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# SAAE International Workshop on Challenges of Engineering Skills Shortage – British Perspective

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Imperial College London



## Engineering as a Profession

- |                          |   |  |
|--------------------------|---|--|
| Romans                   | - | “Necessity is the mother of invention” |
| Middle Ages              | - | Master craftsmen, gentlemen scientists |
| Victorians               | - | Heroic age, mechanics                  |
| 20 <sup>th</sup> Century | - | Engineering Science                    |
| 21 <sup>st</sup> Century | - | ?                                      |



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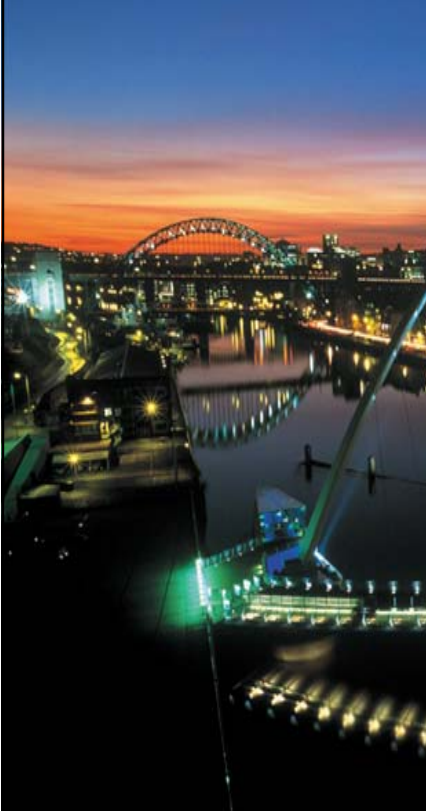
## Professional Institutions

ICE founded in 1818

Formal qualifications – Scientific fundamentals

Practical experience

Test professional competence





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“Yet at this time when our need for engineering talent is huge, when our young people are increasingly interested in how they can help to save the planet, we are failing to persuade them that engineering careers are exciting, well-paid and

Worthwhile”



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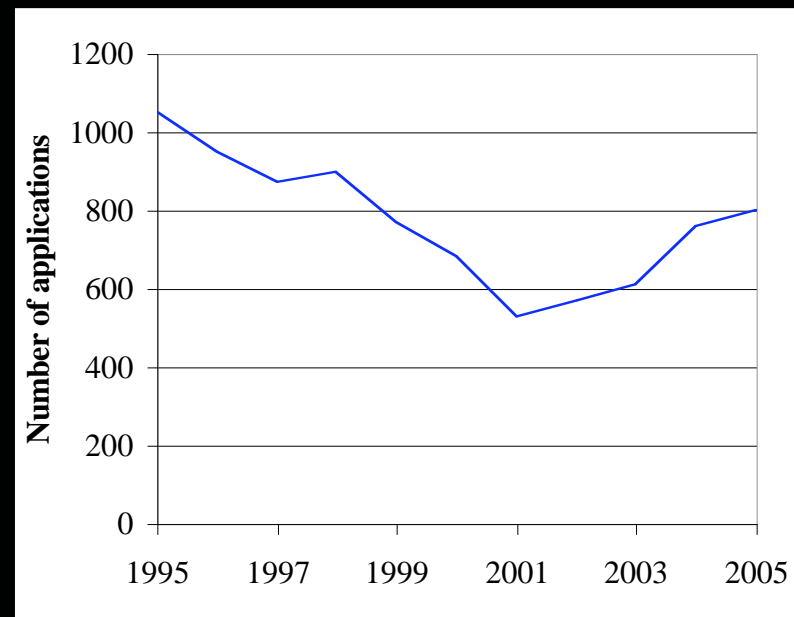
Our share of the most able recruits is low compared to  
Law and Medicine

