery, S. M., and Passow, H. J. (2006); Dick, M., Sheard, J., Bareiss, C., Carter, J., Joyce, D., Harding, T., and Laxer, C. (2002); Harding (2002); Molnar, K.K., Kletke, M.G., and Chongwatpol, J. (2008); Muhney and Campbell (2010); Passow, H.J., Mayhew, M.J., Finelli, C.J., Harding, T.S., and Carpenter, D.D. (2006); Selingo (2004); Staats, S., Hupp, J.M., Wallace, H., and Gresley, J. (2009); and Yardley, J., Rodriguez, M.D., Bates, S.C., and Nelson, J. (2009). UC in engineering students appears to have been growing over several decades (Carter (2010)).

Some authors have described ways of tackling the problem. Carpenter *et al.* (2006) suggested better communication between staff and students; and Harding (2002) suggested better testing procedures, review sessions, and group work. Staats *et al.* (2009) pointed out that universities should make the reporting of cheating less onerous for staff. Carter (2010) described a combined approach in which UC was responded to with a system of warnings, penalties and recording of offences; but in addition a system of *pastoral care* identified the most at-risk students and tried to pre-empt UC by giving these students particular support. This approach

appeared to be successful in reducing the number of UC cases when evaluated over a six-year period.

There is evidence linking the behaviour of students in professional schools with behaviour in their subsequent career. Papadakis, M.A., Hodgson, C.S., Teherani, A., and Kohatsu, N.D. (2004) found that problematic behaviour in US medical school is associated with subsequent disciplinary action (on a practising professional) by a state medical board. Students with comments on file about UC were more than twice as likely to be disciplined by the medical board when they became practising physicians. Teherani, A., Hodgson, C.S., Banach, M., and Papadakis, M.A. (2005) described some of these areas of UC in more detail.

Some studies have also found evidence linking UC in practising professionals with academic underperformance at university: Papadakis, M.A., Teherani, A., Banach, M.A., Knetter, T.R., Rattner, S.L., Stern, D.T., Veloski, J.J., and Hodgson, C.S. (2005); Hodgson, C.S., Teherani, A., Gough, H.G., Bradley, P., and Papadakis, M.A. (2007); and Howe, A., Miles, S., Wright, S., and Leinster, S. (2010). This evidence supports the approach of Carter (2010) in identifying students at risk of UC by means of academic measures (students at risk of failing a second-year course were identified mainly on the basis of a diagnostic test, their overall GPA in the previous year, and their grade in the most closely-related subject in that year).

For many years, professionals and their institutions have been aware of the need to have and maintain ethical standards. In New Zealand, *Engineers for Social Responsibility* has been active in this area since its inception.

Engineers for Social Responsibility

Engineers for Social Responsibility (ESR) was founded by Gerald Coates and other New Zealand professional engineers in 1983 at the height of concerns about the likely effect of nuclear weapons, and engineers' responsibility for their production. It quite quickly broadened its remit, and its constitution now refers to the following objectives:

- To seek to encourage and support social responsibility and a humane professional ethic in the uses of technology.
- To seek to inform the engineering profession, general public and public policy makers about the impact of technology including both positive and negative effects. The field of interest shall include but not be restricted to:
 - The selection and achievement of the long term goals for humanity,
 - Policies and controls relating to nuclear arms and other military technology,
 - Government policy relating to appropriate technology and technology transfer issues in foreign aid,
 - Environmental issues including:
 - health and safety,
 - pollution of all kinds,
 - depletion of resources,
 - energy policy,
 - nuclear power generation and waste disposal,
 - communications policy,
 - privacy.
 - Economic and social aspects of advanced technology and automation,
 - Educational aspects of the impact of technology,
- To communicate or cooperate with other organisations which have similar aims for the whole or part of the fields of interest.
- To make public statements and publish material for the information of the engineering profession, general public and public policy makers, as covered by

these objects. Where opinions are given these shall be identified as such and shall be based on sound engineering judgement.

- To provide a forum for discussion of members' issues of conscience relating to the Association's objects and take any appropriate action.
- To provide support to members, professional engineers and others who act in accordance with the objectives and stated policies of the Association.

ESR has a structure which mirrors that of IPENZ, the Institution of Professional Engineers New Zealand. There are branches in the main centres of Auckland, Hamilton, Wellington and Christchurch, each with its own committee. ESR acts effectively as an ethics pressure group upon IPENZ, and has been called “the conscience of the engineering profession in New Zealand”. It has helped formulate the IPENZ Code of Ethics. While maintaining good relations with IPENZ, ESR is however careful to maintain its separate identity and ability to speak out as occasion demands.

ESR runs an annual conference, which brings together members and related professionals from the whole country. The 2010 conference *Signs of Change* showcased ways in which people were already responding to problems arising from climate change and oil shortage.

A Hippocratic Oath for engineering students?

For a number of years ESR members have recognised the need for an equivalent of the Hippocratic Oath taken by graduating physicians. In 2008 the wording of an *Engineers' Affirmation* was agreed, and this is reproduced as Figure 1. Professional engineers are encouraged to sign and date the document, and display it in their place of work.

The research shows that what happens in university is important throughout the career of the professional. Individual UC cases can always be dealt with, but it seems likely that a climate which encourages ethical behaviour would make UC generally less likely to occur. It may be that UC could be pre-empted by asking students to sign the Engineers' Affirmation during their course of studies, perhaps on a specific occasion, as part of their professionalism training. The author proposes that Engineering Deans adopt this strategy as a way of encouraging the development of ethical engineers. If this is successful in the undergraduate programme, then it seems likely to have a positive effect upon the profession as a whole.

The effect of such an adoption could in principle be measured. In institutions where records of UC are kept, data on occurrence of UC prior to, and subsequent to adoption of the Affirmation could be compared.

Conclusions

Unprofessional conduct (UC) in engineering students includes cheating, computer/network abuse, and other antisocial behaviour. Research shows that UC at university increases the likelihood of subsequent problems during professional practice. *Engineers for Social Responsibility* has agreed the wording of the Engineers' Affirmation, which is modelled on the Hippocratic Oath for physicians. It is proposed that Engineering Deans promote the signing of the Affirmation as a way of encouraging ethical practice during undergraduate studies, and in subsequent careers. Where UC data are kept, the effect of adoption of the Affirmation could be measured.



Engineers' Affirmation

- I vow to practise my profession with skill, conscience and dignity.
- I will strive to apply my skills for the well-being of all humanity, the earth and its ecosystems.
- I vow to ensure that sustainability for present and future generations will underlie all my work.
- I will strive not to allow considerations of politics, prejudice or material advancement to influence my work and my duty to present and future generations.
- I make this Affirmation solemnly, freely and upon my honour.

SignedDate

(Modelled on the Hippocratic Oath for doctors circa 5th Century BC)

Figure 1: Engineers' Affirmation

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