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Christelle Didier

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A Good Answer to (perhaps) not such very Good Questions

Christelle Didier
Université de Lille, CIREL-Proféor
Engineering Studies, 2015, 7 (2-3), pp.185 - 186. 〈10.1080/19378629.2015.1088546〉

How can we make studying engineering and technology a more attractive option for young people who are undecided about their choice of a major but who have sufficient interest to enroll on an engineering pre-professional degree program? How can we attract women and students of colour and therefore improve the balance of male and female engineers and that of white engineers and engineers of colour in society? How can we educate engineers to be more socially responsible? How can engineering education be made more context-sensitive? These are the questions Larry Bucciarelli and David Drew's plans intend to address, or at least the questions they raised to provoke critical reflection and analysis concerning the relevance and importance of the humanities and social sciences in the education of engineers. Although I believe in the relevance of the plan, I do not share all the presuppositions of its authors.

The hypothesis of their "action research" is that a Bachelor of Arts in *Liberal Studies in Engineering* might be a means of solving several different "problems". The program aims to answer the need for change in the demographic of the engineering students' population in two ways. It seeks to improve the representation of women and of people of colour by offering a "smoother", less stereotyped and therefore more "welcoming" pathway to the profession. The program hopes, through being attractive to a wider spectrum of students, to counteract the shortage of graduate engineers for businesses, with its worrying consequences for the competitiveness of the United States in a high-tech information economy. The program also aims at transforming the graduate engineers' profile, as well as the content and goals of engineering education. It wishes to train graduate engineers to think and act as mature, fully informed citizens, sensitive to the interest of others and to ensure that the "fundamentals" of undergraduate engineering education are more in tune with authentic engineering practice.

To what extent do these problems actually exist? Do they each have the same level of need to be solved?

The underrepresentation of women and people of colour in engineering education and in the profession is an indisputable fact. Engineering has developed as a white male profession reflecting societal injustice: girls who could have studied engineering – and would have liked to – have long been excluded from scientific education, in the same way as black people have been excluded. Allowing these groups into engineering education has been far from sufficient in achieving a gender and ethnic balance in engineering, because there are many factors that come into play: external pressures to renounce a desired career, lack of support from family or teachers, auto-censorship, scarcity of role models, the glass-ceiling and maybe other legitimate personal choices. In addition, the underrepresentation of people of colour is strongly correlated to social origins, while that of women is worsened by a high drop-out rate due to lack of support, when they have children, from their partners (often the children's fathers). Women seem to be more attracted to subjects such as human biology and agronomical sciences than men: is auto-censorship the only explanation for this? Should achiveving the gender-balance in all field of engineering be a goal? I do not know. Career opportunities are better today for women, but the inclusiveness still needs to be considered a goal in itself. It is a good thing that managers have realized that diversity might be good for

business, but achieving equal opportunity ought to remains an issue even when it has no financial benefit. Thus, I believe that Bucciarelli and Drew's program will contribute to a better gender and ethnic balance in engineering if and only if it is conceived as such, and if these two goals are addressed separately and appropriately.

Lack of interest among young people in science and technology is a more controversial issue. The media seem to be listening and reporting the alarmist statements coming from business world and from the field of education, but scholars who study this question do not report this lack of interest in such stark terms. What if this need for concern were based on a myth?

Since the shortage of engineers might not be a problem, let us discuss the intrinsic value of the program and how it might be of benefit to both engineers-to-be and to society as a whole.

The inclusion of social and human sciences teaching in engineering education is not a new question and it is controversial because transmitting human and social skills can imply different goals – even antagonistic ones (i.e. improving productivity vs. preventing class war or improving relations between workers and engineers). The key phrase of the program is "critical thinking". But what ought to be looked at critically? Undoubtedly, a more balanced way of educating engineers might be to enable students to take more seriously their share of social responsibility towards sustainability issues and social justice … But this will only be the case if the goal of regeneration goes beyond maintaining the "competitiveness of the US", and if competitiveness is included in what ought to be looked at critically. Will it really be more comfortable for the students – and "smoother", to take Bucciarelli and Drew's own words– to be trained to doubt, to be introduced to multiple perspectives and "think outside the box"? Not necessarily.

Let's hope that such a program will attract talented women and people of colour to engineering, not only to improve its current image – as too many diversity programm do - but also because this particular program will help them become better "citizens of the world", contribute to a better world … and, one hopes, make them happier. Let us dream that it will not only attract those who are undecided, but also those who are fully determined to make changes, ready to shape, along with other stake-holders, today's and tomorrow's technology.

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