Many of our best graduates opt for non-engineering  
careers



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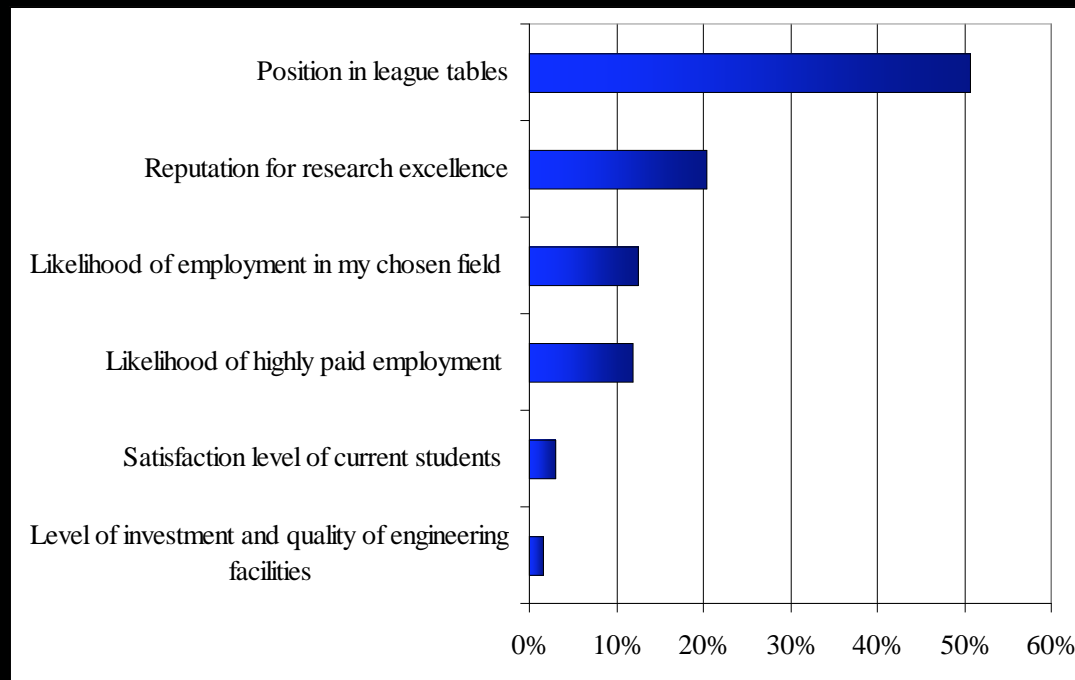
## Application numbers to the Mechanical Engineering department, by year





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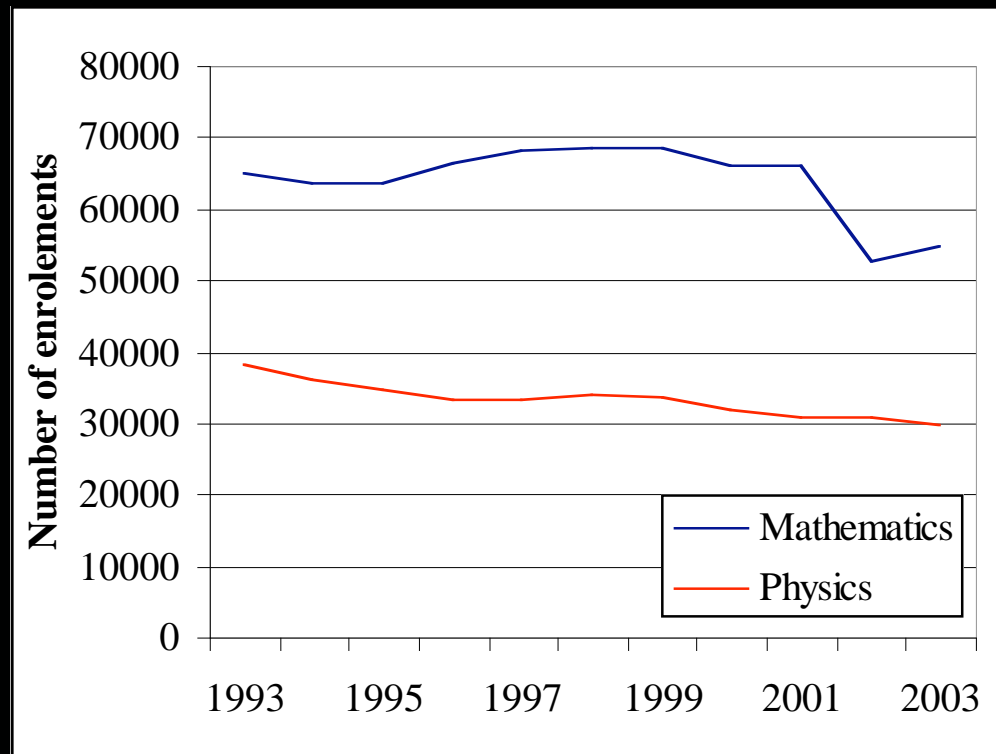
# Which measure of quality would you MOST care about if choosing a university to study engineering?





