Challenges for Engineering Education research

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Engineering skills crisis

By 2022...

1.82 million engineers and technicians at all levels

1.06 million engineers at level 4+

7 out of 10 replacement demand

360,000 expansion

Data from EngineeringUK 2015 annual digest
Engineering skills supply

- Students taking GCSE: 650k
- Students achieving A*-C grade in 2 sciences and maths at GCSE: ~30k
- Students taking A level maths and physics: ~30k
- Students taking engineering, IT and construction apprenticeships at level 3: ~30k
- Students taking engineering degrees (UK domiciled): 15k
- Engineering graduates going into professional engineering occupations: 8k

Data from JCQ, Data Service, HESA
Graduates in engineering jobs

Data from EngineeringUK 2015 annual digest
What does this mean for engineering education research?
Key challenges

• Defining engineering

• Teaching students without physics and/or maths

• Addressing the challenge of graduates leaving engineering for other sectors

• The higher vocational education pathway

• The impact of TEF on the importance of teaching in the HE landscape
• What should engineering students know?
• What should they be capable of doing?
• How do we create breadth and depth of knowledge across disciplines

Image from “Thinking like an Engineer” report. Royal Academy of Engineering 2014
Students without maths/physics

- No statistical correlation between degree classification and A level maths results (or lack of maths) for MEng or BEng
Graduate destinations

Destinations of Leavers from Higher Education (DLHE) summary of "Most important activity" for UK domiciled, full-time engineering graduates (10,421 students)

- Working full time:
  - Male: 590 students
  - Female: 168 students
- Working part time:
  - Male: 586 students
  - Female: 67 students
- Unemployed:
  - Male: 826 students
  - Female: 71 students
- Due to start work next month:
  - Male: 80 students
  - Female: 9 students
- Studying full time:
  - Male: 86 students
  - Female: 7 students
- Studying part time:
  - Male: 37 students
  - Female: 20 students
- Traveling/something else:
  - Male: 183 students
  - Female: 59 students
- Did not answer/DLHE survey:
  - Male: 891 students
  - Female: 154 students

- Working in a professional engineering job:
  - Male: 2867 students
  - Female: 383 students
- Working in a professional non-engineering job:
  - Male: 1551 students
  - Female: 275 students
- Working in a non-professional job:
  - Male: 410 students
  - Female: 68 students
- Higher degree by research:
  - Male: 294 students
  - Female: 54 students
- Taught higher degree:
  - Male: 473 students
  - Female: 68 students
- Other study:
  - Male: 134 students
  - Female: 34 students

Image from “Pathways to success…” report. Royal Academy of Engineering 2015
Higher vocational education

- Up to 2000 Degree apprenticeships starts in 2015/16
Teaching excellence framework

- Judgements made by panel: academic experts in learning and teaching, student reps, and employer/profession reps

- Judgements made against an assessment framework, based on evidence submitted

- Panels will consider how excellent teaching is demonstrated

- Student fees to increasingly differentiate according to the TEF level awarded
Teaching quality - TEF

• Reward and encourage teaching practices that:
  - provide an appropriate level of contact and stimulation
  - encourage student effort
  - are effective in developing their knowledge, skills and career readiness

• There is a strategic and effective approach to understanding the ways in which students are intellectually challenged and engaged in the curriculum and their learning

• The courses, curriculum design, teaching and assessment are effective in developing all students’ knowledge and skills.
Measuring teaching excellence

7. TEF should reward and encourage teaching practices that provide an appropriate level of contact and stimulation, encourage student effort, and are effective in developing their knowledge, skills and career readiness. We will consult on criteria in the technical consultation but purely as an example of what might be considered, we could look at criteria such as:

Image from forthcoming report on template for measuring teaching excellence, RAEng
Measuring teaching excellence

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Thank you.

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