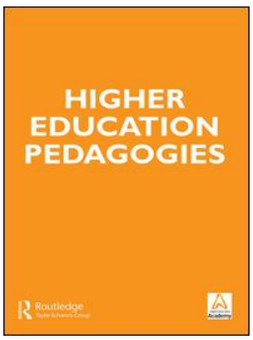

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ARTICLE

Reflections on the 2017 HEA STEM conference: graduate employability challenges and solutions

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ABSTRACT

Professor Marshall, in her conference opening remarks, asked 'What is a university for?' She then discussed the need for higher education to develop graduates who can offer solutions to global challenges, but that this needs to include not only core skills for each discipline but also wider graduate skills that employers require. Professor Wakeham, in his keynote, questioned whether our current approach to employability development is working, for STEM undergraduates, highlighting the poor employment rates for STEM UK graduates.

In this Conference Reflection article, we will respond to the issues raised above by considering what the overarching challenges are for universities trying to teach employability and graduateness. Drawing on the conference keynotes, employer-led reports and using the reviews of Shadbolt and Wakeham, we will consider what problems and issues exist and what solutions are being devised, reflecting on the successes and difficulties reported on at the Manchester conference.

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Graduateness; employability; STEM graduates; computer science

Introduction

The 2017 Higher Education Academy (HEA) STEM conference had the strapline 'Achieving Excellence in Teaching and Learning' and within that a strong focus on employability could be found in many of the presentations. Professor Stephanie Marshall (2017), in her conference opening remarks, asked 'What is a university for?' Her answer to this question discussed the need for higher education practitioners to develop graduates who can offer solutions to worldwide challenges, but that this needs to include not only core skills for each discipline but also wider graduate skills that employers require. In order to achieve this she suggested that 40% of the population receiving higher education should be the norm, rather than HE representing a global elite. Those involved in teaching need to be universal citizens involved in both knowledge creation and dissemination. Higher Education needs to be creating lifelong ambitious graduates capable of being global citizens.

Professor William Wakeham (2017), in his keynote, questioned whether our current approach to employability skills and characteristics development is working, for STEM undergraduates. He highlighted the poor employment rates for STEM UK graduates,

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whilst at the same time asking if these rates are correct or offer a measure of employability. Computer science (CS) graduates were given as an example with the highest STEM post-graduation unemployment rate of 13% compared with a median rate of 3%. How can this be possible with the supposed huge demand for graduates in this discipline? Missing attributes or low skills areas that have been noted by a wide range of professionals are soft skills, awareness of the world of work and numeracy. Professor Wakeham also underlined the need to train STEM graduates for lifelong work.

The STEM problem

The nature and extent of the employment problems being experienced by both employers and graduates in STEM were reported on in the Wakeham Review of 2016 and in the same year in more detail for computer sciences in the Shadbolt Review (Shadbolt, 2016). Of particular relevance to this conference were two themes from these reviews:

- How STEM HE teaching can satisfy employers requirements of producing graduates with specific abilities to meet the current industry needs (e.g. specific programming languages) as well as lifelong learning skills.
- Whether teaching of employability skills and values is best tackled as embedded within courses or as an add-on.

Employer requirements

Whichever way the teaching of employability is tackled within a course or as an individual module, the importance that employers place on this is clear. In his keynote, Professor Wakeham highlighted one particular STEM discipline – Biosciences. He noted skills gaps which had been identified in the following key areas:

- Practical skills;
- Transferrable skills including team work; and
- Mathematics (and applicability to real world situations/problems), although there were variations across sub-disciplines.

This list, however, could be applied to almost any STEM discipline. In the 2007 International Employer Barometer survey (cited in Archer & Davison, 2008) the top two most important skills and capabilities when recruiting new graduates were (1) communication skills and (2) team-working skills, with 'a good degree qualification' not appearing in the top ten. In a 2011 report on employers' perceptions of employability skills (Lowden et al) these top two skills are still being cited first. However, Lowden et al also discuss definitions of employability, illustrating the conundrum that whilst employers want universities to embed employability into their teaching, they do not offer a clear definition of this, summarising it as, for example '… the skills almost everyone needs to do almost any job' (Lowden, Hall, Elliot, & Lewin, 2011). This requirement for graduates to have a 'battery of applied practical skills which make them more "work-

ready"' (Archer & Davison, 2008) presents HEIs a significant challenge in choosing how to teach employability.