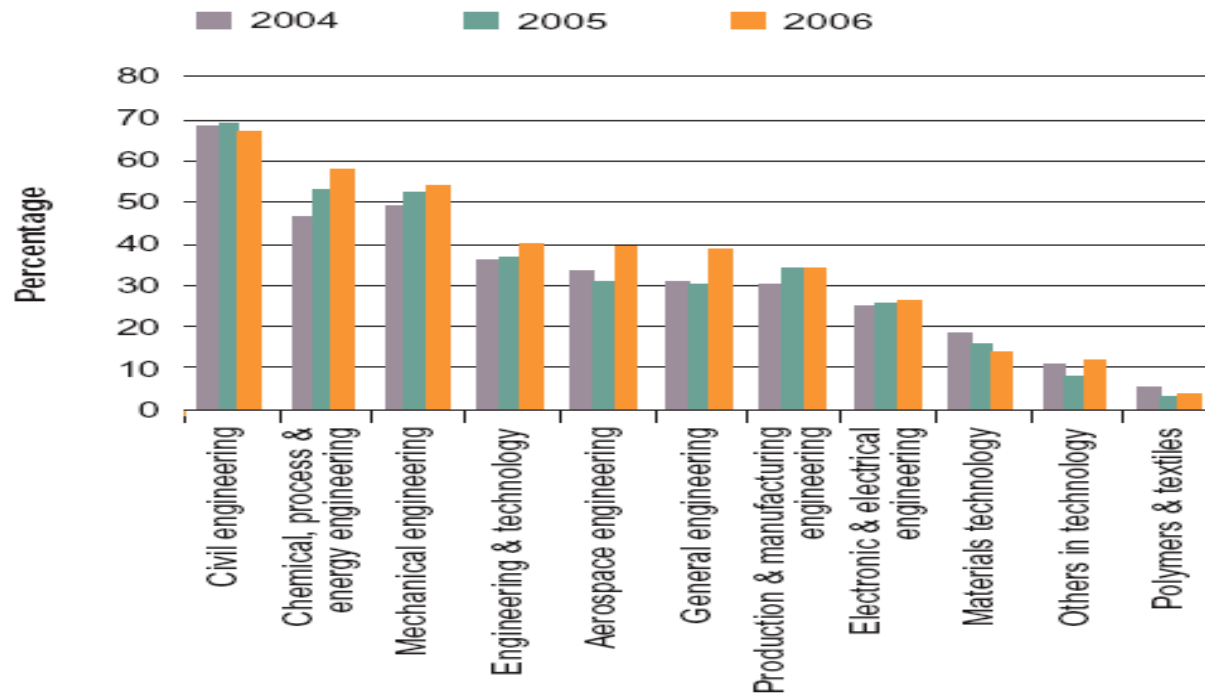
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## Number of people in the UK studying Mathematics and Physics A' level, by year





**Chart 4.7: Percentage of Engineering Graduates Who Move Into Professional Engineering by Discipline 6 Months after Study**



Source: HESA (2006)



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## Recruitment and Retention

National	-	RAEng study
Institutional	-	EnVision 2010
Departmental	-	Civil Engineering at Imperial

“What does our nation need ?”

“What should we expect of our graduates when they leave us?”



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## Surveys

RAENg

Industry

UK University

Engineering Departments

EnVision

Industry

Alumni

Own undergraduates

Own Staff

Analyse, interpret, synthesise



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## Educating Engineers for the 21st Century

