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Consultancy in Engineering Education

Achieving excellence in engineering education: the ingredients of successful change

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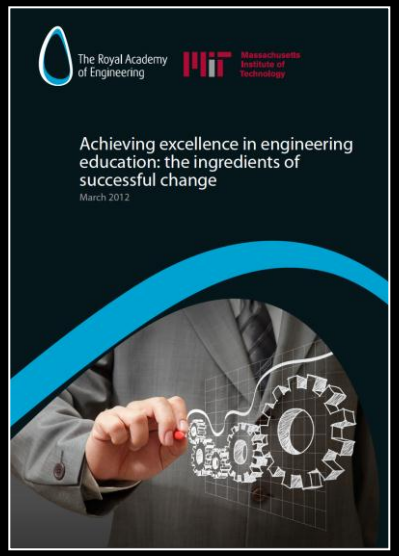
Engineering Professors' Council Congress
17th April 2012



Overview

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   - Context
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Context

Over the past 10-15 years…

- Significant international debate on WHY engineering education needs to change

- Some consensus on WHAT educational approaches deliver the graduates required for the 21st Century

- … but limited evidence on HOW this might be achieved in practice

Study approach

Study outline

- Conducted between January and December 2011
- Drawing on the experiences of those involved with programs of change, to distil the common features of success and failure
- Two stage study process:
  - Interviews with 70 experts from 15 countries across the world with first hand experience of change
  - Detailed case study evaluations of 6 examples of well-regarded change, involving consultations with a further 117 individuals

The case studies:

1. The Department of Civil, Environmental & Geomatic Engineering, UCL, UK
2. School of Engineering, Hong Kong University of Science and Technology, Hong Kong
3. iFoundry, University of Illinois, US
4. Department of Chemical Engineering, University of Queensland, Australia
5. Faculty of Engineering and Computing, Coventry University, UK
6. Learning Factory, Penn State, US

Evaluation of 70-80 programs of educational change that were:

- Planned
- Affecting the mainstream education of a high proportion of the student cohort (i.e. not optional or extra-curricular activities)
- Large scale (i.e. not one or two modules)
- Applied within engineering department or school

World class engineering education: Common features of successful change

Context

- Strong sense of collective responsibility amongst academics, usually triggered by an urgent market driven problem
- Academics are much more likely to have significant industry experience
- Senior managers have experience with failed educational changes
- Trust amongst academics in the Department Head – someone who will “fight our corner” in promotions

Curriculum design

- Typically 20% of curriculum, or less, is non-traditional, but curriculum is strongly interconnected, with multiple dependencies, where academics and students have a clear understanding of the education as a whole
- New approach framed as unique and ‘world class’
- All aspects of the education are set within the engineering context and delivered by engineers
- Academics not forced to deliver non-traditional modules, but are aware of the positive impact they have on students

Leadership and academic engagement

- The endeavor is energetically supported by the department head (and often senior university management)
- Success is largely confined within the departmental boundaries, with limited diffusion
- The need for change is clearly articulated and understood by academics
- Cross-section of academics engaged with the new curriculum design
- The direct connection between academics and individual modules is loosened

Sustaining a world class education

- Most changes are not sustained - 5-10 years after implementation, a gradual module-by-module drift back to the previous curriculum, often triggered by university restructuring
- Programs who successfully change and adapt:
  - Are based around interconnected curriculum where academics see positive impact on the students
  - Where academics continue to appreciate why the change was undertaken
  - Where evidence is available to demonstrate impact on students and advantages over competitors
  - With an on-going emphasis on developing a world class education

Some surprises….

- Systemic, successful change is not typically triggered by pedagogical evidence
- Existing innovation and/or educational expertise are not critical building blocks for systemic reform
- The diffusion of good practice from ‘champions’ is limited and short-term

Implications for the UK

For those considering change

- To what extent are the Department Head and university senior management actively supporting the endeavor?
- To what extent is the entire curriculum as a whole being reconsidered?
- Will the new curriculum structure be clear to students and does potential exist for elements to become fragmented and isolated?
- Outside their own specialism, how engaged will academics be in the curriculum as a whole (including its design)?
- What safe-guards are in place to ensure that the new curriculum can adapt and improve?
- What on-going educational evaluations are planned and when will the first data set be captured?

For those supporting/funding change

- Ambitious, curriculum wide reforms with the support of the HoD appear to hold greater potential for long-term change than module-level innovations
- Well-designed impact evaluations play an important role in sustaining change
- The availability of evidence on the impact of educational reform on program market performance would be of great benefit

Thank you