Of similar but polar opposite concern is the finding reported in the Forging Futures report by UK Commission for Employment and Skills, and Universities UK (UKCES and UUK, 2014) that 16% of the UK workforce 'had skills and qualifications above those required by their current role.' A clear mismatch therefore between skills being taught in Universities and the skills required by employers. One of the ways in which this can arise is that skills can be out of date before graduating. A particular example of this is the agri-food industry where technological advances are extremely fast-paced possibly beyond the speed with which university teaching can adapt.

Turning to the relatively high unemployment experienced by graduates in the computer science (CS) discipline, the Shadbolt Review (Shadbolt, 2016) notes that CS graduates from sandwich courses have an employment rate significantly higher than non-sandwich course graduates and significantly lower non-graduate level employment rates. So in this case, it would appear that gaining employability skills through the add-on of separate employment experience has benefits.

In the 2015 National Centre for Universities and Business report 'Increasing the offer of work experience in STEM subjects: can demand match supply?' (Docherty and Fernandez, 2015) it is stated that not only do employers use placements as recruiting tools but also those 'employers with vacancies are 40% more likely to offer placements than those without.' Furthermore, survey responses suggest that students do not recognise shorter (non-sandwich) placements as work experience. This supports a further point made in the Shadbolt Review (Shadbolt, 2016) that unemployed CS graduates themselves recognised that they failed 'to appreciate the importance of experience of the world of work and the soft skills that employers need.'

Conference solutions

Professor Peter Goodhew (2017), in his day 2 keynote, discussed the setting up of Britain's new first engineering only university. This will offer a three year accelerated engineering masters, including a six month internship for each student. Crucially there will be no lectures, with all teaching in the form of Problem-Based Learning (PBL). Entrants will not necessarily need maths or physics at A Level, but, on the other hand, 'grit, curiosity and passion' will be required. The teaching and learning will be a combination of real-world problem solving with liberal arts, design and other subjects and employability skills focussed on future growth areas.

Several conference sessions reported on using an embedded skills approach. The use of PBL for Sport and Exercise Psychology students (Heaviside, 2017) has been introduced in an attempt to both increase student engagement and also to improve their ability to apply and transfer knowledge they have gained. PBL can be seen to develop higher levels of critical thinking, encourage independent learning and increase self-confidence, all of which contribute to increased employability skills. Although only a very small study, students reported positively on the PBL approach recognising the transferable skills element and greater interactivity, however they also preferred to have traditional lectures for some topics. Jennifer Hill (2017) presented her research on developing graduate attributes through under-graduate research. She highlighted that

offering authentic, challenging, permissive and self-reflecting research opportunities led to self-awareness and adaptability – skills which are valued by employers.

Our own research (Chetwynd, Aiken and Jefferis, 2017) has focussed on a problem specific to CS students – learning programming. Novice programmers often struggle to achieve successful working programs, which can be demoralising and contribute to lack of persistence as a student. One approach to this is to start programming with a visual language which avoids having to grasp some of the trickier concepts such as syntax. Our investigations have shown that students can successfully transition to text-based languages, having learnt the concepts and fundamental principles. For employers this is an important employability skill, as universities can rarely update the programming language(s) that they are teaching to keep pace with the current industry requirements, so graduates must be able to apply their skills to a new language on starting employment.

Summary

Although this conference had the generic title of 'Achieving Excellence in Teaching and Learning' the day 1 keynote provided an underlying theme of employability and how to teach this to STEM undergraduates. The Wakeham and Shadbolt reviews have highlighted the challenges in preparing STEM, and other, undergraduates for employment. There is a growing awareness of the need to teach STEM students these skills, attributes and behaviours – graduateness – and the conference sessions illustrated a variety of approaches to tackle this problem.

Disclosure statement

No potential conflict of interest was reported by the authors.

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