June 2007





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## RAEng

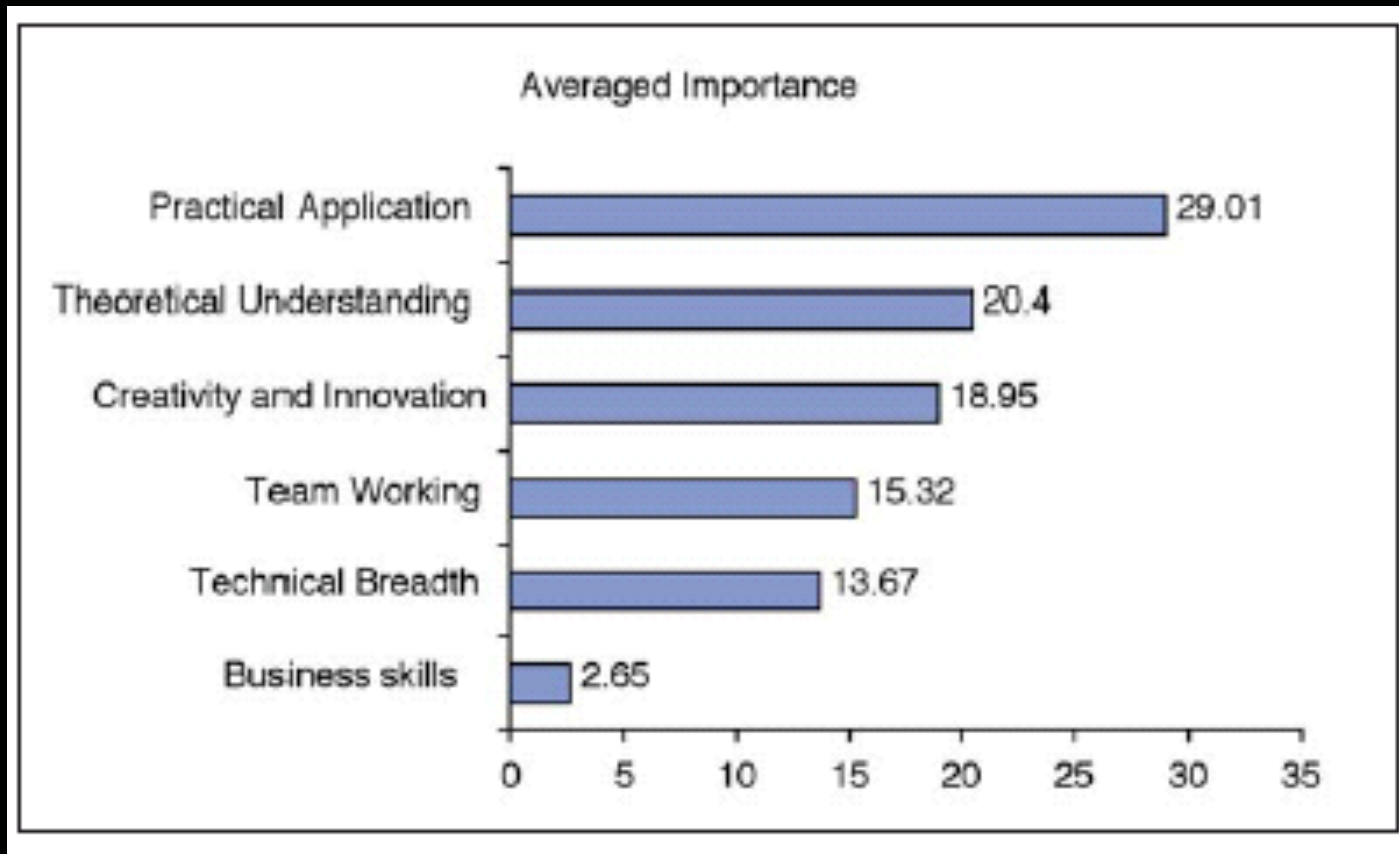
areas of enquiry:

Changes in the industry

Current and future skills requirements

The comparative quality of UK and international engineering graduates

Consequential requirements for changes in engineering degree courses





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“One failing of universities now is that some of the theory never gets translated into reality”

“[graduates] need a more realistic view...”

“I am not hugely bothered about business skills. I think as long as they have common sense they will learn the business skills pretty quickly when they come on board”.

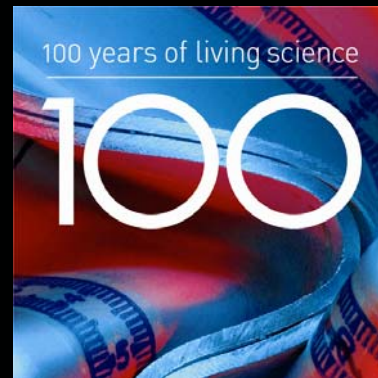
“...practical project work, preferably with an industrial partner is necessary”.

“More creative, practical and market-led project work”.

“...it is about teaching engineering as an applied science, applied business science, as opposed to teaching it as a pure science.”



