# Is the employability of engineering graduates good enough?

### **PHEE Annual Conference**

13<sup>th</sup> January 2016

#### *Our plan for growth: science and innovation* – December 2014

- Government's Science and Innovation Strategy built on work that looked across the STEM skills 'pipeline' to examine issues spanning GCSE at grade A-C level all the way up to masters and specialised degrees
- A key finding: some STEM graduates acquire better employment ready skills and some areas suffer from poorer outcomes relative to others
- S&I Strategy recommends independent reviews of STEM degree accreditation arrangements to improve quality and graduate employability:
  - 1. Targeted review of computer science degree accreditation and graduate employability led by Professor Sir Nigel Shadbolt
  - 2. Wider review of STEM to explore whether other STEM disciplines would warrant similar, specific investigation led by Professor Sir William Wakeham

### **Objectives of the Wakeham Review**

- Review of STEM graduate employability and degree course accreditation
- Explore the graduate employment outcomes for STEM disciplines and <u>determine if there are areas which warrant further investigation through</u> <u>future work</u>
- What is the extent of the problem in areas of disciplinary concern and what are the potential contributing factors?
- To what extent does the accreditation regime(s) for these STEM subjects play a part in graduate outcomes?
- Review will not make explicit recommendations on solutions or specific accreditation regimes. It will identify options for future, more in-depth, exploration of specific STEM disciplines and their associated graduate outcomes

### Methodology

The review has been broadly split into 3 overlapping phases:

#### Recognise that we only have surrogate measures of employability

- A) Interrogate existing data available through Higher Education Statistics Agency (HESA) to develop a more granular picture of STEM graduate employability:
  - i. Unemployment rate
  - ii. Proportion of graduates in 'non-graduate roles'
  - iii. Proportion of graduates earning low salaries (below £20,000)
- B) Conducting an evidence-gathering survey with stakeholders (PSRBs, industry and the HE sector) to develop the evidence base
- C) Targeted stakeholder focus groups/workshops to explore specific issues in more depth
- Advice provided during course of review by Review Advisory Group industry, PSRBs and HE sector

# Unemployment rates of full-time first degree leavers from UK HEIs, 2006-07 to 2012-13



### **Engineering and technology**



Unemployment rates shown for 84 UK HEIs with 23 or more UK-domiciled qualifiers from full-time first degree study in engineering and technology who responded to the DLHE in 2013-14: unemployment rates for a further 17 HEIs with a smaller qualifying cohort are suppressed.

# Distribution of STEM unemployment rates by institution and subject area, 2012-13



HEFCE analysis of the HESA standard qualifiers population and Destination of Leavers from Higher Education survey, both 2012-13. UK-domiciled qualifiers from full-time first degree qualifications registered at publicly-funded English HEIs only. Qualifiers who fell within the DLHE target population and provided a valid response to that survey. All percentages based on fewer than 22.5 qualifiers are not considered to be statistically robust and are suppressed and included under a grouping labelled "Too small".

### Headline STEM disciplines of concern based on HESA data

Discipline	Unemployment level	Graduates in non-grad roles	Graduates on low salaries
Biological sciences	Above average unemployment	Very high proportion in non-graduate roles	Very high proportion in low-pay roles Higher proportion at high tariff institutions
Chemistry and materials science	Above average unemployment	Above average proportion in non- graduate roles from high tariff institutions	Above average proportion in low-pay roles from high tariff institutions
Computer sciences	Above average or high unemployment Sharp difference between low and high tariff institutions	Generally low proportion in non- graduate roles Sharp difference between low and high tariff institutions	Above average proportion in low-pay roles except for high tariff institutions
Earth, marine and environmental sciences	Above average unemployment Peak unemployment for medium tariff institutions	High proportion in non-graduate roles especially for high tariff institutions	Above average proportion in low-pay roles
Chemical, process and energy engineering	High average unemployment especially for high tariff institutions	Very low proportion in non-graduate roles	Very low proportion in low-pay roles
Agriculture, animal and food science	Average unemployment	High proportion in non-graduate roles	High proportion in low-pay roles
Mathematical sciences	Above average unemployment for high tariff institutions	Above average proportion in non- graduate roles for high tariff institutions	Above average in low-pay roles for high tariff institutions
Pharmacology, toxicology and pharmacy	Below average unemployment	Very low proportion in non-graduate roles	High proportion in low-pay roles
Physics and astronomy	Above average unemployment	Below average proportion in non- graduate roles	Below average proportion in low-pay roles