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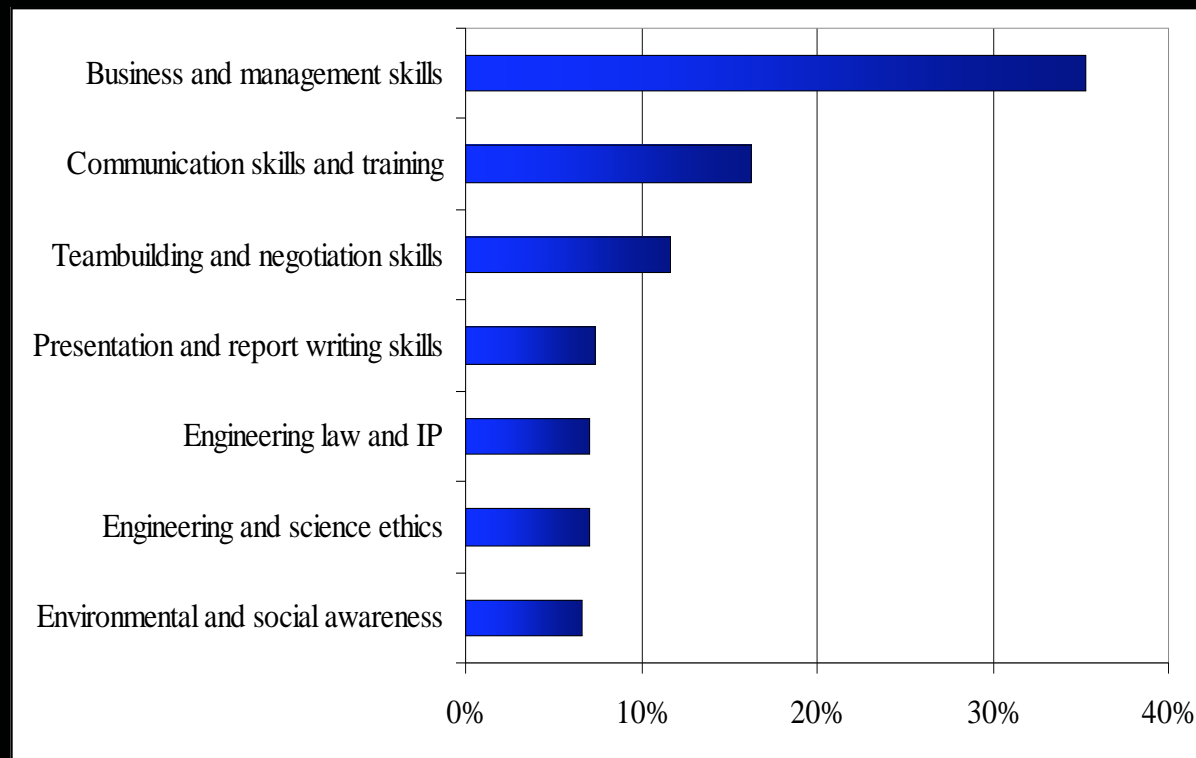


*Next Generation Engineering Education*

[www.imperial.ac.uk/engineering/envision2010](http://www.imperial.ac.uk/engineering/envision2010)

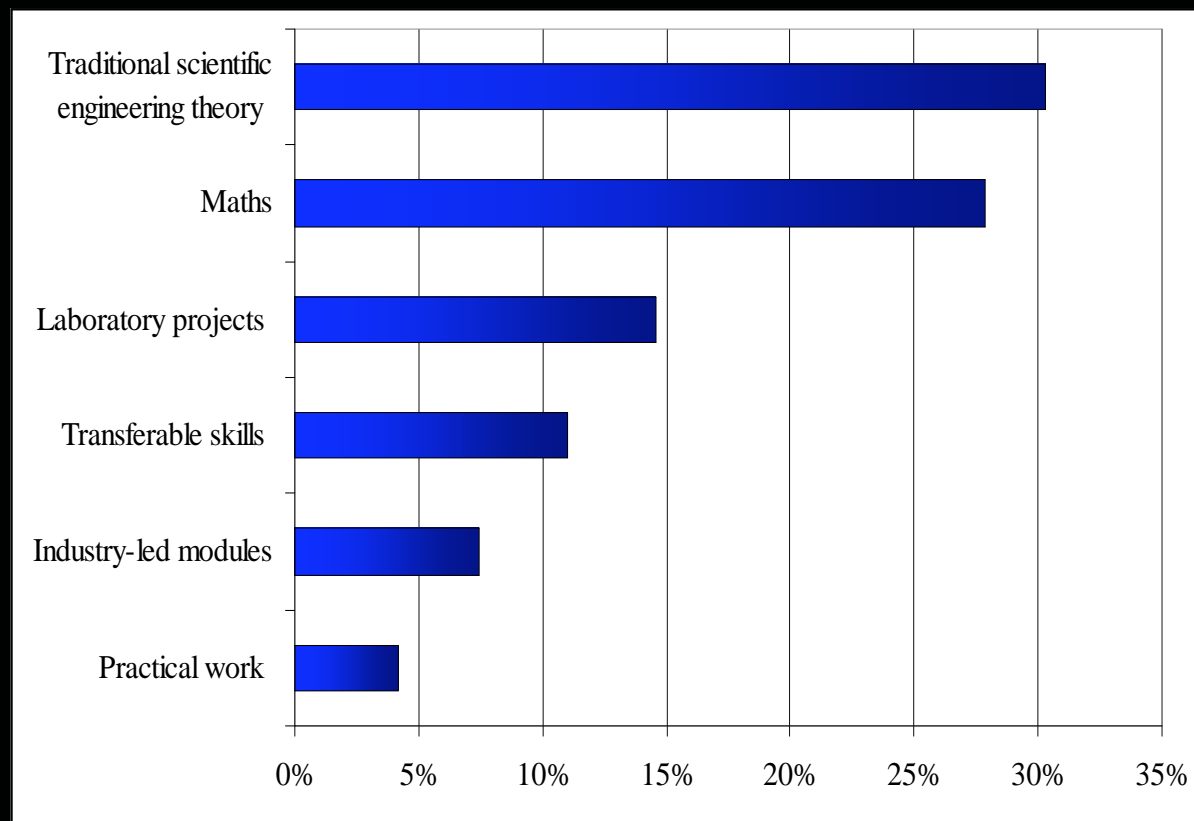


# Expansion of which personal and professional skills would most enhance a traditional engineering syllabus?





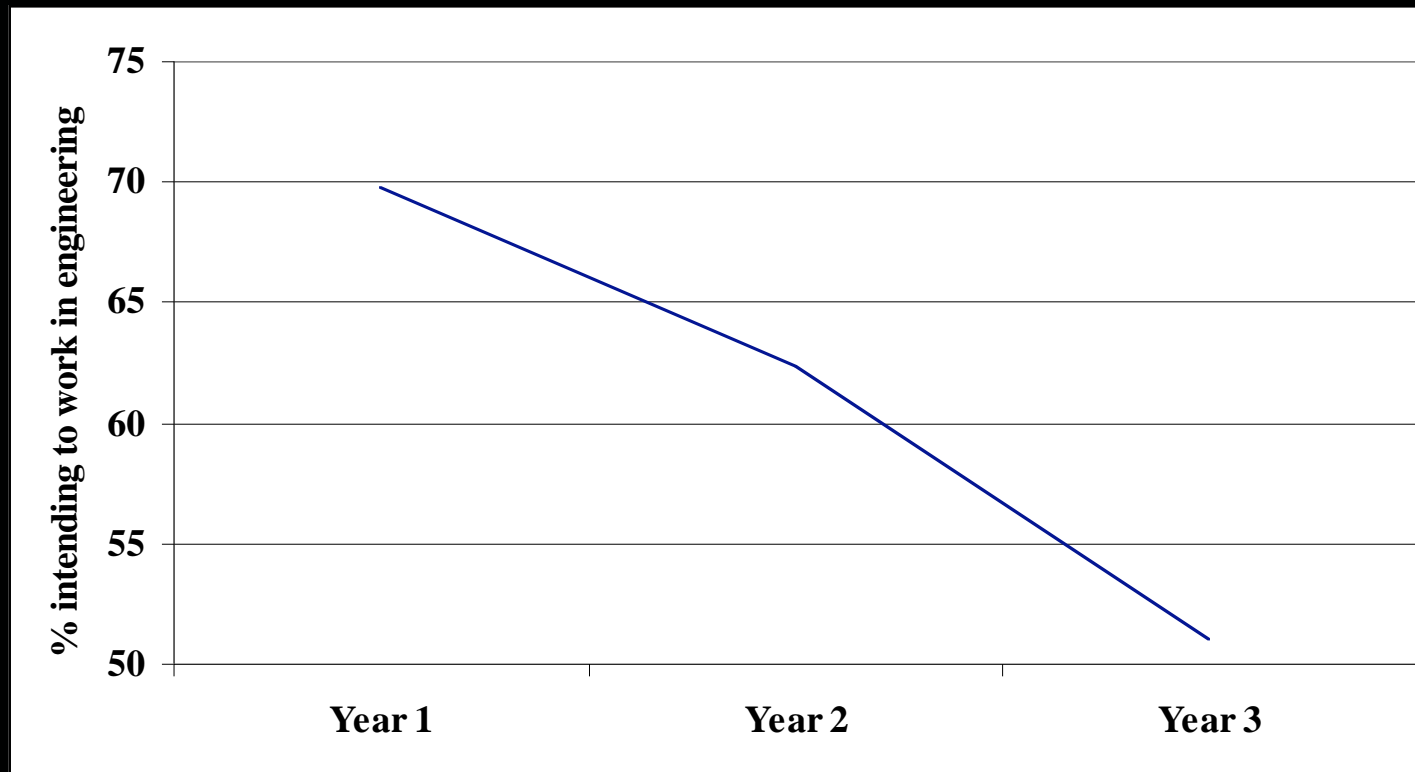
## Which areas of the course would you LEAST like to see expanded?