# Engineering

 Generally Engineering has good employment outcomes across its disciplines

• BUT

•There are some puzzles and a few questions thrown up by the data

#### **Chemical Engineering**

- Key areas of concern:
- Proportion of 2012/13 UK-domiciled <u>Chemical Engineering</u> graduates studying at (high tariff) English HE institutions that, after 6 months, are:
  - **Unemployed: 10.9%** (compares to 7.5% across all STEM disciplines)
  - But best paid engineering graduates by some distance
- *Relevant statistics for Chemical Engineering from the DLHE survey:*
- Number of Chemical, Process and Energy Engineering entrants on first time degrees in 2013-14: 2,310
- Number of 2012/13 Chemical, Process and Energy Engineering graduates that responded to DLHE survey: 580
- Relevant statistics for Chemical, Process and Energy Engineering from the Longitudinal DLHE survey:
- Number of 2008/9 Chemical, Process and Energy Engineering graduates that responded to the LDLHE survey: 85
- Proportion of 2008/09 Chemical, Process and Energy Engineering graduates that, after 3 and a half years, are:
  - Unemployed: 5.1% (based on 85 respondents)
  - In non-graduate jobs: 2.6% (based on 60 respondents)
- Earning low salaries: 11.4% (based on 55 respondents)

### **Engineering sub-disciplines of concern based on HESA data**

Discipline	Unemployment level	Graduates in non- graduate roles	Graduates on low salaries
H150 - Engineering design	High unemployment rates for medium tariff institutions	Below average proportion in non-graduate roles	n/a
H160 - Bioengineering, biomedical engineering and clinical engineering	High unemployment rates for medium tariff institutions	n/a	n/a
H400 - Aerospace engineering	Above average unemployment rates, high unemployment for medium tariff institutions	High proportion in non- graduate roles from medium tariff institutions	Below average proportion earning low salaries
H640 - Communications engineering	Above average unemployment rates	Generally below average proportion in non- graduate roles, but high for low tariff institutions	High proportion earning low salaries from medium and low tariff institutions
H650 - Systems engineering	Very high unemployment rates	No data	No data

- Proportion of 2012/13 UK-domiciled <u>Communications Engineering</u> graduates who studied at English HE institutions and that, after 6 months, are:
  - Unemployed: 14.2% of those graduating from 'low tariff' institutions (compared to 11.8% graduating from 'low tariff' institutions across all STEM disciplines)
  - In non-graduate jobs: 39.6% of those graduating from 'low tariff' institutions (compared to 29.5% graduating from 'low tariff' institutions across all STEM disciplines)
  - Earning low salaries: 67.0% of those graduating from 'medium tariff' institutions (compared to 41.9% graduating from 'medium tariff' institutions across all STEM disciplines)

Proportion of 2012/13 UK-domiciled <u>Systems Engineering</u> graduates who studied at <u>medium</u> tariff English HE institutions and that, after 6 months, are: Unemployed: 24.6% (compared to 9.5% graduating from 'medium tariff' institutions across all STEM disciplines

 Earning low salaries: 70.6% of those graduating from 'low tariff' institutions (compared to 45.1% graduating from 'low tariff' institutions across all STEM disciplines)

- Proportion of 2012/13 UK-domiciled <u>Mechanical, Aero and Production Engineering</u> graduates who studied at English HE institutions and that, after 6 months, are:
  - In non-graduate jobs: 14.1% (of 2,410 respondents) % (compared to 22.1% across all STEM disciplines)
  - Earning low salaries: 19.4% (of 1,720 respondents) (compared to 38.7% across all STEM disciplines)

- Proportion of 2012/13 UK-domiciled <u>Aerospace Engineering</u> graduates who studied at English HE institutions and that, after 6 months, are:
  - Unemployed: 11.1% (of 545 respondents)
  - In non-graduate jobs: 20.6% (of 375 respondents) % (compared to 22.1% across all STEM disciplines)
  - Earning low salaries: 24.6% (of 280 respondents) (compared to 38.7% across all STEM disciplines)

- Proportion of 2012/13 UK-domiciled <u>Bioengineering</u>, <u>Biomedical Engineering</u> and <u>Clinical</u> <u>Engineering</u> graduates studying at English HE institutions that, after 6 months, are:
- Unemployed: 13.1% (compared to 9.2% across all STEM disciplines) particulary in medium tariff institutions

### Additional evidence gathering – online survey and focus groups

- Online survey of HE providers, businesses, industry representative bodies and professional bodies – approx 500 responses received.
  - 'General questions'
  - Discipline specific questions
  - Specific questions for HEI's. PSRB's, Industry etc.
- 3 stakeholder focus groups to explore specific disciplines in more detail:
  - Biological Sciences
  - Earth, Marine and Environmental Sciences
  - Agriculture, Animal Science and Food Science
- Written to professional / representative bodies on other disciplines of concern



# To what extent do you agree that recent graduates meet the employability requirements of employers?



# **Mechanical and Civil**



# Aero and Electrical



# Disciplines for in-depth study



#### Main Issues Identified in Graduate Employability





Institutional or departmental engagement with industry leads to enhanced employability.



#### Graduates have the required 'work ready' skills or business awareness.



#### Graduates have all the practical subject specific skills required.



#### Graduates have all of the subject knowledge required.



#### Graduates have necessary experience of modern scientific equipment.



## To what extent do you agree that the following systems or processes have an impact on graduate employability?





#### Do the processes you use for accreditation of courses involve visits to a university or college?

If yes, is a representative of business or industry part of the visiting team?



Do the processes you use for the accreditation of courses require the involvement of business or industry in the course as a condition for accreditation?



### **Emerging messages / findings 1**

- Stakeholder survey and focus group evidence seems to corroborate poor employment statistics from HESA data
- Disciplines that warrant future, targeted exploration:
  - Biological Sciences
  - Earth, Marine and Environmental Sciences
  - Agri-Food disciplines
- Additional disciplines of milder concern emerge
- Evidence from stakeholders in response to questions will inform action
- <u>Data</u> which elucidates the links between the supply and demand for STEM graduate skills needs to be <u>better developed</u> and strengthened – different types of work experience; geographical factors; flows of STEM graduates into STEM and non-STEM industries involve employers and HEI's

### **Emerging messages / findings 2**

- <u>Some work experience</u> needs to assume greater prominence in degree courses and the benefits must be clearly communicated to students, placements for all not possible examine how else to provide
- <u>Graduate soft / work readiness skills need to be improved</u> and adjusted as demands change. Consideration should be given to how these could be embedded to a greater extent in existing degree course provision/curricula
- <u>Careers advice / training for graduates could be improved</u> large degree of variation across providers and disciplines
- Accreditation has a positive effect on employability. Where accreditation is weak or just beginning there are more problems. Engineering disciplines can provide examples of good practice
- <u>Closer and more systematic engagement</u> more generally between HE providers and industry at a discipline level would help address these issues

# Engineering

- Employment outcomes are among the best on average
- Room for those HEI's not as successful to improve to level of the best, some outcomes are worrying
- Seek to provide all the benefits of an industrial placement in courses even if not a placement
- Remain vigilant about changing needs in soft skills
- Close liaison at discipline level between HEI's and industry