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## Percentage of students, by year, intending to work in engineering on graduation





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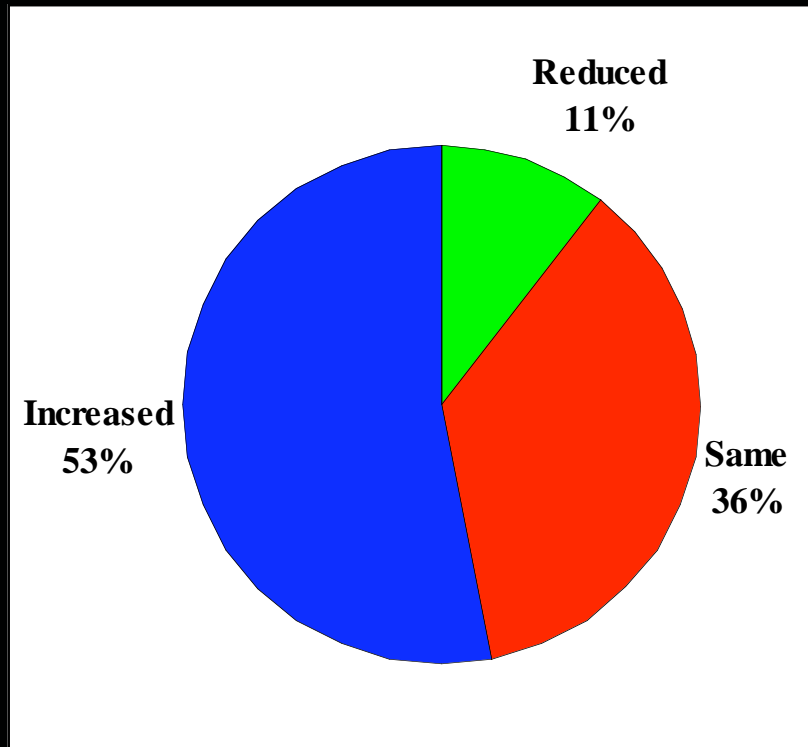
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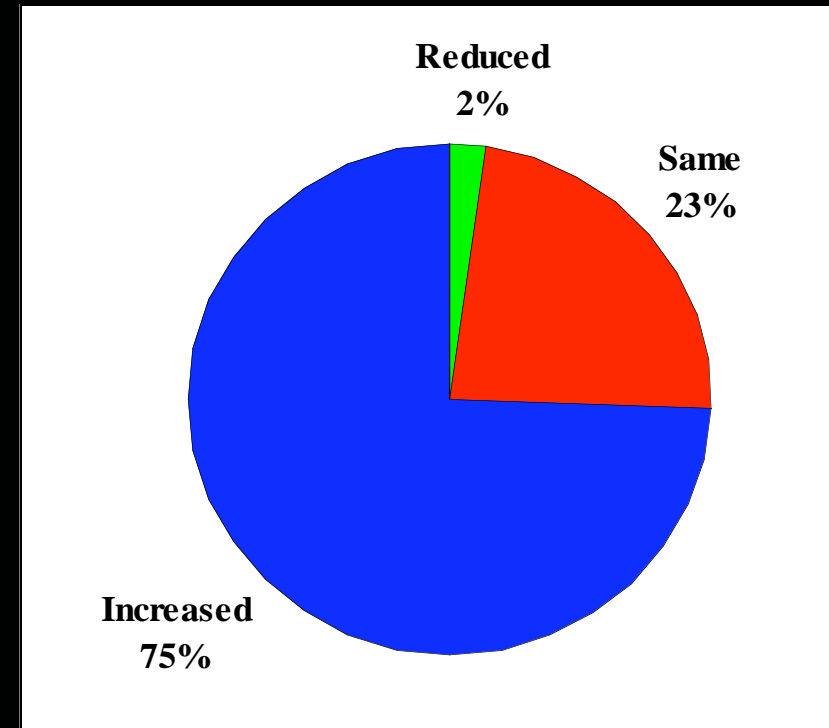


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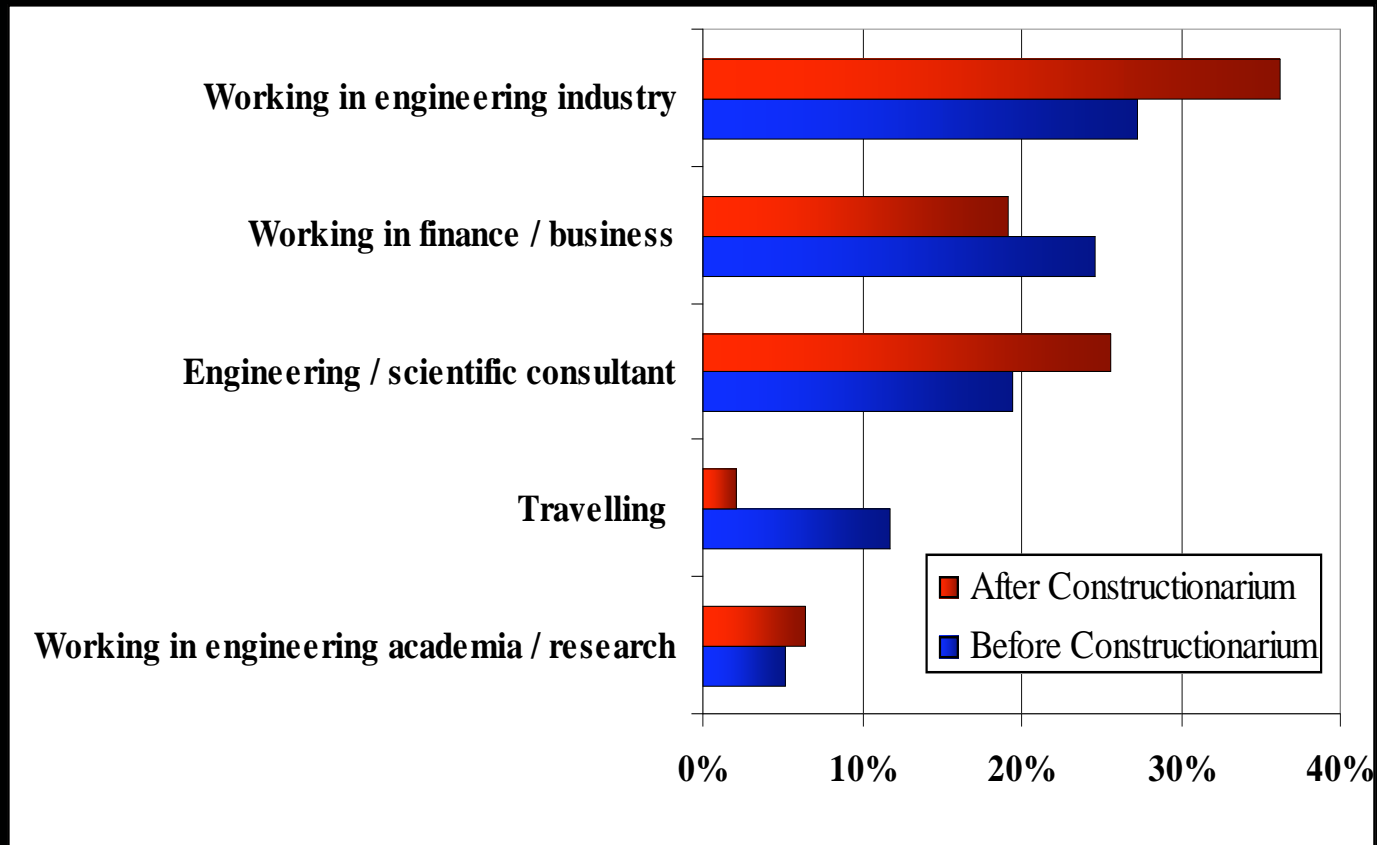




“Please indicate whether the  
Constructionarium changed your motivation  
levels for the course?”



“Please indicate how you feel the  
Constructionarium has changed your  
abilities or skills as an engineer?”





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When asked which part of the course they most enjoyed, 75% of the students identified either “design and make” projects or work with real-world applications.



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## EnVision Surveys Undergraduates and Alumni

The material taught is too abstract and not grounded in modern engineering practice

Demand for increased emphasis on the development of personal and professional skills.

As undergraduates progress through the course, there is a clear decline in their interest in pursuing engineering as a career on graduation



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## Industry Identified areas for improvement

Creativity, entrepreneurship and innovation

Practical experience

Team working and communication skills

The ability to apply knowledge to challenging and real-life situations



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## 9 Key messages leading to 30 specific recommendations

10 for Government

5 for Engineering Institutions

3 for Industry

4 for the Academy

5 for University Engineering Departments



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To Improve understanding in academia of the skills and competences required by industry, to ensure that courses produce graduates with a high level of relevant technical competence backed up by the ability to apply it.



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## Conclusions

Action is required to reverse the lack of interest in and drift from traditional courses

Producing graduates with ability to apply their (fully understood) engineering knowledge in real-life situations is key

Whilst content, facilities, staff and student quality all have some influence, it is the underlying course ethos, expressed through the styles of the teaching and course aims that is the most important



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